

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	1.55E+01		mg/kg	1.6E+01	3.9E-01	C	YES ASL
Barium	1.14E+03		mg/kg	1.1E+03	1.5E+03	N	NO BSL
Cadmium	1.24E+01		mg/kg	1.2E+01	7.0E+00	N	YES ASL
Nickel	1.39E+01		mg/kg	1.4E+01	1.5E+02	N	NO BSL
Zinc	5.28E+02		mg/kg	5.3E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Part 7 of 8  
 This document relates to Parent Doc  
30244878



30244884

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	1.55E+01		1.55E+01	Maximum Detection
Cadmium	mg/kg	1.24E+01		1.24E+01	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	7.79E+02		µg/L	7.8E+02	7.3E+02	N	YES	ASL
Cadmium	2.38E+00		µg/L	2.4E+00	1.8E+00	N	YES	ASL
Zinc	2.72E+02		µg/L	2.7E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	7.79E-01		7.79E-01	Maximum Detection
Cadmium	mg/L	2.38E-03		2.38E-03	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IRage-adj x EF / AT-C  IRage-adj = (EDc x IRc/BWc) + (EDa x IRa/BWa)
	IRage-adj	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWa x AT-C)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent - c	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	tevent - a	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0001 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0001 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0001 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0001 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0001 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	1.6E+01
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	1.2E+01
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	1.1E-08
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	9.1E-09
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.6E+01	mg/kg	1.98E-04	mg/kg-day	3.0E-04	mg/kg-day	7E-01
	Cadmium	1.2E+01	mg/kg	1.6E-04	mg/kg-day	1.0E-03	mg/kg-day	2E-01
Ingestion Route Total								8E-01
Dermal Absorption	Arsenic	1.6E+01	mg/kg	1.66E-05	mg/kg-day	3.0E-04	mg/kg-day	6E-02
	Cadmium	1.2E+01	mg/kg	4.4E-07	mg/kg-day	2.5E-05	mg/kg-day	2E-02
Dermal Absorption Route Total								7E-02
Inhalation	Arsenic	1.1E-08	mg/m <sup>3</sup>	1.09E-08	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	7E-04
	Cadmium	9.1E-09	mg/m <sup>3</sup>	8.7E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								1E-03
Total of Receptor Hazards Across All Media								9E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium Cadmium	7.8E-01	mg/L	5.0E-02	mg/kg-day	2.0E-01	mg/kg-day	2E-01
		2.4E-03	mg/L	1.5E-04	mg/kg-day	5.0E-04	mg/kg-day	3E-01
Ingestion Route Total								6E-01
Dermal Absorption	Barium Cadmium	7.8E-01	mg/L	3.3E-04	mg/kg-day	1.4E-02	mg/kg-day	2E-02
		2.4E-03	mg/L	1.0E-06	mg/kg-day	1.3E-05	mg/kg-day	8E-02
Dermal Absorption Route Total								1E-01
Total of Receptor Hazards Across All Media								7E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	7E-01	--	6E-02	7E-01	
			Cadmium		2E-01	--	2E-02	2E-01	
			Chemical Total	8E-01	--	7E-02	9E-01		
	Exposure Medium Total								9E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	7E-04	--	7E-04	
			Cadmium		--	4E-04	--	4E-04	
			Chemical Total	--	1E-03	--	1E-03		
	Exposure Medium Total								1E-03
	Soil Total								9E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-01	--	2E-02	3E-01
Cadmium				3E-01		--	8E-02	4E-01	
Chemical Total				6E-01	--	1E-01	7E-01		
Groundwater Total								7E-01	

Total Hazard Across All Media = 2E+00

Total Neurological/Nervous System HI =	7E-04
Total Skin HI =	7E-01
Total Vascular HI =	7E-01
Total Kidneys HI =	8E-01
Total Development HI =	7E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	1.6E+01	mg/kg	2.4E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-05
	Cadmium	1.2E+01	mg/kg	1.9E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								4E-05
Dermal Absorption	Arsenic	1.6E+01	mg/kg	2.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
	Cadmium	1.2E+01	mg/kg	6.1E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								3E-06
Inhalation	Arsenic	1.1E-08	mg/m <sup>3</sup>	4.7E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-08
	Cadmium	9.1E-09	mg/m <sup>3</sup>	3.7E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
Inhalation Route Total								3E-08
Total of Receptor Hazards Across All Media								4E-05

NV= No toxicity value available



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	7.8E-01	mg/L	1.2E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	2.4E-03	mg/L	3.5E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	7.8E-01	mg/L	6.6E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	2.4E-03	mg/L	2.0E-07	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

NV = No toxicity value available

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	3.6E-05	2.0E-08	3.4E-06	4E-05
			Cadmium	NV	6.7E-09	NV	7E-09
			Chemical Total	3.6E-05	2.7E-08	3.4E-06	4E-05
			Exposure Medium Total				
Soil Total						4E-05	
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Cadmium	NV	--	NV	0E+00
			Chemical Total	0.0E+00	--	0.0E+00	0E+00
Groundwater Total						0E+00	

NV = No toxicity value available

Total risks across all exposure routes and media = 4E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.6E+01	mg/kg	6.9E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Cadmium	1.2E+01	mg/kg	5.5E-05	mg/kg-day	1.0E-03	mg/kg-day	6E-02
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	1.6E+01	mg/kg	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	4E-02
	Cadmium	1.2E+01	mg/kg	3.1E-07	mg/kg-day	2.5E-05	mg/kg-day	1E-02
Dermal Absorption Route Total								5E-02
Inhalation	Arsenic	1.1E-08	mg/m <sup>3</sup>	7.7E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	5E-04
	Cadmium	9.1E-09	mg/m <sup>3</sup>	6.1E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								8E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	7.8E-01	mg/L	4.6E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
	Cadmium	2.4E-03	mg/L	1.4E-05	mg/kg-day	5.0E-04	mg/kg-day	3E-02
Ingestion Route Total								5E-02
Dermal Absorption	Barium	7.8E-01	mg/L	2.5E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
	Cadmium	2.4E-03	mg/L	7.7E-08	mg/kg-day	1.3E-05	mg/kg-day	6E-03
Dermal Absorption Route Total								8E-03
Total of Receptor Hazards Across All Media								6E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	4E-02	3E-01	
			Cadmium		6E-02	--	1E-02	7E-02	
			Chemical Total	3E-01	--	5E-02	3E-01		
	Exposure Medium Total								3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	5E-04	--	5E-04	
			Cadmium		--	3E-04	--	3E-04	
			Chemical Total	--	8E-04	--	8E-04		
			Exposure Medium Total						
	Soil Total								3E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-02	--	2E-03	3E-02
Cadmium				3E-02		--	6E-03	3E-02	
Chemical Total				5E-02	--	8E-03	6E-02		
Groundwater Total								6E-02	

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI =	5E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	1E-01
Total Development HI =	5E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	1.6E+01	mg/kg	2.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-06
	Cadmium	1.2E+01	mg/kg	2.2E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								4E-06
Dermal Absorption	Arsenic	1.6E+01	mg/kg	5.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	8E-07
	Cadmium	1.2E+01	mg/kg	1.4E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								8E-07
Inhalation	Arsenic	1.1E-08	mg/m <sup>3</sup>	9.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	4E-09
	Cadmium	9.1E-09	mg/m <sup>3</sup>	7.9E-10	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								6E-09
Total of Receptor Hazards Across All Media								5E-06

NV = No toxicity value available



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	7.8E-01	mg/L	1.4E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	2.4E-03	mg/L	4.4E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.0E+00
Dermal Absorption	Barium	7.8E-01	mg/L	5.5E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	2.4E-03	mg/L	1.7E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.0E+00
Total of Receptor Hazards Across All Media								0.0E+00

NV = No toxicity value available

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0001 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	4.1E-06	4.2E-09	7.7E-07	5E-06
			Cadmium	NV	1.4E-09	NV	1E-09
			Chemical Total	4.1E-06	5.6E-09	7.7E-07	5E-06
			Exposure Medium Total				
Soil Total						5E-06	
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Cadmium	NV	--	NV	0E+00
			Chemical Total	0.0E+00	--	0.0E+00	0E+00
			Groundwater Total				

NV = No toxicity value available

Total risks across all exposure routes and media = 5E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	5.05E+02		mg/kg	5.1E+02	1.5E+03	N	NO	BSL
Cadmium	2.82E+00		mg/kg	2.8E+00	7.0E+00	N	NO	BSL
Nickel	1.02E+01		mg/kg	1.0E+01	1.5E+02	N	NO	BSL
Zinc	6.30E+01		mg/kg	6.3E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/kg	5.05E+02		0.00E+00	Not a COPC
Cadmium	mg/kg	2.82E+00		0.00E+00	Not a COPC
Nickel	mg/kg	1.02E+01		0.00E+00	Not a COPC
Zinc	mg/kg	6.30E+01		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	9.59E+02		µg/L	9.6E+02	7.3E+02	N	YES	ASL
Cadmium	5.69E+00		µg/L	5.7E+00	1.8E+00	N	YES	ASL
Zinc	3.54E+02		µg/L	3.5E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	9.59E-01		9.59E-01	Maximum Detection
Cadmium	mg/L	5.69E-03		5.69E-03	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event-c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event-a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0002 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0002 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0002 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0002 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0002 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.0
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.0
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.0
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.0
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00000
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00000
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00000
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00000
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00000
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00000
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.0000
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
<b>Inhalation Route Total</b>								<b>0.000</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium Cadmium	9.6E-01	mg/L	6.1E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
		5.7E-03	mg/L	3.6E-04	mg/kg-day	5.0E-04	mg/kg-day	7E-01
Ingestion Route Total								1E+00
Dermal Absorption	Barium Cadmium	9.6E-01	mg/L	4.0E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
		5.7E-03	mg/L	2.4E-06	mg/kg-day	1.3E-05	mg/kg-day	2E-01
Dermal Absorption Route Total								2E-01
Total of Receptor Hazards Across All Media								1E+00

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02	3E-01
			Cadmium	Kidneys	7E-01	--	2E-01	9E-01
			Chemical Total		1E+00	--	2E-01	1E+00
Groundwater Total								1E+00

Total Hazard Across All Media 1E+00

Total Neurological/Nervous System HI = 0E+00  
 Total Skin HI = 0E+00  
 Total Vascular HI = 0E+00  
 Total Kidneys HI = 1E+00  
 Total Development HI = 0E+00  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg	See Table for Mutagenic Risks				0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
		Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg	See Table for Mutagenic Risks				0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
		Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>	See Table for Mutagenic Risks				0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	9.6E-01	mg/L	1.4E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	5.7E-03	mg/L	8.5E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	9.6E-01	mg/L	8.2E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	5.7E-03	mg/L	4.8E-07	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

NV = No toxicity value available

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Cadmium	NV	--	NV	0E+00
			Chemical Total	0.0E+00	--	0.0E+00	0E+00
Groundwater Total						0E+00	

NV = No toxicity value available

Total risks across all exposure routes and media = 0E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.0
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.0
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.0
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.0
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00000
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00000
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00000
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00000
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00000
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00000
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.0000
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
<b>Inhalation Route Total</b>								<b>0.000</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	9.6E-01	mg/L	5.7E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
	Cadmium	5.7E-03	mg/L	3.4E-05	mg/kg-day	5.0E-04	mg/kg-day	7E-02
Ingestion Route Total								1E-01
Dermal Absorption	Barium	9.6E-01	mg/L	3.1E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
	Cadmium	5.7E-03	mg/L	1.8E-07	mg/kg-day	2.3E-05	mg/kg-day	8E-03
Dermal Absorption Route Total								1E-02
Total of Receptor Hazards Across All Media								1E-01

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS  
CENTRAL TENDENCY EXPOSURE  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03	3E-02
			Cadmium	Kidneys	7E-02	--	8E-03	8E-02
			Chemical Total		1E-01	--	1E-02	1E-01
Groundwater Total								1E-01

Total Hazard Across All Media 1E-01

Total Neurological/Nervous System HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Skin HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Vascular HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Kidneys HI =	<span style="border: 1px solid black; padding: 2px;">1E-01</span>
Total Development HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Blood HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Lungs and Respiratory System HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Beryllium Sensitization HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Hair, Nails, and Teeth HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Body and Organ Weights HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total ESOD HI =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>
Total Fetotoxicity =	<span style="border: 1px solid black; padding: 2px;">0E+00</span>

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg	See Table for Mutagenic Risks				0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg	See Table for Mutagenic Risks				0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>	See Table for Mutagenic Risks				0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	9.6E-01	mg/L	1.8E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	5.7E-03	mg/L	1.1E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	9.6E-01	mg/L	6.8E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	5.7E-03	mg/L	4.0E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

NV = No toxicity value available

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0002 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Cadmium	NV	--	NV	0E+00
			Chemical Total	0.00E+00	--	0.00E+00	0E+00
Groundwater Total						0E+00	

NV = No toxicity value available

Total risks across all exposure routes and media = 0E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Aluminum	2.11E+04		mg/kg	2.1E+04	7.7E+03	N	YES ASL
Arsenic	8.40E+00		mg/kg	8.4E+00	3.9E-01	C	YES ASL
Barium	1.51E+02		mg/kg	1.5E+02	1.5E+03	N	NO BSL
Beryllium	5.20E-01		mg/kg	5.2E-01	1.6E+01	N	NO BSL
Cadmium	3.32E+00		mg/kg	3.3E+00	7.0E+00	N	NO BSL
Calcium	3.80E+03		mg/kg	3.8E+03	NA		NO NUT
Chromium	2.09E+01		mg/kg	2.1E+01	2.9E-01	C	YES ASL
Cobalt	1.40E+01		mg/kg	1.4E+01	2.3E+00	N	YES ASL
Copper	2.00E+01		mg/kg	2.0E+01	3.1E+02	N	NO BSL
Iron	2.40E+04		mg/kg	2.4E+04	5.5E+03	N	YES ASL
Magnesium	2.87E+03		mg/kg	2.9E+03	NA		NO NUT
Manganese	7.75E+02		mg/kg	7.8E+02	1.8E+02	N	YES ASL
Nickel	1.16E+01		mg/kg	1.2E+01	1.5E+02	N	NO BSL
Potassium	1.05E+03		mg/kg	1.1E+03	NA		NO NUT
Vanadium	3.89E+01		mg/kg	3.9E+01	3.9E+01	N	NO BSL
Zinc	1.05E+02		mg/kg	1.1E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	2.11E+04		2.11E+04	Maximum Detection
Arsenic	mg/kg	8.40E+00		8.40E+00	Maximum Detection
Chromium	mg/kg	2.09E+01		2.09E+01	Maximum Detection
Cobalt	mg/kg	1.40E+01		1.40E+01	Maximum Detection
Iron	mg/kg	2.40E+04		2.40E+04	Maximum Detection
Manganese	mg/kg	7.75E+02		7.75E+02	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.99E+02		µg/L	3.0E+02	7.3E+02	N	NO	BSL
Copper	1.18E+02		µg/L	1.2E+02	1.5E+02	N	NO	BSL
Manganese	1.40E+00		µg/L	1.4E+00	8.8E+01	N	NO	BSL
Nickel	1.05E+00		µg/L	1.1E+00	7.3E+01	N	NO	BSL
Zinc	2.39E+02		µg/L	2.4E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	2.99E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	1.18E-01		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	1.40E-03		0.00E+00	Not a COPC
Nickel	mg/L	1.05E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	2.39E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IRage-adj x EF / AT-C  IRage-adj = (EDc x IRc/BWc) + (EDa x IRa/BWa)
	IRage-adj	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWa x AT-C)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent - c	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	tevent - a	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0012 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0012 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0012 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0012 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0012 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	2.1E+04
Antimony	0.0E+00
Arsenic	8.4E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	2.1E+01
Cobalt	1.4E+01
Copper	0.0E+00
Iron	2.4E+04
Manganese	7.8E+02
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	1.6E-05
Antimony	No	0.0E+00
Arsenic	No	6.2E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	1.5E-08
Cobalt	No	1.0E-08
Copper	No	0.0E+00
Iron	No	1.8E-05
Manganese	No	5.7E-07
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	2.1E+04	mg/kg	2.7E-01	mg/kg-day	1.0E+00	mg/kg-day	3E-01
	Arsenic	8.4E+00	mg/kg	1.07E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
	Chromium	2.1E+01	mg/kg	2.7E-04	mg/kg-day	3.0E-03	mg/kg-day	9E-02
	Cobalt	1.4E+01	mg/kg	1.8E-04	mg/kg-day	3.0E-04	mg/kg-day	6E-01
	Iron	2.4E+04	mg/kg	3.1E-01	mg/kg-day	7.0E-01	mg/kg-day	4E-01
	Manganese	7.8E+02	mg/kg	9.9E-03	mg/kg-day	2.3E-02	mg/kg-day	4E-01
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0E+00
Ingestion Route Total								2E+00
Dermal Absorption	Aluminum	2.1E+04	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Arsenic	8.4E+00	mg/kg	9.02E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Chromium	2.1E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.4E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	2.4E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	7.8E+02	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Aluminum	1.6E-05	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	3E-03
	Arsenic	6.2E-09	mg/m <sup>3</sup>	5.92E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
	Chromium	1.5E-08	mg/m <sup>3</sup>	1.5E-08	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	1E-04
	Cobalt	1.0E-08	mg/m <sup>3</sup>	9.9E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	2E-03
	Iron	1.8E-05	mg/m <sup>3</sup>	1.7E-05	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	5.7E-07	mg/m <sup>3</sup>	5.5E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	1E-02
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0E+00
Inhalation Route Total								2E-02
Total of Receptor Hazards Across All Media								2E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.0
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.0
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.0
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Aluminum	Neurological	3E-01	--	0E+00	3E-01
			Arsenic	Skin/Vascular	4E-01	--	3E-02	4E-01
			Chromium	None Reported	9E-02	--	0E+00	9E-02
			Cobalt	Blood	6E-01	--	0E+00	6E-01
			Iron	Gastrointestinal Tract	4E-01	--	0E+00	4E-01
			Manganese	Neurological	4E-01	--	0E+00	4E-01
			Nickel	Body and Organ weights	0E+00	--	0E+00	0E+00
			Chemical Total		2E+00	--	3E-02	2E+00
	Exposure Medium Total							2E+00
Soil	Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	3E-03	--	3E-03
			Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chromium	Lungs	--	1E-04	--	1E-04
			Cobalt	Respiratory System	--	2E-03	--	2E-03
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	1E-02	--	1E-02
			Nickel	Respiratory System	--	0E+00	--	0E+00
			Zinc	NA	--	NV	--	0E+00
			Chemical Total		--	2E-02	--	2E-02
	Exposure Medium Total							2E-02
Soil Total								2E+00

Total Hazard Across All Media = 2E+00

Total Neurological/Nervous System HI =	7E-01
Total Skin HI =	4E-01
Total Vascular HI =	4E-01
Total Kidneys HI =	0E+00
Total Development HI =	4E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	4E-01
Total Blood HI =	6E-01
Total Lungs and Respiratory System HI =	2E-03
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	2.1E+04	mg/kg	3.3E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	8.4E+00	mg/kg	1.3E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Chromium	2.1E+01	mg/kg	See Table for Mutagenic Risks				7E-05
	Cobalt	1.4E+01	mg/kg	2.2E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	2.4E+04	mg/kg	3.8E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	7.8E+02	mg/kg	1.2E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								9E-05
Dermal Absorption	Aluminum	2.1E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	8.4E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Chromium	2.1E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	1.4E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	2.4E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	7.8E+02	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Aluminum	1.6E-05	mg/m <sup>3</sup>	6.4E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	6.2E-09	mg/m <sup>3</sup>	2.5E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Chromium	1.5E-08	mg/m <sup>3</sup>	See Table for Mutagenic Risks				2E-07
	Cobalt	1.0E-08	mg/m <sup>3</sup>	4.2E-09	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	4E-08
	Iron	1.8E-05	mg/m <sup>3</sup>	7.3E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	5.7E-07	mg/m <sup>3</sup>	2.3E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0E+00
Inhalation Route Total								2E-07
Total of Receptor Hazards Across All Media								9E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										7E-05
	Age 0 -2 years	2.1E+01	mg/kg	7.6E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	3.8E-05		
	Age 2 - 6 years	2.1E+01	mg/kg	1.5E-05	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	2.3E-05		
	Age 6 - 16 years	2.1E+01	mg/kg	4.1E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	6.1E-06		
	Age 16 - 30 years	2.1E+01	mg/kg	5.7E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	2.9E-06		
	Dermal Absorption										0E+00
	Age 0 -2 years	2.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	2.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	2.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	2.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										2E-07
	Age 0 -2 years	1.5E-08	mg/m3	4.2E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	5.1E-08		
Age 2 - 6 years	1.5E-08	mg/m3	8.4E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	3.0E-08			
Age 6 - 16 years	1.5E-08	mg/m3	2.1E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	7.6E-08			
Age 16 - 30 years	1.5E-08	mg/m3	2.9E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	3.5E-08			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/L						0.E+00
Cobalt		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0E+00
			Arsenic	2.0.E-05	1.1.E-08	1.9.E-06	2E-05
			Chromium	7.0.E-05	1.9.E-07	0.0.E+00	7E-05
			Cobalt	NV	3.8.E-08	NV	4E-08
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Nickel	NV	0.0.E+00	NV	0E+00
			Chemical Total	9.0.E-05	2.4.E-07	1.9.E-06	9E-05
Exposure Medium Total						9E-05	
Soil Total						9E-05	

Total risks across all exposure routes and media = 9E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	2.1E+04	mg/kg	9.4E-02	mg/kg-day	1.0E+00	mg/kg-day	9E-02
	Arsenic	8.4E+00	mg/kg	3.8E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Chromium	2.1E+01	mg/kg	9.4E-05	mg/kg-day	3.0E-03	mg/kg-day	3E-02
	Cobalt	1.4E+01	mg/kg	6.3E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Iron	2.4E+04	mg/kg	1.1E-01	mg/kg-day	7.0E-01	mg/kg-day	2E-01
	Manganese	7.8E+02	mg/kg	3.5E-03	mg/kg-day	2.3E-02	mg/kg-day	1E-01
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0E+00
Ingestion Route Total								8E-01
Dermal Absorption	Aluminum	2.1E+04	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Arsenic	8.4E+00	mg/kg	6.3E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Chromium	2.1E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.4E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	2.4E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	7.8E+02	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Aluminum	1.6E-05	mg/m <sup>3</sup>	1.0E-05	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	2E-03
	Arsenic	6.2E-09	mg/m <sup>3</sup>	4.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Chromium	1.5E-08	mg/m <sup>3</sup>	1.0E-08	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	1E-04
	Cobalt	1.0E-08	mg/m <sup>3</sup>	6.9E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	1E-03
	Iron	1.8E-05	mg/m <sup>3</sup>	1.2E-05	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	5.7E-07	mg/m <sup>3</sup>	3.8E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	8E-03
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0E+00
Inhalation Route Total								1E-02
Total of Receptor Hazards Across All Media								8E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS  
CENTRAL TENDENCY EXPOSURE  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Aluminum	Neurological	9E-02	--	0E+00	9E-02
			Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chromium	None Reported	3E-02	--	0E+00	3E-02
			Cobalt	Blood	2E-01	--	0E+00	2E-01
			Iron	Gastrointestinal Tract	2E-01	--	0E+00	2E-01
			Manganese	Neurological	1E-01	--	0E+00	1E-01
			Nickel	Body and Organ weights	0E+00	--	0E+00	0E+00
			Chemical Total		8E-01	--	2E-02	8E-01
	Exposure Medium Total							8E-01
	Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	2E-03	--	2E-03
			Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chromium	Lungs	--	1E-04	--	1E-04
			Cobalt	Respiratory System	--	1E-03	--	1E-03
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	8E-03	--	8E-03
			Nickel	Respiratory System	--	0E+00	--	0E+00
			Chemical Total		--	1E-02	--	1E-02
	Exposure Medium Total							1E-02
Soil Total								8E-01

Total Hazard Across All Media = 8E-01

Total Neurological/Nervous System HI =	3E-01
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	2E-01
Total Blood HI =	2E-01
Total Lungs and Respiratory System HI =	1E-03
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	2.1E+04	mg/kg	3.7E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	8.4E+00	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Chromium	2.1E+01	mg/kg	See Table for Mutagenic Risks				2E-05
	Cobalt	1.4E+01	mg/kg	2.5E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	2.4E+04	mg/kg	4.2E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	7.8E+02	mg/kg	1.4E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Aluminum	2.1E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	8.4E+00	mg/kg	2.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
	Chromium	2.1E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	1.4E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	2.4E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	7.8E+02	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-07
Inhalation	Aluminum	1.6E-05	mg/m <sup>3</sup>	1.3E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	6.2E-09	mg/m <sup>3</sup>	5.3E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Chromium	1.5E-08	mg/m <sup>3</sup>	See Table for Mutagenic Risks				7E-08
	Cobalt	1.0E-08	mg/m <sup>3</sup>	8.9E-10	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
	Iron	1.8E-05	mg/m <sup>3</sup>	1.5E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	5.7E-07	mg/m <sup>3</sup>	4.9E-08	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0E+00
Inhalation Route Total								8E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	2.1E+01	mg/kg	2.7E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	1.3E-05	2E-05
	Age 2 - 6 years	2.1E+01	mg/kg	5.3E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	8.0E-06	
	Age 6 - 9 years	2.1E+01	mg/kg	4.3E-07	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	6.4E-07	
	Dermal Absorption									
	Age 0 -2 years	2.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0E+00
	Age 2 - 6 years	2.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	2.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	1.5E-08	mg/m3	2.9E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	3.5E-08	7E-08	
Age 2 - 6 years	1.5E-08	mg/m3	5.9E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	2.1E-08		
Age 6 - 9 years	1.5E-08	mg/m3	4.4E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.6E-08		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0012 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0E+00
			Arsenic	2.2.E-06	2.3.E-09	4.2.E-07	3E-06
			Chromium	2.2.E-05	7.3.E-08	0.0.E+00	2E-05
			Cobalt	NV	8.0.E-09	NV	8E-09
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Nickel	NV	0.0.E+00	NV	0E+00
			Chemical Total	2.4.E-05	8.3.E-08	4.2.E-07	2E-05
Exposure Medium Total						2E-05	
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.04E+02		mg/kg	1.0E+02	1.5E+03	N	NO	BSL
Cadmium	8.61E+00		mg/kg	8.6E+00	7.0E+00	N	YES	ASL
Nickel	1.82E+01		mg/kg	1.8E+01	1.5E+02	N	NO	BSL
Zinc	4.46E+02		mg/kg	4.5E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Cadmium	mg/kg	8.61E+00		8.61E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.32E+02		µg/L	4.3E+02	7.3E+02	N	NO	BSL
Nickel	1.78E+00		µg/L	1.8E+00	7.3E+01	N	NO	BSL
Zinc	7.54E+02		µg/L	7.5E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.32E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	1.78E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	7.54E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event  
 cm/hr = centimeter per hour  
 hrs = hours  
 hr/event = hour per event  
 kg = kilogram  
 L/cm<sup>3</sup> = liters per cubic centimeter  
 L/day = liters per day  
 L-year/kg-day = liters per year per kilograms per day  
 mg/L = milligrams per liter  
 mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

- EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.
- EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0019 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0019 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0019 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0019 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0019 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	8.6E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	6.3E-09
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	8.6E+00	mg/kg	1.1E-04	mg/kg-day	1.0E-03	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Cadmium	8.6E+00	mg/kg	3.1E-07	mg/kg-day	2.5E-05	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Cadmium	6.3E-09	mg/m <sup>3</sup>	6.1E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Cadmium	Kidneys	1E-01	--	1E-02	1E-01
			Chemical Total		1E-01	--	1E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Cadmium	Kidneys	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	1E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Cadmium	8.6E+00	mg/kg	1.3E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Cadmium	8.6E+00	mg/kg	4.3E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Inhalation	Cadmium	6.3E-09	mg/m <sup>3</sup>	2.6E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	5E-09
Inhalation Route Total								5E-09
Total of Receptor Hazards Across All Media								5E-09



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion									0E+00	
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption									0E+00	
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0E+00
	Age 0 - 2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
<b>Ingestion Route Total</b>								<b>0E+00</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
<b>Dermal Absorption Route Total</b>								<b>0E+00</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0E+00</b>

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Cadmium	NV	4.7.E-09	NV	5E-09
			Chemical Total	0.0.E+00	4.7.E-09	0.0.E+00	5E-09
			Exposure Medium Total				5E-09
Soil Total							5E-09

Total risks across all exposure routes and media = 5E-09

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	8.6E+00	mg/kg	3.9E-05	mg/kg-day	1.0E-03	mg/kg-day	4E-02
Ingestion Route Total								4E-02
Dermal Absorption	Cadmium	8.6E+00	mg/kg	2.2E-07	mg/kg-day	2.5E-05	mg/kg-day	9E-03
Dermal Absorption Route Total								9E-03
Inhalation	Cadmium	6.3E-09	mg/m <sup>3</sup>	4.2E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								5E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Cadmium	Kidneys	4E-02	--	9E-03	5E-02
			Chemical Total		4E-02	--	9E-03	5E-02
			Exposure Medium Total					5E-02
	Air	Volatile and Fugitive Dust Emissions	Cadmium	Kidneys	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							5E-02	

Total Hazard Across All Media = 5E-02

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	5E-02
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Cadmium	8.6E+00	mg/kg	1.5E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Cadmium	8.6E+00	mg/kg	9.5E-09	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Inhalation	Cadmium	6.3E-09	mg/m <sup>3</sup>	5.5E-10	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								1E-09



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	0.0E+00
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	0.0E+00
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	0.0E+00
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	0.0E+00
	Inhalation										
	Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00	0.0E+00
	Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00	0.0E+00

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion									
	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
Dermal Absorption									
	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0019 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Cadmium	NV	9.8.E-10	NV	1E-09
			Chemical Total	0.0.E+00	9.8.E-10	0.0.E+00	1E-09
			Exposure Medium Total				1E-09
Soil Total						1E-09	

Total risks across all exposure routes and media = 1E-09

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	9.64E+01		mg/kg	9.6E+01	1.5E+03	N	NO	BSL
Cadmium	3.91E+00		mg/kg	3.9E+00	7.0E+00	N	NO	BSL
Nickel	5.76E+00		mg/kg	5.8E+00	1.5E+02	N	NO	BSL
Zinc	5.30E+01		mg/kg	5.3E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	9.64E+01		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	3.91E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	5.76E+00		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	5.30E+01		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.14E+03		µg/L	1.1E+03	7.3E+02	N	YES	ASL
Zinc	2.88E+02		µg/L	2.9E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.14E+00		1.14E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	- -	0.000001	- -	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	- -	0.000001	- -	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9}$  m<sup>3</sup>/kg.

Sources:

- EPA, 1991. Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Child Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event-c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event-a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0021 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0021 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0021 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0021 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0021 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.1E+00	mg/L	7.3E-02	mg/kg-day	2.0E-01	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Barium	1.1E+00	mg/L	4.8E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Child
--------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	4E-01	--	3E-02	4E-01
			Chemical Total		4E-01	--	3E-02	4E-01
Groundwater Total								4E-01

Total Hazard Across All Media 4E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	4E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
CALCULATION OF CANCER RISKS  
REASONABLE MAXIMUM EXPOSURE  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Soil  
Exposure Media: Soil and Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	<b>Ingestion Route Total</b>								<b>0.E+00</b>
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
<b>Dermal Absorption Route Total</b>								<b>0.E+00</b>	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	<b>Inhalation Route Total</b>								<b>0.E+00</b>
	<b>Total of Receptor Hazards Across All Media</b>								<b>0.E+00</b>



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	1.1E+00	mg/L	1.7E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.1E+00	mg/L	9.7E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 0E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Potable Well Receptor Population: Resident Receptor Age: Child
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Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.1E+00	mg/L	6.8E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	1.1E+00	mg/L	3.7E-05	mg/kg-day	1.4E-02	mg/kg-day	3E-03
Dermal Absorption Route Total								3E-03
Total of Receptor Hazards Across All Media								4E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Child
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Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	3E-03	4E-02
			Chemical Total		3E-02	--	3E-03	4E-02
Groundwater Total								4E-02

Total Hazard Across All Media 4E-02

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	4E-02
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
<b>Ingestion Route Total</b>								<b>0.E+00</b>
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
<b>Dermal Absorption Route Total</b>								<b>0.E+00</b>
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
<b>Inhalation Route Total</b>								<b>0.E+00</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.E+00</b>



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00	
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00	

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	1.1E+00	mg/L	2.1E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.1E+00	mg/L	8.1E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0021 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0.0.E+00	--	0.0.E+00	0E+00
Groundwater Total						0E+00	

Total risks across all exposure routes and media = 0E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	5.51E+02		mg/kg	5.5E+02	1.5E+03	N	NO	BSL
Cadmium	5.30E+00		mg/kg	5.3E+00	7.0E+00	N	NO	BSL
Nickel	1.30E+01		mg/kg	1.3E+01	1.5E+02	N	NO	BSL
Zinc	1.43E+02		mg/kg	1.4E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	5.51E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	5.30E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	1.30E+01		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	1.43E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.88E+02		µg/L	4.9E+02	7.3E+02	N	NO	BSL
Cadmium	1.20E+00		µg/L	1.2E+00	1.8E+00	N	NO	BSL
Nickel	1.21E+00		µg/L	1.2E+00	7.3E+01	N	NO	BSL
Zinc	5.06E+02		µg/L	5.1E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.88E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	1.20E-03		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	1.21E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	5.06E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	

RME noncancer constant  
Ingestion  
1.27854E-05

Dermal intake constant  
3.57991E-05

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

RME Constants  
1.09589E-06  
4.69667E-07

3.06849E-06  
1.87397E-06

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Inhalation Constant

0.95890411 RME constant  
0.671232877 CTE constant

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Inhalation Constant

0.410958904 RME constant

0.08630137 CTE constant

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9}$  m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc / BWc) + (EDa \times IRa / BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent - c	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	tevent - a	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0022 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0022 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0022 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0022 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0022 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
<b>Inhalation Route Total</b>								<b>0.00</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0022 - Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Child			Chemical	Non-Carcinogenic Hazard Quotient							
Medium	Exposure Medium	Exposure Point		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.0			
			Antimony	Blood	0.00	--	0.00	0.0			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.0			
			Barium	Kidneys	0.00	--	0.00	0.0			
			Beryllium	Small intestine	0.00	--	0.00	0.0			
			Cadmium	Kidneys	0.00	--	0.00	0.0			
			Chromium	None Reported	0.00	--	0.00	0.0			
			Cobalt	Blood	0.00	--	0.00	0.0			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.0			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.0			
			Manganese	Neurological	0.00	--	0.00	0.0			
			Nickel	Body and Organ weights	0.00	--	0.00	0.0			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.0			
			Silver	Skin	0.00	--	0.00	0.0			
			Thallium	0	NV	--	NV	0.0			
			Vanadium	Kidneys	0.00	--	0.00	0.0			
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.0			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total							0.0	
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.0
						Antimony	0	--	NV	--	0.0
Arsenic	Development, vascular, nervous system	--				0.00	--	0.0			
Barium	Fecundity	--				0.00	--	0.0			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.0			
Cadmium	Kidneys	--				0.00	--	0.0			
Chromium	Lungs	--				0.00	--	0.0			
Cobalt	Respiratory System	--				0.00	--	0.0			
Copper	NA	--				NV	--	0.0			
Iron	NA	--				NV	--	0.0			
Manganese	Neurological	--				0.00	--	0.0			
Nickel	Respiratory System	--				0.00	--	0.0			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.0			
Silver	NA	--				NV	--	0.0			
Thallium	NA	--				NV	--	0.0			
Vanadium	NA	--				NV	--	0.0			
Zinc	NA	--				NV	--	0.0			
Chemical Total							--	0.00	--	0.00	
Exposure Medium Total										0.00	
Soil Total										0.0	
Groundwater	Groundwater	Potable Well				Aluminum	Neurological	0.00	--	0.00	0.0
			Antimony	Blood	0.00	--	0.00	0.0			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.0			
			Barium	Kidneys	0.00	--	0.00	0.0			
			Beryllium	Small intestine	0.00	--	0.00	0.0			
			Cadmium	Kidneys	0.00	--	0.00	0.0			
			Chromium	None Reported	0.00	--	0.00	0.0			
			Cobalt	Blood	0.00	--	0.00	0.0			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.0			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.0			
			Manganese	Neurological	0.00	--	0.00	0.0			
			Nickel	Body and Organ weights	0.00	--	0.00	0.0			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.0			
			Silver	Skin	0.00	--	0.00	0.0			
			Thallium	0	NV	--	NV	0.0			
			Vanadium	Kidneys	0.00	--	0.00	0.0			
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.0			
			Chemical Total				0.00	--	0.00	0.00	
			Groundwater Total							0.0	

Total Hazard Across All Media = 0.0

Total Neurological/Nervous System HI = 0.0

Total Skin HI = 0.0

Total Vascular HI = 0.0

Total Kidneys HI = 0.0

Total Development HI = 0.0

Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0.0

Total Blood HI = 0.0

Total Lungs and Respiratory System HI = 0.0

Total Beryllium Sensitization HI = 0.0

Total Hair, Nails, and Teeth HI = 0.0

Total Body and Organ Weights HI = 0.0

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg						
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
		Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg						
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
		Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>						
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/L						0.E+00
Cobalt		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property					
			Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
Zinc	NV	NV	NV	0.E+00			
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
			Exposure Medium Total				0.E+00
			Soil Total				0.E+00
Groundwater	Groundwater	Potable Well					

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
<b>Inhalation Route Total</b>								<b>0.00</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0022 - Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	Skin	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							0.00
			Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
					Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--			0.00	--	0.00			
Barium	Fetotoxicity	--			0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--			0.00	--	0.00			
Cadmium	Kidneys	--			0.00	--	0.00			
Chromium	Lungs	--			0.00	--	0.00			
Cobalt	Respiratory System	--			0.00	--	0.00			
Copper	NA	--			NV	--	0.00			
Iron	NA	--			NV	--	0.00			
Manganese	Neurological	--			0.00	--	0.00			
Nickel	Respiratory System	--			0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--			0.00	--	0.00			
Silver	NA	--			NV	--	0.00			
Thallium	NA	--			NV	--	0.00			
Vanadium	NA	--			NV	--	0.00			
Zinc	NA	--			NV	--	0.00			
Chemical Total						--	0.00	--	0.00	
Exposure Medium Total									0.00	
Soil Total									0.00	
Groundwater	Groundwater	Potable Well			Aluminum	Neurological	0.00	--	0.00	0.00
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg						
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg						
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>						
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion									
	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
Dermal Absorption									
	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0022 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
Exposure Medium Total							0.E+00
Soil Total							0.E+00
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Aluminum	7.49E+03		mg/kg	7.5E+03	7.7E+03	N	NO	BSL
Arsenic	6.90E+00		mg/kg	6.9E+00	3.9E-01	C	YES	ASL
Barium	1.64E+02		mg/kg	1.6E+02	1.5E+03	N	NO	BSL
Beryllium	6.60E-01		mg/kg	6.6E-01	1.6E+01	N	NO	BSL
Cadmium	6.30E+00		mg/kg	6.3E+00	7.0E+00	N	NO	BSL
Calcium	1.71E+04		mg/kg	1.7E+04	NA		NO	NUT
Chromium	1.12E+01		mg/kg	1.1E+01	2.9E-01	C	YES	ASL
Cobalt	1.02E+01		mg/kg	1.0E+01	2.3E+00	N	YES	ASL
Copper	1.61E+01		mg/kg	1.6E+01	3.1E+02	N	NO	BSL
Iron	1.50E+04		mg/kg	1.5E+04	5.5E+03	N	YES	ASL
Magnesium	8.82E+03		mg/kg	8.8E+03	NA		NO	NUT
Manganese	1.47E+03		mg/kg	1.5E+03	1.8E+02	N	YES	ASL
Nickel	1.20E+01		mg/kg	1.2E+01	1.5E+02	N	NO	BSL
Potassium	8.43E+02		mg/kg	8.4E+02	NA		NO	NUT
Vanadium	2.19E+01		mg/kg	2.2E+01	3.9E+01	N	NO	BSL
Zinc	4.36E+02		mg/kg	4.4E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.90E+00		6.90E+00	Maximum Detection
Chromium	mg/kg	1.12E+01		1.12E+01	Maximum Detection
Cobalt	mg/kg	1.02E+01		1.02E+01	Maximum Detection
Iron	mg/kg	1.50E+04		1.50E+04	Maximum Detection
Manganese	mg/kg	1.47E+03		1.47E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.38E+02		µg/L	8.4E+02	7.3E+02	N	YES	ASL
Copper	1.71E+01		µg/L	1.7E+01	1.5E+02	N	NO	BSL
Manganese	1.90E+00		µg/L	1.9E+00	8.8E+01	N	NO	BSL
Nickel	1.90E+00		µg/L	1.9E+00	7.3E+01	N	NO	BSL
Zinc	8.03E+01		µg/L	8.0E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	8.38E-01		8.38E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IRage-adj x EF / AT-C  IRage-adj = (EDc x IRc/BWc) + (EDa x IRa/BWa)
	IRage-adj	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWa x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0024 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0024 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0024 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0024 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0024 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.9E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	1.1E+01
Cobalt	1.0E+01
Copper	0.0E+00
Iron	1.5E+04
Manganese	1.5E+03
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.1E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	8.2E-09
Cobalt	No	7.5E-09
Copper	No	0.0E+00
Iron	No	1.1E-05
Manganese	No	1.1E-06
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.9E+00	mg/kg	8.82E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Chromium	1.1E+01	mg/kg	1.4E-04	mg/kg-day	3.0E-03	mg/kg-day	5E-02
	Cobalt	1.0E+01	mg/kg	1.3E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
	Iron	1.5E+04	mg/kg	1.9E-01	mg/kg-day	7.0E-01	mg/kg-day	3E-01
	Manganese	1.5E+03	mg/kg	1.9E-02	mg/kg-day	2.3E-02	mg/kg-day	8E-01
Ingestion Route Total								2E+00
Dermal Absorption	Arsenic	6.9E+00	mg/kg	7.41E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Chromium	1.1E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.0E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	1.5E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	1.5E+03	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.1E-09	mg/m <sup>3</sup>	4.87E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Chromium	8.2E-09	mg/m <sup>3</sup>	7.9E-09	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	8E-05
	Cobalt	7.5E-09	mg/m <sup>3</sup>	7.2E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	1E-03
	Iron	1.1E-05	mg/m <sup>3</sup>	1.1E-05	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	1.1E-06	mg/m <sup>3</sup>	1.0E-06	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	2E-02
Inhalation Route Total								2E-02
Total of Receptor Hazards Across All Media								2E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.4E-01	mg/L	5.4E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	8.4E-01	mg/L	3.5E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chromium	None Reported	5E-02	--	0E+00	5E-02
			Cobalt	Blood	4E-01	--	0E+00	4E-01
			Iron	Gastrointestinal Tract	3E-01	--	0E+00	3E-01
			Manganese	Neurological	8E-01	--	0E+00	8E-01
			Chemical Total		2E+00	--	2E-02	2E+00
	Exposure Medium Total							
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chromium	Lungs	--	8E-05	--	8E-05
			Cobalt	Respiratory System	--	1E-03	--	1E-03
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	2E-02	--	2E-02
			Chemical Total		--	2E-02	--	2E-02
	Exposure Medium Total							
Soil Total								
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02	3E-01
			Chemical Total		3E-01	--	3E-02	3E-01
Groundwater Total								

Total Hazard Across All Media = 2E+00

Total Neurological/Nervous System HI =	8E-01
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	3E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	3E-01
Total Blood HI =	4E-01
Total Lungs and Respiratory System HI =	1E-03
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	6.9E+00	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Chromium	1.1E+01	mg/kg	See Table for Mutagenic Risks				4E-05
	Cobalt	1.0E+01	mg/kg	1.6E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.5E+04	mg/kg	2.3E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.5E+03	mg/kg	2.3E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								5E-05
Dermal	Arsenic	6.9E+00	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Chromium	1.1E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	1.0E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.5E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.5E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.1E-09	mg/m <sup>3</sup>	2.1E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
	Chromium	8.2E-09	mg/m <sup>3</sup>	See Table for Mutagenic Risks				1E-07
	Cobalt	7.5E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-08
	Iron	1.1E-05	mg/m <sup>3</sup>	4.5E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	1.1E-06	mg/m <sup>3</sup>	4.4E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								1E-07
Total of Receptor Hazards Across All Media								6E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										4E-05
	Age 0 -2 years	1.1E+01	mg/kg	4.1E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	2.0E-05		
	Age 2 - 6 years	1.1E+01	mg/kg	8.2E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	1.2E-05		
	Age 6 - 16 years	1.1E+01	mg/kg	2.2E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	3.3E-06		
	Age 16 - 30 years	1.1E+01	mg/kg	3.1E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	1.5E-06		
	Dermal Absorption										0E+00
	Age 0 -2 years	1.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	1.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	1.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	1.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										1E-07
	Age 0 -2 years	8.2E-09	mg/m3	2.3E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	2.7E-08		
Age 2 - 6 years	8.2E-09	mg/m3	4.5E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.6E-08			
Age 6 - 16 years	8.2E-09	mg/m3	1.1E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	4.1E-08			
Age 16 - 30 years	8.2E-09	mg/m3	1.6E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	1.9E-08			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.4E-01	mg/L	1.2E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.4E-01	mg/L	7.1E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	9E-09	2E-06	2E-05
			Chromium	4E-05	1E-07	0E+00	4E-05
			Cobalt	NV	3E-08	NV	3E-08
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Chemical Total	5E-05	1E-07	2E-06	6E-05
Exposure Medium Total						6E-05	
Soil Total						6E-05	
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				

Total risks across all exposure routes and media = 6E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.9E+00	mg/kg	3.1E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Chromium	1.1E+01	mg/kg	5.0E-05	mg/kg-day	3.0E-03	mg/kg-day	2E-02
	Cobalt	1.0E+01	mg/kg	4.6E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Iron	1.5E+04	mg/kg	6.7E-02	mg/kg-day	7.0E-01	mg/kg-day	1E-01
	Manganese	1.5E+03	mg/kg	6.6E-03	mg/kg-day	2.3E-02	mg/kg-day	3E-01
Ingestion Route Total								6E-01
Dermal Absorption	Arsenic	6.9E+00	mg/kg	5.2E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Chromium	1.1E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.0E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	1.5E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	1.5E+03	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.1E-09	mg/m <sup>3</sup>	3.4E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
	Chromium	8.2E-09	mg/m <sup>3</sup>	5.5E-09	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	6E-05
	Cobalt	7.5E-09	mg/m <sup>3</sup>	5.0E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	8E-04
	Iron	1.1E-05	mg/m <sup>3</sup>	7.4E-06	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	1.1E-06	mg/m <sup>3</sup>	7.3E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	1E-02
Inhalation Route Total								2E-02
Total of Receptor Hazards Across All Media								7E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.4E-01	mg/L	5.0E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Barium	8.4E-01	mg/L	2.7E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chromium	None Reported	2E-02	--	0E+00	2E-02
			Cobalt	Blood	2E-01	--	0E+00	2E-01
			Iron	Gastrointestinal Tract	1E-01	--	0E+00	1E-01
			Manganese	Neurological	3E-01	--	0E+00	3E-01
			Chemical Total		6E-01	--	2E-02	7E-01
	Exposure Medium Total							
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chromium	Lungs	--	6E-05	--	6E-05
			Cobalt	Respiratory System	--	8E-04	--	8E-04
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	1E-02	--	1E-02
			Chemical Total		--	2E-02	--	2E-02
	Exposure Medium Total							
	Soil Total							
Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-02	--	2E-03	3E-02
			Chemical Total		2E-02	--	2E-03	3E-02
			Groundwater Total					

Total Hazard Across All Media = 7E-01

Total Neurological/Nervous System HI =	3E-01
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	3E-02
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	1E-01
Total Blood HI =	2E-01
Total Lungs and Respiratory System HI =	9E-04
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	6.9E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Chromium	1.1E+01	mg/kg	See Table for Mutagenic Risks				1E-05
	Cobalt	1.0E+01	mg/kg	1.8E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.5E+04	mg/kg	2.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.5E+03	mg/kg	2.6E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.9E+00	mg/kg	2.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
	Chromium	1.1E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	1.0E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.5E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.5E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	5.1E-09	mg/m <sup>3</sup>	4.4E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Chromium	8.2E-09	mg/m <sup>3</sup>	See Table for Mutagenic Risks				4E-08
	Cobalt	7.5E-09	mg/m <sup>3</sup>	6.5E-10	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
	Iron	1.1E-05	mg/m <sup>3</sup>	9.5E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	1.1E-06	mg/m <sup>3</sup>	9.3E-08	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								5E-08
Total of Receptor Hazards Across All Media								1E-05



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	1.1E+01	mg/kg	1.4E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	7.2E-06	1E-05
	Age 2 - 6 years	1.1E+01	mg/kg	2.9E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	4.3E-06	
	Age 6 - 9 years	1.1E+01	mg/kg	2.3E-07	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	3.5E-07	
	Dermal Absorption									
	Age 0 -2 years	1.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0E+00
	Age 2 - 6 years	1.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	1.1E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	8.2E-09	mg/m <sup>3</sup>	1.6E-10	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	1.9E-08	4E-08	
Age 2 - 6 years	8.2E-09	mg/m <sup>3</sup>	3.2E-10	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.1E-08		
Age 6 - 9 years	8.2E-09	mg/m <sup>3</sup>	2.4E-10	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	8.5E-09		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.4E-01	mg/L	1.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.4E-01	mg/L	5.9E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0024 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chromium	1E-05	4E-08	0E+00	1E-05
			Cobalt	NV	6E-09	NV	6E-09
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Chemical Total	1E-05	5E-08	3E-07	1E-05
Exposure Medium Total						1E-05	
Soil Total						1E-05	
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				

Total risks across all exposure routes and media = 1E-05

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	2.04E+01		mg/kg	2.0E+01	3.9E-01	C	YES	ASL
Barium	3.38E+03		mg/kg	3.4E+03	1.5E+03	N	YES	ASL
Cadmium	1.26E+01		mg/kg	1.3E+01	7.0E+00	N	YES	ASL
Nickel	1.46E+01		mg/kg	1.5E+01	1.5E+02	N	NO	BSL
Zinc	1.01E+03		mg/kg	1.0E+03	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	2.04E+01		2.04E+01	Maximum Detection
Barium	mg/kg	3.38E+03		3.38E+03	Maximum Detection
Cadmium	mg/kg	1.26E+01		1.26E+01	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA	NO	NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA	NO	NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA	NO	NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA	NO	NO	NUT
Thallium			µg/L	0.0E+00	NSV	YES	YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventic \times SAc \times EDc \times EF/(BWc \times AT-C) + Deventa \times SAA \times EDa \times EF/(BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAA	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0028 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0028 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0028 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0028 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0028 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	2.0E+01
Barium	3.4E+03
Beryllium	0.0E+00
Cadmium	1.3E+01
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	1.5E-08
Barium	No	2.5E-06
Beryllium	No	0.0E+00
Cadmium	No	9.3E-09
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	2.0E+01	mg/kg	2.61E-04	mg/kg-day	3.0E-04	mg/kg-day	9E-01
	Barium	3.4E+03	mg/kg	4.3E-02	mg/kg-day	2.0E-01	mg/kg-day	2E-01
	Cadmium	1.3E+01	mg/kg	1.6E-04	mg/kg-day	1.0E-03	mg/kg-day	2E-01
Ingestion Route Total								1E+00
Dermal Absorption	Arsenic	2.0E+01	mg/kg	2.19E-05	mg/kg-day	3.0E-04	mg/kg-day	7E-02
	Barium	3.4E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
	Cadmium	1.3E+01	mg/kg	4.5E-07	mg/kg-day	2.5E-05	mg/kg-day	2E-02
Dermal Absorption Route Total								9E-02
Inhalation	Arsenic	1.5E-08	mg/m <sup>3</sup>	1.44E-08	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-03
	Barium	2.5E-06	mg/m <sup>3</sup>	2.4E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	5E-03
	Cadmium	9.3E-09	mg/m <sup>3</sup>	8.9E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								6E-03
Total of Receptor Hazards Across All Media								1E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-01	--	7E-02	9E-01
			Barium	Kidneys	2E-01	--	0E+00	2E-01
			Cadmium	Kidneys	2E-01	--	2E-02	2E-01
			Chemical Total		1E+00	--	9E-02	1E+00
	Exposure Medium Total							1E+00
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-03	--	1E-03
			Barium	Fetotoxicity	--	5E-03	--	5E-03
			Cadmium	Kidneys	--	4E-04	--	4E-04
			Chemical Total		--	6E-03	--	6E-03
			Exposure Medium Total					
Soil Total							1E+00	

Total Hazard Across All Media = 1E+00

Total Neurological/Nervous System HI = 1E-03  
Total Skin HI = 9E-01  
Total Vascular HI = 9E-01  
Total Kidneys HI = 4E-01  
Total Development HI = 1E-03  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 5E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	2.0E+01	mg/kg	3.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-05
	Barium	3.4E+03	mg/kg	5.3E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	1.3E+01	mg/kg	2.0E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								5E-05
Dermal Absorption	Arsenic	2.0E+01	mg/kg	3.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-06
	Barium	3.4E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	1.3E+01	mg/kg	6.2E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								5E-06
Inhalation	Arsenic	1.5E-08	mg/m <sup>3</sup>	6.2E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-08
	Barium	2.5E-06	mg/m <sup>3</sup>	1.0E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Cadmium	9.3E-09	mg/m <sup>3</sup>	3.8E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
Inhalation Route Total								3E-08
Total of Receptor Hazards Across All Media								5E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion									
	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
Dermal Absorption									
	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	5E-05	3E-08	5E-06	5E-05
			Barium	NV	NV	NV	0E+00
			Cadmium	NV	7E-09	NV	7E-09
			Chemical Total	5E-05	3E-08	5E-06	5E-05
Exposure Medium Total						5E-05	
Soil Total						5E-05	

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	2.0E+01	mg/kg	9.1E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Barium	3.4E+03	mg/kg	1.5E-02	mg/kg-day	2.0E-01	mg/kg-day	8E-02
	Cadmium	1.3E+01	mg/kg	5.6E-05	mg/kg-day	1.0E-03	mg/kg-day	6E-02
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	2.0E+01	mg/kg	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	5E-02
	Barium	3.4E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
	Cadmium	1.3E+01	mg/kg	3.2E-07	mg/kg-day	2.5E-05	mg/kg-day	1E-02
Dermal Absorption Route Total								6E-02
Inhalation	Arsenic	1.5E-08	mg/m <sup>3</sup>	1.0E-08	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	7E-04
	Barium	2.5E-06	mg/m <sup>3</sup>	1.7E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	3E-03
	Cadmium	9.3E-09	mg/m <sup>3</sup>	6.2E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								4E-03
Total of Receptor Hazards Across All Media								5E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Child
--------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	5E-02	4E-01
			Barium	Kidneys	8E-02	--	0E+00	8E-02
			Cadmium	Kidneys	6E-02	--	1E-02	7E-02
			Chemical Total		4E-01	--	6E-02	5E-01
	Exposure Medium Total							5E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	7E-04	--	7E-04
			Barium	Fetotoxicity	--	3E-03	--	3E-03
			Cadmium	Kidneys	--	3E-04	--	3E-04
			Chemical Total		--	4E-03	--	4E-03
	Exposure Medium Total							4E-03
Soil Total							5E-01	

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	2.0E+01	mg/kg	3.6E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-06
	Barium	3.4E+03	mg/kg	5.9E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	1.3E+01	mg/kg	2.2E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								5E-06
Dermal Absorption	Arsenic	2.0E+01	mg/kg	6.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
	Barium	3.4E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	1.3E+01	mg/kg	1.4E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	1.5E-08	mg/m <sup>3</sup>	1.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
	Barium	2.5E-06	mg/m <sup>3</sup>	2.1E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Cadmium	9.3E-09	mg/m <sup>3</sup>	8.0E-10	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								7E-09
Total of Receptor Hazards Across All Media								6E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion									
	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption									
	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0028 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	5.4.E-06	5.6.E-09	1.0.E-06	6E-06
			Barium	NV	NV	NV	0E+00
			Cadmium	NV	1.4.E-09	NV	1E-09
			Chemical Total	5.4.E-06	7.0.E-09	1.0.E-06	6E-06
Exposure Medium Total						6E-06	
Soil Total						6E-06	

Total risks across all exposure routes and media = 6E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	9.56E+02		mg/kg	9.6E+02	1.5E+03	N	NO	BSL
Cadmium	4.63E+00		mg/kg	4.6E+00	7.0E+00	N	NO	BSL
Nickel	1.08E+01		mg/kg	1.1E+01	1.5E+02	N	NO	BSL
Zinc	1.59E+02		mg/kg	1.6E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	9.56E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	4.63E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	1.08E+01		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	1.59E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	5.21E+02		µg/L	5.2E+02	7.3E+02	N	NO	BSL
Zinc	1.16E+02		µg/L	1.2E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	5.21E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	1.16E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0031 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0031 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
CANCER TOXICITY DATA -- ORAL/DERMAL

JC-0031 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0031 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0031 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-2031 - Jefferson County Mining Site

Scenario: Fimelname: Current/Future Receptor: Populatio: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	Skin	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total				0.00			
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--
Antimony	0	--				NV	--	0.00		
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00		
Barium	Phototoxicity	--				0.00	--	0.00		
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00		
Cadmium	Kidneys	--				0.00	--	0.00		
Chromium	Lungs	--				0.00	--	0.00		
Cobalt	Respiratory System	--				0.00	--	0.00		
Copper	NA	--				NV	--	0.00		
Iron	NA	--				NV	--	0.00		
Manganese	Neurological	--				0.00	--	0.00		
Nickel	Respiratory System	--				0.00	--	0.00		
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00		
Silver	NA	--				NV	--	0.00		
Thallium	NA	--				NV	--	0.00		
Vanadium	NA	--				NV	--	0.00		
Zinc	NA	--				NV	--	0.00		
Chemical Total						--	0.00	--	0.00	
Exposure Medium Total						0.00				
Soil Total						0.00				
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	Skin	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Groundwater Total				0.00			
			Total Hazard Across All Media				0.00			
Total Neurological/Nervous System HI				0.00						
Total Skin HI				0.00						
Total Vascular HI				0.00						
Total Kidneys HI				0.00						
Total Development HI				0.00						
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI				0.00						
Total Blood HI				0.00						
Total Lungs and Respiratory System HI				0.00						
Total Beryllium Sensitization HI				0.00						
Total Hair, Nails, and Teeth HI				0.00						
Total Body and Organ Weights HI				0.00						
Total ESOD HI				0.00						
Total Phototoxicity				0.00						

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-2031 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							
				Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--
			Antimony	0	--	NV	--	0.00		
			Arsenic	Development, vascular, nervous system	--	0.00	--	0.00		
			Barium	Phototoxicity	--	0.00	--	0.00		
			Beryllium	Beryllium sensitization (respiratory system)	--	0.00	--	0.00		
			Cadmium	Kidneys	--	0.00	--	0.00		
			Chromium	Lungs	--	0.00	--	0.00		
			Cobalt	Respiratory System	--	0.00	--	0.00		
			Copper	NA	--	NV	--	0.00		
			Iron	NA	--	NV	--	0.00		
			Manganese	Neurological	--	0.00	--	0.00		
			Nickel	Respiratory System	--	0.00	--	0.00		
			Selenium	Alimentary system, cardiovascular system, nervous system	--	0.00	--	0.00		
			Silver	NA	--	NV	--	0.00		
			Thallium	NA	--	NV	--	0.00		
			Vanadium	NA	--	NV	--	0.00		
			Zinc	NA	--	NV	--	0.00		
Chemical Total					--	0.00	--	0.00		
Exposure Medium Total										
Soil Total										
								0.00		
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Groundwater Total							
			Soil Total							
Groundwater Total										
Total Hazard Across All Media										
0.00										
Total Neurological/Nervous System HI										
0.00										
Total Skin HI										
0.00										
Total Vascular HI										
0.00										
Total Kidneys HI										
0.00										
Total Development HI										
0.00										
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI										
0.00										
Total Blood HI										
0.00										
Total Lungs and Respiratory System HI										
0.00										
Total Beryllium Sensitization HI										
0.00										
Total Hair, Nails, and Teeth HI										
0.00										
Total Body and Organ Weights HI										
0.00										
Total ESOD HI										
0.00										
Total Phototoxicity										
0.00										

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0031 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
Exposure Medium Total							0.E+00
Soil Total							0.E+00
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
			Chemical Total	0.E+00	--	0.E+00	0.E+00
Groundwater Total							0.E+00

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.35E+03		mg/kg	1.4E+03	1.5E+03	N	NO	BSL
Cadmium	4.47E+00		mg/kg	4.5E+00	7.0E+00	N	NO	BSL
Nickel	1.18E+01		mg/kg	1.2E+01	1.5E+02	N	NO	BSL
Zinc	1.50E+02		mg/kg	1.5E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	1.35E+03		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	4.47E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	1.18E+01		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	1.50E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.77E+02		µg/L	8.8E+02	7.3E+02	N	YES	ASL
Zinc	8.94E+01		µg/L	8.9E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	8.77E-01		8.77E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0032 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0032 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0032 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0032 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0032 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.8E-01	mg/L	5.6E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	8.8E-01	mg/L	3.7E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	0.28	--	0.03	0.3
			Chemical Total		0.28	--	0.03	0.31
Groundwater Total								0.3

Total Hazard Across All Media = 0.3

Total Neurological/Nervous System HI =	0.0
Total Skin HI =	0.0
Total Vascular HI =	0.0
Total Kidneys HI =	0.3
Total Development HI =	0.0
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0.0
Total Blood HI =	0.0
Total Lungs and Respiratory System HI =	0.0
Total Beryllium Sensitization HI =	0.0
Total Hair, Nails, and Teeth HI =	0.0
Total Body and Organ Weights HI =	0.0
Total ESOD HI =	0.0
Total Fetotoxicity =	0.0

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.8E-01	mg/L	1.3E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.8E-01	mg/L	7.5E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0.0.E+00	--	0.0.E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 0E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.8E-01	mg/L	5.2E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	8.8E-01	mg/L	2.8E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Child
--------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	0.03	--	0.00	3E-02
			Chemical Total		0.03	--	0.00	3E-02
Groundwater Total								3E-02

Total Hazard Across All Media = 3E-02

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	3E-02
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.8E-01	mg/L	1.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.8E-01	mg/L	6.2E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0032 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0.0.E+00	--	0.0.E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 0E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.14E+03		mg/kg	1.1E+03	1.5E+03	N	NO	BSL
Cadmium	5.38E+00		mg/kg	5.4E+00	7.0E+00	N	NO	BSL
Nickel	1.23E+01		mg/kg	1.2E+01	1.5E+02	N	NO	BSL
Zinc	1.10E+02		mg/kg	1.1E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	1.14E+03		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	5.38E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	1.23E+01		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	1.10E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.05E+01		µg/L	4.1E+01	7.3E+02	N	NO	BSL
Nickel	2.87E+00	J	µg/L	2.9E+00	7.3E+01	N	NO	BSL
Zinc	2.26E+01		µg/L	2.3E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.05E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	2.87E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00	J	0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	2.26E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

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TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0033 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0033 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0033 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0033 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0033 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-2033 - Jefferson County Mining Site

Scenario: Fimelname: Current/Future Receptor: Populatio: Resident Receptor Age: Child				Non-Carcinogenic Hazard Quotient							
Medium	Exposure Medium	Exposure Point	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total								0.00
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
Antimony	0	--				NV	--	0.00			
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00			
Barium	Phototoxicity	--				0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00			
Cadmium	Kidneys	--				0.00	--	0.00			
Chromium	Lungs	--				0.00	--	0.00			
Cobalt	Respiratory System	--				0.00	--	0.00			
Copper	NA	--				NV	--	0.00			
Iron	NA	--				NV	--	0.00			
Manganese	Neurological	--				0.00	--	0.00			
Nickel	Respiratory System	--				0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00			
Silver	NA	--				NV	--	0.00			
Thallium	NA	--				NV	--	0.00			
Vanadium	NA	--				NV	--	0.00			
Zinc	NA	--				NV	--	0.00			
Chemical Total							--	0.00	--	0.00	
Exposure Medium Total										0.00	
Soil Total										0.00	
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Groundwater Total								0.00
			Soil Total								0.00
Groundwater Total								0.00			
Total Hazard Across All Media								0.00			
Total Neurological/Nervous System HI								0.00			
Total Skin HI								0.00			
Total Vascular HI								0.00			
Total Kidneys HI								0.00			
Total Development HI								0.00			
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI								0.00			
Total Blood HI								0.00			
Total Lungs and Respiratory System HI								0.00			
Total Beryllium Sensitization HI								0.00			
Total Hair, Nails, and Teeth HI								0.00			
Total Body and Organ Weights HI								0.00			
Total ESOD HI								0.00			
Total Phototoxicity								0.00			

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium in Groundwater	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-2033 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child											
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient							
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	0	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu,ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total				0.00				
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00			
Barium	Phototoxicity	--				0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00			
Cadmium	Kidneys	--				0.00	--	0.00			
Chromium	Lungs	--				0.00	--	0.00			
Cobalt	Respiratory System	--				0.00	--	0.00			
Copper	NA	--				NV	--	0.00			
Iron	NA	--				NV	--	0.00			
Manganese	Neurological	--				0.00	--	0.00			
Nickel	Respiratory System	--				0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00			
Silver	NA	--				NV	--	0.00			
Thallium	NA	--				NV	--	0.00			
Vanadium	NA	--				NV	--	0.00			
Zinc	NA	--				NV	--	0.00			
Chemical Total						--	0.00	--	0.00		
Exposure Medium Total						0.00					
Soil Total						0.00					
Groundwater	Groundwater	Potable Well				Aluminum	Neurological	0.00	--	0.00	0.00
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	0	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu,ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Groundwater Total				0.00				
			Total Hazard Across All Media				0.00				
			Total Neurological/Nervous System HI				0.00				
Total Skin HI				0.00							
Total Vascular HI				0.00							
Total Kidneys HI				0.00							
Total Development HI				0.00							
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI				0.00							
Total Blood HI				0.00							
Total Lungs and Respiratory System HI				0.00							
Total Beryllium Sensitization HI				0.00							
Total Hair, Nails, and Teeth HI				0.00							
Total Body and Organ Weights HI				0.00							
Total ESOD HI				0.00							
Total Phototoxicity				0.00							

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0033 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.38E+02		mg/kg	2.4E+02	1.5E+03	N	NO	BSL
Cadmium	4.71E+00		mg/kg	4.7E+00	7.0E+00	N	NO	BSL
Nickel	1.57E+01		mg/kg	1.6E+01	1.5E+02	N	NO	BSL
Zinc	6.45E+01		mg/kg	6.5E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	2.38E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	4.71E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	1.57E+01		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	6.45E+01		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.75E+02		µg/L	4.8E+02	7.3E+02	N	NO	BSL
Zinc	6.34E+01		µg/L	6.3E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.75E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	6.34E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0035 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0035 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0035 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0035 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0035 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0035 - Jefferson County Mining Site

Scenario: Future Receptor Population: Resident Receptor Age: Child				Non-Carcinogenic Hazard Quotient							
Medium	Exposure Medium	Exposure Point	Chemical	Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total							0.00	
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00			
Barium	Phototoxicity	--				0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00			
Cadmium	Kidneys	--				0.00	--	0.00			
Chromium	Lungs	--				0.00	--	0.00			
Cobalt	Respiratory System	--				0.00	--	0.00			
Copper	NA	--				NV	--	0.00			
Iron	NA	--				NV	--	0.00			
Manganese	Neurological	--				0.00	--	0.00			
Nickel	Respiratory System	--				0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00			
Silver	NA	--				NV	--	0.00			
Thallium	NA	--				NV	--	0.00			
Vanadium	NA	--				NV	--	0.00			
Zinc	NA	--				NV	--	0.00			
Chemical Total							--	0.00	--	0.00	
Exposure Medium Total										0.00	
Soil Total										0.00	
Groundwater	Groundwater	Potable Well				Aluminum	Neurological	0.00	--	0.00	0.00
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Groundwater Total							0.00	
			Total Hazard Across All Media								0.00
			Total Neurological/Nervous System HI								0.00
Total Skin HI								0.00			
Total Vascular HI								0.00			
Total Kidneys HI								0.00			
Total Development HI								0.00			
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI								0.00			
Total Blood HI								0.00			
Total Lungs and Respiratory System HI								0.00			
Total Beryllium Sensitization HI								0.00			
Total Hair, Nails, and Teeth HI								0.00			
Total Body and Organ Weights HI								0.00			
Total ESOD HI								0.00			
Total Phototoxicity								0.00			

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0035 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							0.00
			Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
					Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--			0.00	--	0.00			
Barium	Phototoxicity	--			0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--			0.00	--	0.00			
Cadmium	Kidneys	--			0.00	--	0.00			
Chromium	Lungs	--			0.00	--	0.00			
Cobalt	Respiratory System	--			0.00	--	0.00			
Copper	NA	--			NV	--	0.00			
Iron	NA	--			NV	--	0.00			
Manganese	Neurological	--			0.00	--	0.00			
Nickel	Respiratory System	--			0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--			0.00	--	0.00			
Silver	NA	--			NV	--	0.00			
Thallium	NA	--			NV	--	0.00			
Vanadium	NA	--			NV	--	0.00			
Zinc	NA	--			NV	--	0.00			
Chemical Total						--	0.00	--	0.00	
Exposure Medium Total									0.00	
Soil Total									0.00	
Groundwater	Groundwater	Potable Well			Aluminum	Neurological	0.00	--	0.00	0.00
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Groundwater Total							0.00
			Soil Total							0.00
			Groundwater Total							0.00
Total Hazard Across All Media							0.00			
Total Neurological/Nervous System HI							0.00			
Total Skin HI							0.00			
Total Vascular HI							0.00			
Total Kidneys HI							0.00			
Total Development HI							0.00			
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI							0.00			
Total Blood HI							0.00			
Total Lungs and Respiratory System HI							0.00			
Total Beryllium Sensitization HI							0.00			
Total Hair, Nails, and Teeth HI							0.00			
Total Body and Organ Weights HI							0.00			
Total ESOD HI							0.00			
Total Phototoxicity							0.00			

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0035 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.67E+00		mg/kg	6.7E+00	3.9E-01	C	YES ASL
Barium	1.83E+02		mg/kg	1.8E+02	1.5E+03	N	NO BSL
Nickel	9.66E+00		mg/kg	9.7E+00	1.5E+02	N	NO BSL
Zinc	6.63E+01		mg/kg	6.6E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.67E+00		6.67E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.93E+01		µg/L	8.9E+01	7.3E+02	N	NO	BSL
Zinc	1.02E+02		µg/L	1.0E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	8.93E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	1.02E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0036 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0036 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0036 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0036 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0036 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.7E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.9E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.7E+00	mg/kg	8.53E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.7E+00	mg/kg	7.16E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.9E-09	mg/m <sup>3</sup>	4.70E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.7E+00	mg/kg	1.0E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	6.7E+00	mg/kg	9.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.9E-09	mg/m <sup>3</sup>	2.0E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
Inhalation Route Total								9E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1.6.E-05	8.7.E-09	1.5.E-06	2E-05
			Chemical Total	1.6.E-05	8.7.E-09	1.5.E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.7E+00	mg/kg	3.0E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	6.7E+00	mg/kg	5.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.9E-09	mg/m <sup>3</sup>	3.3E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0E+00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0E+00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0E+00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0E+00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0E+00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0E+00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0E+00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0E+00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0E+00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0E+00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0E+00	
<b>Ingestion Route Total</b>								<b>0E+00</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0E+00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0E+00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0E+00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0E+00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0E+00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0E+00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0E+00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0E+00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0E+00	
<b>Dermal Absorption Route Total</b>								<b>0E+00</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0E+00</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
	Soil Total							1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.7E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.7E+00	mg/kg	2.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.9E-09	mg/m <sup>3</sup>	4.2E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Ingestion Route Total							
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Dermal Absorption Route Total							
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0036 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1.8.E-06	1.8.E-09	3.3.E-07	2E-06
			Chemical Total	1.8.E-06	1.8.E-09	3.3.E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	3.72E+02		mg/kg	3.7E+02	1.5E+03	N	NO	BSL
Cadmium	3.54E+00		mg/kg	3.5E+00	7.0E+00	N	NO	BSL
Nickel	9.60E+00		mg/kg	9.6E+00	1.5E+02	N	NO	BSL
Zinc	1.50E+02		mg/kg	1.5E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	3.72E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	3.54E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	9.60E+00		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	1.50E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	6.95E+02		µg/L	7.0E+02	7.3E+02	N	NO	BSL
Nickel	2.78E+00		µg/L	2.8E+00	7.3E+01	N	NO	BSL
Zinc	7.12E+01		µg/L	7.1E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	6.95E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	2.78E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	7.12E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.35	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0038 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0038 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0038 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0038 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0038 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0038 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child											
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient							
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total				0.00				
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00			
Barium	Phototoxicity	--				0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00			
Cadmium	Kidneys	--				0.00	--	0.00			
Chromium	Lungs	--				0.00	--	0.00			
Cobalt	Respiratory System	--				0.00	--	0.00			
Copper	NA	--				NV	--	0.00			
Iron	NA	--				NV	--	0.00			
Manganese	Neurological	--				0.00	--	0.00			
Nickel	Respiratory System	--				0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00			
Silver	NA	--				NV	--	0.00			
Thallium	NA	--				NV	--	0.00			
Vanadium	NA	--	NV	--	0.00						
Zinc	NA	--	NV	--	0.00						
Chemical Total				--	0.00	--	0.00				
Exposure Medium Total				0.00							
Soil Total				0.00							
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
Vanadium	Kidneys	0.00	--	0.00	0.00						
Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00						
Chemical Total				0.00	--	0.00	0.00				
Groundwater Total				0.00							
Total Hazard Across All Media				0.00							
Total Neurological/Nervous System HI				0.00							
Total Skin HI				0.00							
Total Vascular HI				0.00							
Total Kidneys HI				0.00							
Total Development HI				0.00							
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI				0.00							
Total Blood HI				0.00							
Total Lungs and Respiratory System HI				0.00							
Total Beryllium Sensitization HI				0.00							
Total Hair, Nails, and Teeth HI				0.00							
Total Body and Organ Weights HI				0.00							
Total ESOD HI				0.00							
Total Phototoxicity				0.00							

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-2038 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child											
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient							
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	0	0.00	--	0.00	0.00			
			Thallium	0	0.00	--	0.00	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total								
				Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
			Arsenic	Development, vascular, nervous system	--	0.00	--	0.00			
			Barium	Phototoxicity	--	0.00	--	0.00			
			Beryllium	Beryllium sensitization (respiratory system)	--	0.00	--	0.00			
			Cadmium	Kidneys	--	0.00	--	0.00			
			Chromium	Lungs	--	0.00	--	0.00			
			Cobalt	Respiratory System	--	0.00	--	0.00			
			Copper	NA	--	NV	--	0.00			
			Iron	NA	--	NV	--	0.00			
			Manganese	Neurological	--	0.00	--	0.00			
			Nickel	Respiratory System	--	0.00	--	0.00			
			Selenium	Alimentary system, cardiovascular system, nervous system	--	0.00	--	0.00			
			Silver	NA	--	NV	--	0.00			
			Thallium	NA	--	NV	--	0.00			
			Vanadium	NA	--	NV	--	0.00			
			Zinc	NA	--	NV	--	0.00			
Chemical Total					--	0.00	--	0.00			
Exposure Medium Total											
Soil Total											
0.00											
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	0	0.00	--	0.00	0.00			
			Thallium	0	0.00	--	0.00	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Groundwater Total								
			0.00								
			Total Hazard Across All Media								
0.00											
Total Neurological/Nervous System HI											
0.00											
Total Skin HI											
0.00											
Total Vascular HI											
0.00											
Total Kidneys HI											
0.00											
Total Development HI											
0.00											
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI											
0.00											
Total Blood HI											
0.00											
Total Lungs and Respiratory System HI											
0.00											
Total Beryllium Sensitization HI											
0.00											
Total Hair, Nails, and Teeth HI											
0.00											
Total Body and Organ Weights HI											
0.00											
Total ESOD HI											
0.00											
Total Phototoxicity											
0.00											

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0038 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.82E+00		mg/kg	6.8E+00	3.9E-01	C	YES ASL
Barium	4.25E+02		mg/kg	4.3E+02	1.5E+03	N	NO BSL
Cadmium	4.15E+00		mg/kg	4.2E+00	7.0E+00	N	NO BSL
Nickel	1.99E+01		mg/kg	2.0E+01	1.5E+02	N	NO BSL
Zinc	3.21E+02		mg/kg	3.2E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.82E+00		6.82E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.22E+03		µg/L	1.2E+03	7.3E+02	N	YES	ASL
Zinc	1.70E+02		µg/L	1.7E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.22E+00		1.22E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0044 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0044 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0044 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0044 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0044 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.8E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.0E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.8E+00	mg/kg	8.72E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.8E+00	mg/kg	7.32E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.0E-09	mg/m <sup>3</sup>	4.81E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	7.8E-02	mg/kg-day	2.0E-01	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Barium	1.2E+00	mg/L	5.1E-04	mg/kg-day	1.4E-02	mg/kg-day	4E-02
Dermal Absorption Route Total								4E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	4E-01	--	4E-02	4E-01
			Chemical Total		4E-01	--	4E-02	4E-01
			Groundwater Total					4E-01

Total Hazard Across All Media = 7E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	4E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.8E+00	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	6.8E+00	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.0E-09	mg/m <sup>3</sup>	2.1E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
Inhalation Route Total								9E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	1.8E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.2E+00	mg/L	1.0E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	1.6.E-05	8.9.E-09	1.5.E-06	2E-05	
			Chemical Total	1.6.E-05	8.9.E-09	1.5.E-06	2E-05	
			Exposure Medium Total					2E-05
			Soil Total					2E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0.0.E+00	--	0.0.E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.8E+00	mg/kg	3.1E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	6.8E+00	mg/kg	5.1E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.0E-09	mg/m <sup>3</sup>	3.4E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	7.3E-03	mg/kg-day	2.0E-01	mg/kg-day	4E-02
Ingestion Route Total								4E-02
Dermal Absorption	Barium	1.2E+00	mg/L	4.0E-05	mg/kg-day	1.4E-02	mg/kg-day	3E-03
Dermal Absorption Route Total								3E-03
Total of Receptor Hazards Across All Media								4E-02

TABLE 9.3  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 CENTRAL TENDENCY EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							1E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	4E-02	--	3E-03	4E-02
			Chemical Total		4E-02	--	3E-03	4E-02
			Groundwater Total					4E-02

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	4E-02
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.8E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.8E+00	mg/kg	2.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	5.0E-09	mg/m <sup>3</sup>	4.3E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	2.3E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.2E+00	mg/L	8.7E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0044 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	1.8.E-06	1.9.E-09	3.4.E-07	2E-06	
			Chemical Total	1.8.E-06	1.9.E-09	3.4.E-07	2E-06	
			Exposure Medium Total					2E-06
			Soil Total					2E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0.0.E+00	--	0.0.E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	4.26E+00		mg/kg	4.3E+00	3.9E-01	C	YES ASL
Barium	9.77E+02		mg/kg	9.8E+02	1.5E+03	N	NO BSL
Nickel	9.17E+00		mg/kg	9.2E+00	1.5E+02	N	NO BSL
Zinc	6.75E+01		mg/kg	6.8E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	4.26E+00		4.26E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.15E+03		µg/L	1.2E+03	7.3E+02	N	YES	ASL
Cadmium	1.22E+00		µg/L	1.2E+00	1.8E+00	N	NO	BSL
Zinc	1.15E+02		µg/L	1.2E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.15E+00		1.15E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0045 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0045 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0045 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0045 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0045 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	4.3E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.1E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.3E+00	mg/kg	5.45E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	4.3E+00	mg/kg	4.58E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.1E-09	mg/m <sup>3</sup>	3.00E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	7.4E-02	mg/kg-day	2.0E-01	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Barium	1.2E+00	mg/L	4.9E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							2E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	4E-01	--	3E-02	4E-01
			Chemical Total		4E-01	--	3E-02	4E-01
			Groundwater Total					4E-01

Total Hazard Across All Media = 6E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	4E-01
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.3E+00	mg/kg	6.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	4.3E+00	mg/kg	6.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	9E-07
Dermal Absorption Route Total								9E-07
Inhalation	Arsenic	3.1E-09	mg/m <sup>3</sup>	1.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
Inhalation Route Total								6E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	1.7E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.2E+00	mg/L	9.8E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	1E-05	6E-09	9E-07	1E-05	
			Chemical Total	1E-05	6E-09	9E-07	1E-05	
			Exposure Medium Total					1E-05
			Soil Total					1E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.3E+00	mg/kg	1.9E-05	mg/kg-day	3.0E-04	mg/kg-day	6E-02
Ingestion Route Total								6E-02
Dermal Absorption	Arsenic	4.3E+00	mg/kg	3.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.1E-09	mg/m <sup>3</sup>	2.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-04
Inhalation Route Total								1E-04
Total of Receptor Hazards Across All Media								7E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	6.9E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	1.2E+00	mg/L	3.7E-05	mg/kg-day	1.4E-02	mg/kg-day	3E-03
Dermal Absorption Route Total								3E-03
Total of Receptor Hazards Across All Media								4E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	6E-02	--	1E-02	7E-02
			Chemical Total		6E-02	--	1E-02	7E-02
			Exposure Medium Total					7E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-04	--	1E-04
			Chemical Total		--	1E-04	--	1E-04
			Exposure Medium Total					1E-04
Soil Total							7E-02	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	3E-03	4E-02
			Chemical Total		3E-02	--	3E-03	4E-02
			Groundwater Total					4E-02

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	1E-04
Total Skin HI =	7E-02
Total Vascular HI =	7E-02
Total Kidneys HI =	4E-02
Total Development HI =	1E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.3E+00	mg/kg	7.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	4.3E+00	mg/kg	1.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	3.1E-09	mg/m <sup>3</sup>	2.7E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								1E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	2.1E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.2E+00	mg/L	8.2E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0045 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	2E-07	1E-06	
			Chemical Total	1E-06	1E-09	2E-07	1E-06	
			Exposure Medium Total					1E-06
			Soil Total					1E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 1E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.57E+00		mg/kg	5.6E+00	3.9E-01	C	YES ASL
Barium	5.92E+03		mg/kg	5.9E+03	1.5E+03	N	YES ASL
Cadmium	1.63E+00		mg/kg	1.6E+00	7.0E+00	N	NO BSL
Nickel	9.97E+00		mg/kg	1.0E+01	1.5E+02	N	NO BSL
Zinc	4.04E+02		mg/kg	4.0E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.57E+00		5.57E+00	Maximum Detection
Barium	mg/kg	5.92E+03		5.92E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.14E+03		µg/L	1.1E+03	7.3E+02	N	YES	ASL
Nickel	1.15E+00		µg/L	1.2E+00	7.3E+01	N	NO	BSL
Zinc	2.07E+02		µg/L	2.1E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.14E+00		1.14E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0047 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0047 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0047 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0047 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0047 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.6E+00
Barium	5.9E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.1E-09
Barium	No	4.4E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.6E+00	mg/kg	7.12E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Barium	5.9E+03	mg/kg	7.6E-02	mg/kg-day	2.0E-01	mg/kg-day	4E-01
Ingestion Route Total								6E-01
Dermal Absorption	Arsenic	5.6E+00	mg/kg	5.98E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Barium	5.9E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.1E-09	mg/m <sup>3</sup>	3.93E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Barium	4.4E-06	mg/m <sup>3</sup>	4.2E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	8E-03
Inhalation Route Total								9E-03
Total of Receptor Hazards Across All Media								6E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.1E+00	mg/L	7.3E-02	mg/kg-day	2.0E-01	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Barium	1.1E+00	mg/L	4.8E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	3E-01
			Barium		4E-01	--	0E+00	4E-01
			Chemical Total	6E-01	--	2E-02	6E-01	
	Exposure Medium Total							6E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Barium		--	8E-03	--	8E-03
			Chemical Total	--	9E-03	--	9E-03	
	Exposure Medium Total							9E-03
	Soil Total							6E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	4E-01	--	3E-02
Chemical Total				4E-01	--	3E-02	4E-01	
Groundwater Total							4E-01	

Total Hazard Across All Media = 1E+00

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	8E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	8E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.6E+00	mg/kg	8.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
	Barium	5.9E+03	mg/kg	9.3E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.6E+00	mg/kg	8.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
	Barium	5.9E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.1E-09	mg/m <sup>3</sup>	1.7E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
	Barium	4.4E-06	mg/m <sup>3</sup>	1.8E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								7E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.1E+00	mg/L	1.7E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.1E+00	mg/L	9.7E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	7E-09	1E-06	1E-05
			Barium	NV	NV	NV	0E+00
			Chemical Total	1E-05	7E-09	1E-06	1E-05
			Exposure Medium Total				1E-05
Soil Total							1E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.6E+00	mg/kg	2.5E-05	mg/kg-day	3.0E-04	mg/kg-day	8E-02
	Barium	5.9E+03	mg/kg	2.6E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	5.6E+00	mg/kg	4.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
	Barium	5.9E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	4.1E-09	mg/m <sup>3</sup>	2.7E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
	Barium	4.4E-06	mg/m <sup>3</sup>	2.9E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	6E-03
Inhalation Route Total								6E-03
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.1E+00	mg/L	6.8E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	1.1E+00	mg/L	3.7E-05	mg/kg-day	1.4E-02	mg/kg-day	3E-03
Dermal Absorption Route Total								3E-03
Total of Receptor Hazards Across All Media								4E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular Kidneys	8E-02	--	1E-02	1E-01
			Barium		1E-01	--	0E+00	
			Chemical Total		2E-01	--	1E-02	
	Exposure Medium Total							2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system Fetotoxicity	--	2E-04	--	2E-04
			Barium		--	6E-03	--	6E-03
			Chemical Total		--	6E-03	--	6E-03
	Exposure Medium Total							6E-03
	Soil Total							2E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	3E-03
Chemical Total				3E-02		--	3E-03	
Groundwater Total							4E-02	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	2E-01
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	6E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.6E+00	mg/kg	9.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
	Barium	5.9E+03	mg/kg	1.0E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	5.6E+00	mg/kg	1.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
	Barium	5.9E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.1E-09	mg/m <sup>3</sup>	3.5E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Barium	4.4E-06	mg/m <sup>3</sup>	3.8E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.1E+00	mg/L	2.1E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.1E+00	mg/L	8.1E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0047 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	2E-09	3E-07	2E-06
			Barium	NV	NV	NV	0E+00
			Chemical Total	1E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.21E+00		mg/kg	6.2E+00	3.9E-01	C YES	ASL
Barium	3.61E+02		mg/kg	3.6E+02	1.5E+03	N NO	BSL
Cadmium	1.21E+00		mg/kg	1.2E+00	7.0E+00	N NO	BSL
Nickel	1.04E+01		mg/kg	1.0E+01	1.5E+02	N NO	BSL
Zinc	1.38E+02		mg/kg	1.4E+02	2.3E+03	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.21E+00		6.21E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	6.55E+02		µg/L	6.6E+02	7.3E+02	N	NO	BSL
Zinc	9.48E+02		µg/L	9.5E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	6.55E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	9.48E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0049 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0049 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0049 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0049 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0049 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.2E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.6E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	7.94E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.2E+00	mg/kg	6.67E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	4.38E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
	Exposure Medium Total							3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
	Exposure Medium Total							3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	9.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.2E+00	mg/kg	9.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	1.9E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	6.2E+00	mg/kg	4.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	2E-02	1E-01
			Chemical Total		9E-02	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.2E+00	mg/kg	2.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	3.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0049 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.37E+02		mg/kg	2.4E+02	1.5E+03	N	NO	BSL
Cadmium	1.45E+01		mg/kg	1.5E+01	7.0E+00	N	YES	ASL
Nickel	2.00E+01	J	mg/kg	2.0E+01	1.5E+02	N	NO	BSL
Zinc	4.73E+02		mg/kg	4.7E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Cadmium	mg/kg	1.45E+01		1.45E+01	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.02E+03		µg/L	1.0E+03	7.3E+02	N	YES	ASL
Zinc	9.03E+01		µg/L	9.0E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.02E+00		1.02E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0052 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0052 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0052 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0052 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0052 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	1.5E+01
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	1.1E-08
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	1.5E+01	mg/kg	1.9E-04	mg/kg-day	1.0E-03	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Cadmium	1.5E+01	mg/kg	5.2E-07	mg/kg-day	2.5E-05	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Cadmium	1.1E-08	mg/m <sup>3</sup>	1.0E-08	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	5E-04
Inhalation Route Total								5E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	6.5E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	1.0E+00	mg/L	4.3E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Cadmium	Kidneys	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Cadmium	Kidneys	--	5E-04	--	5E-04
			Chemical Total		--	5E-04	--	5E-04
			Exposure Medium Total					5E-04
Soil Total							2E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Groundwater Total					

Total Hazard Across All Media = 6E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	6E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Cadmium	1.5E+01	mg/kg	2.3E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Cadmium	1.5E+01	mg/kg	7.2E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Inhalation	Cadmium	1.1E-08	mg/m <sup>3</sup>	4.4E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								8E-09



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 - 2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	1.5E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.0E+00	mg/L	8.7E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Cadmium	NV	8E-09	NV	8E-09
			Chemical Total	0E+00	8E-09	0E+00	8E-09
			Exposure Medium Total				
Soil Total							8E-09
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				

Total risks across all exposure routes and media = 8E-09

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	1.5E+01	mg/kg	6.5E-05	mg/kg-day	1.0E-03	mg/kg-day	6E-02
Ingestion Route Total								6E-02
Dermal Absorption	Cadmium	1.5E+01	mg/kg	3.6E-07	mg/kg-day	2.5E-05	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Cadmium	1.1E-08	mg/m <sup>3</sup>	7.2E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								8E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	6.1E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	1.0E+00	mg/L	3.3E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS  
CENTRAL TENDENCY EXPOSURE  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Cadmium	Kidneys	6E-02	--	1E-02	8E-02
			Chemical Total		6E-02	--	1E-02	8E-02
			Exposure Medium Total					8E-02
	Air	Volatile and Fugitive Dust Emissions	Cadmium	Kidneys	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total						8E-02		
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03	3E-02
			Chemical Total		3E-02	--	2E-03	3E-02
			Groundwater Total					3E-02

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	1E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Cadmium	1.5E+01	mg/kg	2.5E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Cadmium	1.5E+01	mg/kg	1.6E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Inhalation	Cadmium	1.1E-08	mg/m <sup>3</sup>	9.2E-10	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-09



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	1.9E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.0E+00	mg/L	7.2E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0052 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk					
				Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil and Air	Residential Property	Cadmium	NV	1.66E-09	NV	2E-09		
			Chemical Total	0.00E+00	1.66E-09	0.00E+00	2E-09		
			Exposure Medium Total						2E-09
			Soil Total						2E-09
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00		
			Chemical Total	0.00E+00	--	0.00E+00	0E+00		
			Groundwater Total						0E+00

Total risks across all exposure routes and media = 2E-09

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.23E+02		mg/kg	8.2E+02	1.5E+03	N	NO	BSL
Cadmium	5.24E+00		mg/kg	5.2E+00	7.0E+00	N	NO	BSL
Nickel	1.16E+01		mg/kg	1.2E+01	1.5E+02	N	NO	BSL
Zinc	2.48E+02		mg/kg	2.5E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	8.23E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	5.24E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	1.16E+01		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	2.48E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.23E+03		µg/L	1.2E+03	7.3E+02	N	YES	ASL
Nickel	1.11E+00		µg/L	1.1E+00	7.3E+01	N	NO	BSL
Zinc	2.74E+02		µg/L	2.7E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.23E+00		1.23E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0054 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0054 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0054 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0054 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0054 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	7.9E-02	mg/kg-day	2.0E-01	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Barium	1.2E+00	mg/L	5.2E-04	mg/kg-day	1.4E-02	mg/kg-day	4E-02
Dermal Absorption Route Total								4E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	4E-01	--	4E-02	4E-01
			Chemical Total		4E-01	--	4E-02	4E-01
Groundwater Total								4E-01

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	4E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	1.8E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.2E+00	mg/L	1.0E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 0E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	7.3E-03	mg/kg-day	2.0E-01	mg/kg-day	4E-02
Ingestion Route Total								4E-02
Dermal Absorption	Barium	1.2E+00	mg/L	4.0E-05	mg/kg-day	1.4E-02	mg/kg-day	3E-03
Dermal Absorption Route Total								3E-03
Total of Receptor Hazards Across All Media								4E-02

TABLE 9.3  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 CENTRAL TENDENCY EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	4E-02	--	3E-03	4E-02
			Chemical Total		4E-02	--	3E-03	4E-02
Groundwater Total								4E-02

Total Hazard Across All Media 4E-02

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	4E-02
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.2E+00	mg/L	2.3E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.2E+00	mg/L	8.7E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0054 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 0E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.24E+02		mg/kg	1.2E+02	1.5E+03	N	NO	BSL
Cadmium	2.92E+00		mg/kg	2.9E+00	7.0E+00	N	NO	BSL
Nickel	6.88E+00		mg/kg	6.9E+00	1.5E+02	N	NO	BSL
Zinc	2.61E+02		mg/kg	2.6E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	1.24E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	2.92E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	6.88E+00		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	2.61E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.84E+01		µg/L	8.8E+01	7.3E+02	N	NO	BSL
Zinc	2.74E+01		µg/L	2.7E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	8.84E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	2.74E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0055 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0055 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0055 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0055 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0055 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-005 - Jefferson County Mining Site

Scenario: Fimelname: Current/Future Receptor: Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	Skin	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							
				Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--
			Antimony	0	--	NV	--	0.00		
			Arsenic	Development, vascular, nervous system	--	0.00	--	0.00		
			Barium	Phototoxicity	--	0.00	--	0.00		
			Beryllium	Beryllium sensitization (respiratory system)	--	0.00	--	0.00		
			Cadmium	Kidneys	--	0.00	--	0.00		
			Chromium	Lungs	--	0.00	--	0.00		
			Cobalt	Respiratory System	--	0.00	--	0.00		
			Copper	NA	--	NV	--	0.00		
			Iron	NA	--	NV	--	0.00		
			Manganese	Neurological	--	0.00	--	0.00		
			Nickel	Respiratory System	--	0.00	--	0.00		
			Selenium	Alimentary system, cardiovascular system, nervous system	--	0.00	--	0.00		
			Silver	NA	--	NV	--	0.00		
			Thallium	NA	--	NV	--	0.00		
			Vanadium	NA	--	NV	--	0.00		
			Zinc	NA	--	NV	--	0.00		
Chemical Total					--	0.00	--	0.00		
Exposure Medium Total										
Soil Total										
	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	Skin	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
Chemical Total					0.00	--	0.00	0.00		
Groundwater Total										
Total Hazard Across All Media										
0.00										
Total Neurological/Nervous System HI										
0.00										
Total Skin HI										
0.00										
Total Vascular HI										
0.00										
Total Kidneys HI										
0.00										
Total Development HI										
0.00										
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI										
0.00										
Total Blood HI										
0.00										
Total Lungs and Respiratory System HI										
0.00										
Total Beryllium Sensitization HI										
0.00										
Total Hair, Nails, and Teeth HI										
0.00										
Total Body and Organ Weights HI										
0.00										
Total ESOD HI										
0.00										
Total Phototoxicity										
0.00										

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0055 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							
				Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--
			Antimony	0	--	NV	--	0.00		
			Arsenic	Development, vascular, nervous system	--	0.00	--	0.00		
			Barium	Phototoxicity	--	0.00	--	0.00		
			Beryllium	Beryllium sensitization (respiratory system)	--	0.00	--	0.00		
			Cadmium	Kidneys	--	0.00	--	0.00		
			Chromium	Lungs	--	0.00	--	0.00		
			Cobalt	Respiratory System	--	0.00	--	0.00		
			Copper	NA	--	NV	--	0.00		
			Iron	NA	--	NV	--	0.00		
			Manganese	Neurological	--	0.00	--	0.00		
			Nickel	Respiratory System	--	0.00	--	0.00		
			Selenium	Alimentary system, cardiovascular system, nervous system	--	0.00	--	0.00		
			Silver	NA	--	NV	--	0.00		
			Thallium	NA	--	NV	--	0.00		
			Vanadium	NA	--	NV	--	0.00		
			Zinc	NA	--	NV	--	0.00		
Chemical Total					--	0.00	--	0.00		
Exposure Medium Total										
Soil Total										
0.00										
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Groundwater Total							
			0.00							
Total Hazard Across All Media										
0.00										
Total Neurological/Nervous System HI										
0.00										
Total Skin HI										
0.00										
Total Vascular HI										
0.00										
Total Kidneys HI										
0.00										
Total Development HI										
0.00										
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI										
0.00										
Total Blood HI										
0.00										
Total Lungs and Respiratory System HI										
0.00										
Total Beryllium Sensitization HI										
0.00										
Total Hair, Nails, and Teeth HI										
0.00										
Total Body and Organ Weights HI										
0.00										
Total ESOD HI										
0.00										
Total Phototoxicity										
0.00										

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L		See Table for Mutagenic Risks				0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L		See Table for Mutagenic Risks				0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0055 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
Exposure Medium Total							0.E+00
Soil Total							0.E+00
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
			Chemical Total	0.E+00	--	0.E+00	0.E+00
Groundwater Total							0.E+00

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	3.85E+02		mg/kg	3.9E+02	1.5E+03	N	NO	BSL
Cadmium	4.64E+00		mg/kg	4.6E+00	7.0E+00	N	NO	BSL
Nickel	1.10E+01		mg/kg	1.1E+01	1.5E+02	N	NO	BSL
Zinc	1.30E+02		mg/kg	1.3E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	3.85E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	4.64E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	1.10E+01		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	1.30E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	7.80E+02		µg/L	7.8E+02	7.3E+02	N	YES	ASL
Nickel	1.92E+00		µg/L	1.9E+00	7.3E+01	N	NO	BSL
Zinc	3.22E+02		µg/L	3.2E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	7.80E-01		7.80E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0062 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0062 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0062 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0062 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

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Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	7.8E-01	mg/L	5.0E-02	mg/kg-day	2.0E-01	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Barium	7.8E-01	mg/L	3.3E-04	mg/kg-day	1.4E-02	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-01	--	2E-02	3E-01
			Chemical Total		2E-01	--	2E-02	3E-01
Groundwater Total								3E-01

Total Hazard Across All Media 3E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	3E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	7.8E-01	mg/L	1.2E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	7.8E-01	mg/L	6.6E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 0E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	7.8E-01	mg/L	4.7E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Barium	7.8E-01	mg/L	2.5E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-02	--	2E-03	3E-02
			Chemical Total		2E-02	--	2E-03	3E-02
Groundwater Total								3E-02

Total Hazard Across All Media 3E-02

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	3E-02
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	7.8E-01	mg/L	1.4E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	7.8E-01	mg/L	5.5E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0062 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 0E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Aluminum	1.67E+04		mg/kg	1.7E+04	7.7E+03	N	YES ASL
Arsenic	9.10E+00		mg/kg	9.1E+00	3.9E-01	C	YES ASL
Barium	3.22E+02		mg/kg	3.2E+02	1.5E+03	N	NO BSL
Beryllium	6.50E-01		mg/kg	6.5E-01	1.6E+01	N	NO BSL
Cadmium	4.90E-01		mg/kg	4.9E-01	7.0E+00	N	NO BSL
Calcium	2.59E+03		mg/kg	2.6E+03	NA		NO NUT
Chromium	1.95E+01		mg/kg	2.0E+01	2.9E-01	C	YES ASL
Cobalt	1.31E+01		mg/kg	1.3E+01	2.3E+00	N	YES ASL
Copper	1.27E+01		mg/kg	1.3E+01	3.1E+02	N	NO BSL
Iron	2.62E+04		mg/kg	2.6E+04	5.5E+03	N	YES ASL
Magnesium	2.42E+03		mg/kg	2.4E+03	NA		NO NUT
Manganese	1.55E+03		mg/kg	1.6E+03	1.8E+02	N	YES ASL
Nickel	1.14E+01		mg/kg	1.1E+01	1.5E+02	N	NO BSL
Potassium	1.03E+03		mg/kg	1.0E+03	NA		NO NUT
Vanadium	3.82E+01		mg/kg	3.8E+01	3.9E+01	N	NO BSL
Zinc	5.99E+01		mg/kg	6.0E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	1.67E+04		1.67E+04	Maximum Detection
Arsenic	mg/kg	9.10E+00		9.10E+00	Maximum Detection
Chromium	mg/kg	1.95E+01		1.95E+01	Maximum Detection
Cobalt	mg/kg	1.31E+01		1.31E+01	Maximum Detection
Iron	mg/kg	2.62E+04		2.62E+04	Maximum Detection
Manganese	mg/kg	1.55E+03		1.55E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.87E+02		µg/L	1.9E+02	7.3E+02	N	NO	BSL
Copper	3.92E+01		µg/L	3.9E+01	1.5E+02	N	NO	BSL
Nickel	2.39E+00		µg/L	2.4E+00	7.3E+01	N	NO	BSL
Zinc	5.32E+01		µg/L	5.3E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	1.87E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	3.92E-02		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	2.39E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	5.32E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IRage-adj x EF / AT-C  IRage-adj = (EDc x IRc/BWc) + (EDa x IRa/BWa)
	IRage-adj	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0066 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0066 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0066 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0066 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0066 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	1.7E+04
Antimony	0.0E+00
Arsenic	9.1E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	2.0E+01
Cobalt	1.3E+01
Copper	0.0E+00
Iron	2.6E+04
Manganese	1.6E+03
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	1.2E-05
Antimony	No	0.0E+00
Arsenic	No	6.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	1.4E-08
Cobalt	No	9.6E-09
Copper	No	0.0E+00
Iron	No	1.9E-05
Manganese	No	1.1E-06
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	1.7E+04	mg/kg	2.1E-01	mg/kg-day	1.0E+00	mg/kg-day	2E-01
	Arsenic	9.1E+00	mg/kg	1.16E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
	Chromium	2.0E+01	mg/kg	2.5E-04	mg/kg-day	3.0E-03	mg/kg-day	8E-02
	Cobalt	1.3E+01	mg/kg	1.7E-04	mg/kg-day	3.0E-04	mg/kg-day	6E-01
	Iron	2.6E+04	mg/kg	3.3E-01	mg/kg-day	7.0E-01	mg/kg-day	5E-01
	Manganese	1.6E+03	mg/kg	2.0E-02	mg/kg-day	2.3E-02	mg/kg-day	8E-01
Ingestion Route Total								3E+00
Dermal Absorption	Aluminum	1.7E+04	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Arsenic	9.1E+00	mg/kg	9.77E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Chromium	2.0E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.3E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	2.6E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	1.6E+03	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Aluminum	1.2E-05	mg/m <sup>3</sup>	1.2E-05	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	2E-03
	Arsenic	6.7E-09	mg/m <sup>3</sup>	6.42E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
	Chromium	1.4E-08	mg/m <sup>3</sup>	1.4E-08	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	1E-04
	Cobalt	9.6E-09	mg/m <sup>3</sup>	9.2E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	2E-03
	Iron	1.9E-05	mg/m <sup>3</sup>	1.8E-05	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	1.1E-06	mg/m <sup>3</sup>	1.1E-06	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	2E-02
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Inhalation Route Total								3E-02
Total of Receptor Hazards Across All Media								3E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Aluminum	Neurological	2E-01	--	0E+00	2E-01
			Arsenic	Skin/Vascular	4E-01	--	3E-02	4E-01
			Chromium	None Reported	8E-02	--	0E+00	8E-02
			Cobalt	Blood	6E-01	--	0E+00	6E-01
			Iron	Gastrointestinal Tract	5E-01	--	0E+00	5E-01
			Manganese	Neurological	8E-01	--	0E+00	8E-01
			Chemical Total		3E+00	--	3E-02	3E+00
	Exposure Medium Total							3E+00
	Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	2E-03	--	2E-03
			Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chromium	Lungs	--	1E-04	--	1E-04
			Cobalt	Respiratory System	--	2E-03	--	2E-03
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	2E-02	--	2E-02
			Chemical Total		--	3E-02	--	3E-02
Exposure Medium Total							3E-02	
Soil Total							3E+00	

Total Hazard Across All Media = 3E+00

Total Neurological/Nervous System HI =	1E+00
Total Skin HI =	4E-01
Total Vascular HI =	4E-01
Total Kidneys HI =	0E+00
Total Development HI =	4E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	5E-01
Total Blood HI =	6E-01
Total Lungs and Respiratory System HI =	2E-03
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	1.7E+04	mg/kg	2.6E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	9.1E+00	mg/kg	1.4E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Chromium	2.0E+01	mg/kg	See Table for Mutagenic Risks				7E-05
	Cobalt	1.3E+01	mg/kg	2.1E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	2.6E+04	mg/kg	4.1E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.6E+03	mg/kg	2.4E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								9E-05
Dermal Absorption	Aluminum	1.7E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	9.1E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Chromium	2.0E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	1.3E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	2.6E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.6E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Aluminum	1.2E-05	mg/m <sup>3</sup>	5.0E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	6.7E-09	mg/m <sup>3</sup>	2.7E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Chromium	1.4E-08	mg/m <sup>3</sup>	See Table for Mutagenic Risks				2E-07
	Cobalt	9.6E-09	mg/m <sup>3</sup>	4.0E-09	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	4E-08
	Iron	1.9E-05	mg/m <sup>3</sup>	7.9E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	1.1E-06	mg/m <sup>3</sup>	4.7E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								2E-07
Total of Receptor Hazards Across All Media								9E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	2.0E+01	mg/kg	7.1E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	3.6E-05	7E-05	
	Age 2 - 6 years	2.0E+01	mg/kg	1.4E-05	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	2.1E-05		
	Age 6 - 16 years	2.0E+01	mg/kg	3.8E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	5.7E-06		
	Age 16 - 30 years	2.0E+01	mg/kg	5.3E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	2.7E-06		
	Dermal Absorption										0E+00
	Age 0 -2 years	2.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	2.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	2.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	2.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										2E-07
	Age 0 -2 years	1.4E-08	mg/m3	3.9E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	4.7E-08		
	Age 2 - 6 years	1.4E-08	mg/m3	7.9E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	2.8E-08		
Age 6 - 16 years	1.4E-08	mg/m3	2.0E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	7.1E-08			
Age 16 - 30 years	1.4E-08	mg/m3	2.7E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	3.3E-08			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0E+00
			Arsenic	2E-05	1E-08	2E-06	2E-05
			Chromium	7E-05	2E-07	0E+00	7E-05
			Cobalt	NV	4E-08	NV	4E-08
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			<b>Chemical Total</b>	<b>9E-05</b>	<b>2E-07</b>	<b>2E-06</b>	<b>9E-05</b>
<b>Exposure Medium Total</b>						<b>9E-05</b>	
<b>Soil Total</b>						<b>9E-05</b>	

Total risks across all exposure routes and media = 9E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	1.7E+04	mg/kg	7.5E-02	mg/kg-day	1.0E+00	mg/kg-day	7E-02
	Arsenic	9.1E+00	mg/kg	4.1E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Chromium	2.0E+01	mg/kg	8.7E-05	mg/kg-day	3.0E-03	mg/kg-day	3E-02
	Cobalt	1.3E+01	mg/kg	5.9E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Iron	2.6E+04	mg/kg	1.2E-01	mg/kg-day	7.0E-01	mg/kg-day	2E-01
	Manganese	1.6E+03	mg/kg	6.9E-03	mg/kg-day	2.3E-02	mg/kg-day	3E-01
Ingestion Route Total								9E-01
Dermal Absorption	Aluminum	1.7E+04	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Arsenic	9.1E+00	mg/kg	6.8E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Chromium	2.0E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.3E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	2.6E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	1.6E+03	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Aluminum	1.2E-05	mg/m <sup>3</sup>	8.2E-06	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	2E-03
	Arsenic	6.7E-09	mg/m <sup>3</sup>	4.5E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Chromium	1.4E-08	mg/m <sup>3</sup>	9.6E-09	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	1E-04
	Cobalt	9.6E-09	mg/m <sup>3</sup>	6.5E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	1E-03
	Iron	1.9E-05	mg/m <sup>3</sup>	1.3E-05	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	1.1E-06	mg/m <sup>3</sup>	7.7E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	2E-02
Inhalation Route Total								2E-02
Total of Receptor Hazards Across All Media								9E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Aluminum	Neurological	7E-02	--	0E+00	7E-02	
			Arsenic	Skin/Vascular	1E-01	--	2E-02	2E-01	
			Chromium	None Reported	3E-02	--	0E+00	3E-02	
			Cobalt	Blood	2E-01	--	0E+00	2E-01	
			Iron	Gastrointestinal Tract	2E-01	--	0E+00	2E-01	
			Manganese	Neurological	3E-01	--	0E+00	3E-01	
			Chemical Total		9E-01	--	2E-02	9E-01	
	Exposure Medium Total							9E-01	
		Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	2E-03	--	2E-03
				Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
				Chromium	Lungs	--	1E-04	--	1E-04
				Cobalt	Respiratory System	--	1E-03	--	1E-03
				Iron	NA	--	NV	--	0E+00
				Manganese	Neurological	--	2E-02	--	2E-02
				Chemical Total		--	2E-02	--	2E-02
Exposure Medium Total							2E-02		
Soil Total							9E-01		

Total Hazard Across All Media = 9E-01

Total Neurological/Nervous System HI =	4E-01
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	2E-01
Total Blood HI =	2E-01
Total Lungs and Respiratory System HI =	1E-03
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	1.7E+04	mg/kg	2.9E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	9.1E+00	mg/kg	1.6E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06	
	Chromium	2.0E+01	mg/kg	See Table for Mutagenic Risks					2E-05
	Cobalt	1.3E+01	mg/kg	2.3E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	2.6E+04	mg/kg	4.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	1.6E+03	mg/kg	2.7E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								2E-05	
Dermal Absorption	Aluminum	1.7E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	9.1E+00	mg/kg	3.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07	
	Chromium	2.0E+01	mg/kg	See Table for Mutagenic Risks					0E+00
	Cobalt	1.3E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	2.6E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	1.6E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								4E-07	
Inhalation	Aluminum	1.2E-05	mg/m <sup>3</sup>	1.1E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	6.7E-09	mg/m <sup>3</sup>	5.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09	
	Chromium	1.4E-08	mg/m <sup>3</sup>	See Table for Mutagenic Risks					7E-08
	Cobalt	9.6E-09	mg/m <sup>3</sup>	8.3E-10	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09	
	Iron	1.9E-05	mg/m <sup>3</sup>	1.7E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	1.1E-06	mg/m <sup>3</sup>	9.8E-08	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
Inhalation Route Total								8E-08	
Total of Receptor Hazards Across All Media								2E-05	



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	2.0E+01	mg/kg	2.5E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	1.2E-05	2E-05
	Age 2 - 6 years	2.0E+01	mg/kg	5.0E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	7.5E-06	
	Age 6 - 9 years	2.0E+01	mg/kg	4.0E-07	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	6.0E-07	
	Dermal Absorption									
	Age 0 -2 years	2.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0E+00
	Age 2 - 6 years	2.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	2.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	1.4E-08	mg/m3	2.7E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	3.3E-08	7E-08	
Age 2 - 6 years	1.4E-08	mg/m3	5.5E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	2.0E-08		
Age 6 - 9 years	1.4E-08	mg/m3	4.1E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.5E-08		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0066 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0E+00
			Arsenic	2.4.E-06	2.5.E-09	4.5.E-07	3E-06
			Chromium	2.1.E-05	6.8.E-08	0.0.E+00	2E-05
			Cobalt	NV	7.5.E-09	NV	7E-09
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			<b>Chemical Total</b>	<b>2.3.E-05</b>	<b>7.8.E-08</b>	<b>4.5.E-07</b>	<b>2E-05</b>
<b>Exposure Medium Total</b>						<b>2E-05</b>	
<b>Soil Total</b>						<b>2E-05</b>	

Total risks across all exposure routes and media = 2E-05

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.65E+00		mg/kg	5.7E+00	3.9E-01	C	YES ASL
Barium	2.45E+02		mg/kg	2.5E+02	1.5E+03	N	NO BSL
Nickel	1.06E+01		mg/kg	1.1E+01	1.5E+02	N	NO BSL
Zinc	6.94E+01		mg/kg	6.9E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.65E+00		5.65E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	6.56E+01		µg/L	6.6E+01	7.3E+02	N	NO	BSL
Nickel	2.26E+00		µg/L	2.3E+00	7.3E+01	N	NO	BSL
Zinc	1.72E+01		µg/L	1.7E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	6.56E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	2.26E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	1.72E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	7	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0067 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0067 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0067 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0067 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0067 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.7E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.2E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	7.22E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	5.7E+00	mg/kg	6.07E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	3.98E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	3E-01
			Chemical Total		2E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	8.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.7E+00	mg/kg	8.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	1.7E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
Inhalation Route Total								7E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	7E-09	1E-06	1E-05
			Chemical Total	1E-05	7E-09	1E-06	1E-05
			Exposure Medium Total				1E-05
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	2.5E-05	mg/kg-day	3.0E-04	mg/kg-day	8E-02
Ingestion Route Total								8E-02
Dermal Absorption	Arsenic	5.7E+00	mg/kg	4.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	2.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	8E-02	--	1E-02	1E-01
			Chemical Total		8E-02	--	1E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	9.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	5.7E+00	mg/kg	1.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	3.6E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0067 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	2E-09	3E-07	2E-06
			Chemical Total	1E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.97E+00		mg/kg	6.0E+00	3.9E-01	C	YES ASL
Barium	3.03E+02		mg/kg	3.0E+02	1.5E+03	N	NO BSL
Nickel	1.19E+01		mg/kg	1.2E+01	1.5E+02	N	NO BSL
Zinc	3.49E+02		mg/kg	3.5E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.97E+00		5.97E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0069 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0069 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0069 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0069 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0069 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.4E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.0E+00	mg/kg	7.63E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.0E+00	mg/kg	6.41E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.4E-09	mg/m <sup>3</sup>	4.21E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.0E+00	mg/kg	9.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.0E+00	mg/kg	8.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.4E-09	mg/m <sup>3</sup>	1.8E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Ingestion Route Total							
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Dermal Absorption Route Total							
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.0E+00	mg/kg	2.7E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	6.0E+00	mg/kg	4.5E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	4.4E-09	mg/m <sup>3</sup>	2.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	1E-02	1E-01
			Chemical Total		9E-02	--	1E-02	1E-01
	Exposure Medium Total							1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
	Exposure Medium Total							2E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.0E+00	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.0E+00	mg/kg	2.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.4E-09	mg/m <sup>3</sup>	3.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0069 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.96E+00		mg/kg	8.0E+00	3.9E-01	C	YES ASL
Barium	2.71E+02		mg/kg	2.7E+02	1.5E+03	N	NO BSL
Cadmium	2.33E+00		mg/kg	2.3E+00	7.0E+00	N	NO BSL
Nickel	1.31E+01		mg/kg	1.3E+01	1.5E+02	N	NO BSL
Zinc	1.95E+02	J	mg/kg	2.0E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.96E+00		7.96E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	BSL
Calcium			µg/L	0.0E+00	NA	NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	BSL
Magnesium			µg/L	0.0E+00	NA	NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	BSL
Potassium			µg/L	0.0E+00	NA	NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	BSL
Sodium			µg/L	0.0E+00	NA	NO	NUT
Thallium			µg/L	0.0E+00	NSV	YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989		
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989		

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0070 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0070 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0070 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0070 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0070 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	8.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.9E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.02E-04	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	8.0E+00	mg/kg	8.55E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	5.61E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total							4E-01	

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
 Total Skin HI = 4E-01  
 Total Vascular HI = 4E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 4E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	8.0E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Ingestion Route Total							
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Dermal Absorption Route Total							
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	3.6E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	8.0E+00	mg/kg	6.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	3.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	8.0E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	5.1E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0070 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.49E+00		mg/kg	7.5E+00	3.9E-01	C	YES	ASL
Barium	3.40E+02		mg/kg	3.4E+02	1.5E+03	N	NO	BSL
Cadmium	2.24E+00		mg/kg	2.2E+00	7.0E+00	N	NO	BSL
Nickel	1.19E+01		mg/kg	1.2E+01	1.5E+02	N	NO	BSL
Zinc	1.24E+02		mg/kg	1.2E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.49E+00		7.49E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.88E+02		µg/L	1.9E+02	7.3E+02	N	NO	BSL
Nickel	2.58E+00		µg/L	2.6E+00	7.3E+01	N	NO	BSL
Zinc	7.00E+02	J	µg/L	7.0E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	1.88E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	2.58E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	7.00E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x CF x EF x [(IR-C x ED-C/BW-C) + (IR-A x ED-A/BW-A)] x 1/AT
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x CF x DABS x EF x 1/AT x [(SA-C x SSAF-C x ED-C/BW-C) + (SA-A x SSAF-A x ED-A/BW-A)]
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Child Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF/(BWc \times AT-C) + Deventa \times SAa \times EDa \times EF/(BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	$t_{event-c}$	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	$t_{event-a}$	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0071 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0071 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0071 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0071 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0071 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.5E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.5E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.5E+00	mg/kg	9.58E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.5E+00	mg/kg	8.04E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.5E-09	mg/m <sup>3</sup>	5.28E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	3E-01
			Chemical Total		3E-01	--	3E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
			Soil Total					3E-01

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI =	4E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	0E+00
Total Development HI =	4E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.5E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.5E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.5E-09	mg/m <sup>3</sup>	2.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.5E+00	mg/kg	3.4E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.5E+00	mg/kg	5.6E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.5E-09	mg/m <sup>3</sup>	3.7E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total						1E-01		

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.5E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.5E+00	mg/kg	2.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.5E-09	mg/m <sup>3</sup>	4.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00	
Age 6 - 9 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00	

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0071 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	8.55E+00		mg/kg	8.6E+00	3.9E-01	C	YES ASL
Barium	1.04E+03		mg/kg	1.0E+03	1.5E+03	N	NO BSL
Cadmium	2.50E+00		mg/kg	2.5E+00	7.0E+00	N	NO BSL
Nickel	1.44E+01		mg/kg	1.4E+01	1.5E+02	N	NO BSL
Zinc	2.98E+02		mg/kg	3.0E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	8.55E+00		8.55E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0074 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0074 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0074 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0074 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0074 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	8.6E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	6.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.6E+00	mg/kg	1.09E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	8.6E+00	mg/kg	9.18E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	6.3E-09	mg/m <sup>3</sup>	6.03E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	4E-01	--	3E-02	4E-01
			Chemical Total		4E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total							4E-01	

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
Total Skin HI = 4E-01  
Total Vascular HI = 4E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 4E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.6E+00	mg/kg	1.3E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	8.6E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	6.3E-09	mg/m <sup>3</sup>	2.6E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.6E+00	mg/kg	3.8E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	8.6E+00	mg/kg	6.4E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	6.3E-09	mg/m <sup>3</sup>	4.2E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.6E+00	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	8.6E+00	mg/kg	2.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	6.3E-09	mg/m <sup>3</sup>	5.4E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								3E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0074 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	3E-06
			Chemical Total	2E-06	2E-09	4E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	C	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	4.43E+00		mg/kg	4.4E+00	3.9E-01	C	YES	ASL
Barium	7.72E+01		mg/kg	7.7E+01	1.5E+03	N	NO	BSL
Nickel	5.83E+00		mg/kg	5.8E+00	1.5E+02	N	NO	BSL
Zinc	3.14E+01		mg/kg	3.1E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	4.43E+00		4.43E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0079 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0079 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0079 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0079 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0079 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	4.4E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.4E+00	mg/kg	5.66E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	4.4E+00	mg/kg	4.76E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.3E-09	mg/m <sup>3</sup>	3.12E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 2E-01  
Total Vascular HI = 2E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.4E+00	mg/kg	6.9E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	4.4E+00	mg/kg	6.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	3.3E-09	mg/m <sup>3</sup>	1.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
Inhalation Route Total								6E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	6E-09	1E-06	1E-05
			Chemical Total	1E-05	6E-09	1E-06	1E-05
			Exposure Medium Total				1E-05
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.4E+00	mg/kg	2.0E-05	mg/kg-day	3.0E-04	mg/kg-day	7E-02
Ingestion Route Total								7E-02
Dermal Absorption	Arsenic	4.4E+00	mg/kg	3.3E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.3E-09	mg/m <sup>3</sup>	2.2E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-04
Inhalation Route Total								1E-04
Total of Receptor Hazards Across All Media								8E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	7E-02	--	1E-02	8E-02
			Chemical Total		7E-02	--	1E-02	8E-02
	Exposure Medium Total							8E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-04	--	1E-04
			Chemical Total		--	1E-04	--	1E-04
	Exposure Medium Total							1E-04
Soil Total							8E-02	

Total Hazard Across All Media = 8E-02

Total Neurological/Nervous System HI =	1E-04
Total Skin HI =	8E-02
Total Vascular HI =	8E-02
Total Kidneys HI =	0E+00
Total Development HI =	1E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.4E+00	mg/kg	7.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	4.4E+00	mg/kg	1.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	3.3E-09	mg/m <sup>3</sup>	2.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								1E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0079 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	2E-07	1E-06
			Chemical Total	1E-06	1E-09	2E-07	1E-06
			Exposure Medium Total				1E-06
Soil Total						1E-06	

Total risks across all exposure routes and media = 1E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.75E+00		mg/kg	7.8E+00	3.9E-01	C	YES ASL
Barium	7.55E+02		mg/kg	7.6E+02	1.5E+03	N	NO BSL
Cadmium	1.43E+00		mg/kg	1.4E+00	7.0E+00	N	NO BSL
Nickel	1.22E+01		mg/kg	1.2E+01	1.5E+02	N	NO BSL
Zinc	1.38E+02		mg/kg	1.4E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.75E+00		7.75E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.05E+02		µg/L	4.1E+02	7.3E+02	N	NO	BSL
Zinc	6.27E+01		µg/L	6.3E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.05E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	6.27E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0083 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0083 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0083 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0083 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0083 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.8E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	9.91E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.8E+00	mg/kg	8.32E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	5.46E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
			Soil Total					4E-01

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
Total Skin HI = 4E-01  
Total Vascular HI = 4E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 4E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.8E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	2.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	3.5E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.8E+00	mg/kg	5.8E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	3.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.8E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	4.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0083 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.78E+00		mg/kg	7.8E+00	3.9E-01	C	YES ASL
Barium	9.35E+02		mg/kg	9.4E+02	1.5E+03	N	NO BSL
Nickel	1.10E+01		mg/kg	1.1E+01	1.5E+02	N	NO BSL
Zinc	7.12E+01		mg/kg	7.1E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.78E+00		7.78E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	6.79E+01		µg/L	6.8E+01	7.3E+02	N	NO	BSL
Zinc	5.60E+01	J	µg/L	5.6E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	6.79E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	5.60E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0084 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0084 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0084 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0084 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0084 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.8E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	9.95E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.8E+00	mg/kg	8.36E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	5.49E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
			Soil Total					4E-01

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
 Total Skin HI = 4E-01  
 Total Vascular HI = 4E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 4E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.8E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	3.5E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.8E+00	mg/kg	5.8E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	3.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
	Exposure Medium Total							1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
	Exposure Medium Total							3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.8E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	4.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0084 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	6.37E+00		mg/kg	6.4E+00	3.9E-01	C	YES	ASL
Barium	1.12E+02		mg/kg	1.1E+02	1.5E+03	N	NO	BSL
Nickel	1.00E+01		mg/kg	1.0E+01	1.5E+02	N	NO	BSL
Zinc	4.69E+01		mg/kg	4.7E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.37E+00		6.37E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	5.53E+02		µg/L	5.5E+02	7.3E+02	N	NO	BSL
Nickel	1.54E+00		µg/L	1.5E+00	7.3E+01	N	NO	BSL
Zinc	6.09E+02		µg/L	6.1E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	5.53E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	1.54E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	6.09E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Child Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0088 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0088 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0088 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0088 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0088 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.4E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.4E+00	mg/kg	8.14E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.4E+00	mg/kg	6.84E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.7E-09	mg/m <sup>3</sup>	4.49E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.4E+00	mg/kg	1.0E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.4E+00	mg/kg	9.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.7E-09	mg/m <sup>3</sup>	1.9E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.4E+00	mg/kg	2.9E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	6.4E+00	mg/kg	4.8E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.7E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.4E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.4E+00	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.7E-09	mg/m <sup>3</sup>	4.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0088 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum	1.02E+04		mg/kg	1.0E+04	7.7E+03	N	YES	ASL
Arsenic	1.01E+01		mg/kg	1.0E+01	3.9E-01	C	YES	ASL
Barium	7.46E+02		mg/kg	7.5E+02	1.5E+03	N	NO	BSL
Beryllium	5.80E-01		mg/kg	5.8E-01	1.6E+01	N	NO	BSL
Cadmium	5.42E+00		mg/kg	5.4E+00	7.0E+00	N	NO	BSL
Calcium	8.97E+03		mg/kg	9.0E+03	NA		NO	NUT
Chromium	1.77E+01		mg/kg	1.8E+01	2.9E-01	C	YES	ASL
Cobalt	1.36E+01		mg/kg	1.4E+01	2.3E+00	N	YES	ASL
Copper	2.40E+01		mg/kg	2.4E+01	3.1E+02	N	NO	BSL
Iron	1.99E+04		mg/kg	2.0E+04	5.5E+03	N	YES	ASL
Magnesium	5.51E+03		mg/kg	5.5E+03	NA		NO	NUT
Manganese	1.37E+03		mg/kg	1.4E+03	1.8E+02	N	YES	ASL
Nickel	1.90E+01		mg/kg	1.9E+01	1.5E+02	N	NO	BSL
Potassium	1.08E+03		mg/kg	1.1E+03	NA		NO	NUT
Vanadium	2.57E+01		mg/kg	2.6E+01	3.9E+01	N	NO	BSL
Zinc	3.01E+02		mg/kg	3.0E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	1.02E+04		1.02E+04	Maximum Detection
Arsenic	mg/kg	1.01E+01		1.01E+01	Maximum Detection
Chromium	mg/kg	1.77E+01		1.77E+01	Maximum Detection
Cobalt	mg/kg	1.36E+01		1.36E+01	Maximum Detection
Iron	mg/kg	1.99E+04		1.99E+04	Maximum Detection
Manganese	mg/kg	1.37E+03		1.37E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	1.10E+00		µg/L	1.1E+00	4.5E-02	C	YES ASL
Barium	1.58E+02		µg/L	1.6E+02	7.3E+02	N	NO BSL
Copper	4.21E+01		µg/L	4.2E+01	1.5E+02	N	NO BSL
Nickel	3.40E+00		µg/L	3.4E+00	7.3E+01	N	NO BSL
Zinc	1.25E+03		µg/L	1.3E+03	1.1E+03	N	YES ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/L	1.10E-03		1.10E-03	Maximum Detection
Zinc	mg/L	1.25E+00		1.25E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0093 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	5.0E-03	mg/kg-day	0.026	1.3E-04	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0093 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0093 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0093 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

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Chemical	Conc (mg/kg)
Aluminum	1.0E+04
Antimony	0.0E+00
Arsenic	1.0E+01
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	1.8E+01
Cobalt	1.4E+01
Copper	0.0E+00
Iron	2.0E+04
Manganese	1.4E+03
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	7.5E-06
Antimony	No	0.0E+00
Arsenic	No	7.4E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	1.3E-08
Cobalt	No	1.0E-08
Copper	No	0.0E+00
Iron	No	1.5E-05
Manganese	No	1.0E-06
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	1.0E+04	mg/kg	1.3E-01	mg/kg-day	1.0E+00	mg/kg-day	1E-01
	Arsenic	1.0E+01	mg/kg	1.29E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
	Chromium	1.8E+01	mg/kg	2.3E-04	mg/kg-day	3.0E-03	mg/kg-day	8E-02
	Cobalt	1.4E+01	mg/kg	1.7E-04	mg/kg-day	3.0E-04	mg/kg-day	6E-01
	Iron	2.0E+04	mg/kg	2.5E-01	mg/kg-day	7.0E-01	mg/kg-day	4E-01
	Manganese	1.4E+03	mg/kg	1.8E-02	mg/kg-day	2.3E-02	mg/kg-day	8E-01
Ingestion Route Total								2E+00
Dermal Absorption	Aluminum	1.0E+04	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Arsenic	1.0E+01	mg/kg	1.08E-05	mg/kg-day	3.0E-04	mg/kg-day	4E-02
	Chromium	1.8E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.4E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	2.0E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	1.4E+03	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								4E-02
Inhalation	Aluminum	7.5E-06	mg/m <sup>3</sup>	7.2E-06	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	1E-03
	Arsenic	7.4E-09	mg/m <sup>3</sup>	7.12E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	5E-04
	Chromium	1.3E-08	mg/m <sup>3</sup>	1.2E-08	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	1E-04
	Cobalt	1.0E-08	mg/m <sup>3</sup>	9.6E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	2E-03
	Iron	1.5E-05	mg/m <sup>3</sup>	1.4E-05	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	1.0E-06	mg/m <sup>3</sup>	9.7E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	2E-02
Inhalation Route Total								2E-02
Total of Receptor Hazards Across All Media								2E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.1E-03	mg/L	7.0E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Zinc	1.3E+00	mg/L	8.0E-02	mg/kg-day	3.0E-01	mg/kg-day	3E-01
Ingestion Route Total								5E-01
Dermal Absorption	Arsenic	1.1E-03	mg/L	4.6E-07	mg/kg-day	3.0E-04	mg/kg-day	2E-03
	Zinc	1.3E+00	mg/L	3.2E-04	mg/kg-day	3.0E-01	mg/kg-day	1E-03
Dermal Absorption Route Total								3E-03
Total of Receptor Hazards Across All Media								5E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Aluminum	Neurological	1E-01	--	0E+00	1E-01
			Arsenic	Skin/Vascular	4E-01	--	4E-02	5E-01
			Chromium	None Reported	8E-02	--	0E+00	8E-02
			Cobalt	Blood	6E-01	--	0E+00	6E-01
			Iron	Gastrointestinal Tract	4E-01	--	0E+00	4E-01
			Manganese	Neurological	8E-01	--	0E+00	8E-01
			Chemical Total		2E+00	--	4E-02	2E+00
	Exposure Medium Total							2E+00
	Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	1E-03	--	1E-03
			Arsenic	Development, vascular, nervous system	--	5E-04	--	5E-04
			Chromium	Lungs	--	1E-04	--	1E-04
			Cobalt	Respiratory System	--	2E-03	--	2E-03
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	2E-02	--	2E-02
			Chemical Total		--	2E-02	--	2E-02
Exposure Medium Total							2E-02	
Soil Total							2E+00	
Groundwater	Groundwater	Potable Well	Arsenic	Skin/Vascular	2E-01	--	2E-03	2E-01
			Zinc	erythrocyte Cu,Zn-superoxide Dismutase (ESOD)	3E-01	--	1E-03	3E-01
			Chemical Total		5E-01	--	3E-03	5E-01
Groundwater Total							5E-01	

Total Hazard Across All Media = 3E+00

Total Neurological/Nervous System HI =	9E-01
Total Skin HI =	7E-01
Total Vascular HI =	7E-01
Total Kidneys HI =	0E+00
Total Development HI =	5E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	4E-01
Total Blood HI =	6E-01
Total Lungs and Respiratory System HI =	2E-03
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	3E-01
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	1.0E+04	mg/kg	1.6E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	1.0E+01	mg/kg	1.6E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05	
	Chromium	1.8E+01	mg/kg	See Table for Mutagenic Risks					6E-05
	Cobalt	1.4E+01	mg/kg	2.1E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	2.0E+04	mg/kg	3.1E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	1.4E+03	mg/kg	2.1E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								8E-05	
Dermal Absorption	Aluminum	1.0E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	1.0E+01	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06	
	Chromium	1.8E+01	mg/kg	See Table for Mutagenic Risks					0E+00
	Cobalt	1.4E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	2.0E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	1.4E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								2E-06	
Inhalation	Aluminum	7.5E-06	mg/m <sup>3</sup>	3.1E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	7.4E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08	
	Chromium	1.3E-08	mg/m <sup>3</sup>	See Table for Mutagenic Risks					2E-07
	Cobalt	1.0E-08	mg/m <sup>3</sup>	4.1E-09	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	4E-08	
	Iron	1.5E-05	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	1.0E-06	mg/m <sup>3</sup>	4.1E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
Inhalation Route Total								2E-07	
Total of Receptor Hazards Across All Media								9E-05	



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										6E-05
	Age 0 -2 years	1.8E+01	mg/kg	6.5E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	3.2E-05		
	Age 2 - 6 years	1.8E+01	mg/kg	1.3E-05	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	1.9E-05		
	Age 6 - 16 years	1.8E+01	mg/kg	3.5E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	5.2E-06		
	Age 16 - 30 years	1.8E+01	mg/kg	4.8E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	2.4E-06		
	Dermal Absorption										0E+00
	Age 0 -2 years	1.8E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	1.8E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	1.8E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	1.8E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										2E-07
	Age 0 -2 years	1.3E-08	mg/m3	3.6E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	4.3E-08		
	Age 2 - 6 years	1.3E-08	mg/m3	7.1E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	2.6E-08		
Age 6 - 16 years	1.3E-08	mg/m3	1.8E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	6.4E-08			
Age 16 - 30 years	1.3E-08	mg/m3	2.5E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	3.0E-08			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	1.1E-03	mg/L	1.6E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Zinc	1.3E+00	mg/L	1.9E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	1.1E-03	mg/L	9.4E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-07
	Zinc	1.3E+00	mg/L	6.4E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								1E-07
Total of Receptor Hazards Across All Media								2E-05

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0E+00
			Arsenic	2.4.E-05	1.3.E-08	2.2.E-06	3E-05
			Chromium	5.9.E-05	1.6.E-07	0.0.E+00	6E-05
			Cobalt	NV	3.7.E-08	NV	4E-08
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Chemical Total	8.3.E-05	2.1.E-07	2.2.E-06	9E-05
Exposure Medium Total						9E-05	
Soil Total						9E-05	
Groundwater	Groundwater	Potable Well	Arsenic	2.5.E-05	--	1.4.E-07	2E-05
			Zinc	NV	--	NV	0E+00
			Chemical Total	2.5.E-05	--	1.4.E-07	2E-05
Groundwater Total						2E-05	

Total risks across all exposure routes and media = 1E-04

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	1.0E+04	mg/kg	4.6E-02	mg/kg-day	1.0E+00	mg/kg-day	5E-02
	Arsenic	1.0E+01	mg/kg	4.5E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Chromium	1.8E+01	mg/kg	7.9E-05	mg/kg-day	3.0E-03	mg/kg-day	3E-02
	Cobalt	1.4E+01	mg/kg	6.1E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Iron	2.0E+04	mg/kg	8.9E-02	mg/kg-day	7.0E-01	mg/kg-day	1E-01
	Manganese	1.4E+03	mg/kg	6.1E-03	mg/kg-day	2.3E-02	mg/kg-day	3E-01
Ingestion Route Total								8E-01
Dermal Absorption	Aluminum	1.0E+04	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Arsenic	1.0E+01	mg/kg	7.6E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Chromium	1.8E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.4E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	2.0E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	1.4E+03	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Aluminum	7.5E-06	mg/m <sup>3</sup>	5.0E-06	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	1E-03
	Arsenic	7.4E-09	mg/m <sup>3</sup>	5.0E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Chromium	1.3E-08	mg/m <sup>3</sup>	8.7E-09	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	9E-05
	Cobalt	1.0E-08	mg/m <sup>3</sup>	6.7E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	1E-03
	Iron	1.5E-05	mg/m <sup>3</sup>	9.8E-06	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	1.0E-06	mg/m <sup>3</sup>	6.8E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	1E-02
Inhalation Route Total								2E-02
Total of Receptor Hazards Across All Media								9E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.1E-03	mg/L	6.6E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Zinc	1.3E+00	mg/L	7.5E-03	mg/kg-day	3.0E-01	mg/kg-day	2E-02
Ingestion Route Total								5E-02
Dermal Absorption	Arsenic	1.1E-03	mg/L	3.6E-08	mg/kg-day	3.0E-04	mg/kg-day	1E-04
	Zinc	1.3E+00	mg/L	2.4E-05	mg/kg-day	3.0E-01	mg/kg-day	8E-05
Dermal Absorption Route Total								2E-04
Total of Receptor Hazards Across All Media								5E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Aluminum	Neurological	5E-02	--	0E+00	5E-02
			Arsenic	Skin/Vascular	2E-01	--	3E-02	2E-01
			Chromium	None Reported	3E-02	--	0E+00	3E-02
			Cobalt	Blood	2E-01	--	0E+00	2E-01
			Iron	Gastrointestinal Tract	1E-01	--	0E+00	1E-01
			Manganese	Neurological	3E-01	--	0E+00	3E-01
			Chemical Total		8E-01	--	3E-02	8E-01
	Exposure Medium Total							
	Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	1E-03	--	1E-03
			Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chromium	Lungs	--	9E-05	--	9E-05
			Cobalt	Respiratory System	--	1E-03	--	1E-03
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	1E-02	--	1E-02
			Chemical Total		--	2E-02	--	2E-02
Exposure Medium Total								
Soil Total								
9E-01								
Groundwater	Groundwater	Potable Well	Arsenic	Skin/Vascular	2E-02	--	1E-04	2E-02
			Zinc	erythrocyte Cu,Zn-superoxide Dismutase (ESOD)	2E-02	--	8E-05	2E-02
			Chemical Total		5E-02	--	2E-04	5E-02
Groundwater Total								
5E-02								

Total Hazard Across All Media = 9E-01

Total Neurological/Nervous System HI =	3E-01
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	1E-01
Total Blood HI =	2E-01
Total Lungs and Respiratory System HI =	1E-03
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	2E-02
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	1.0E+04	mg/kg	1.8E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	1.0E+01	mg/kg	1.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
	Chromium	1.8E+01	mg/kg	See Table for Mutagenic Risks				2E-05
	Cobalt	1.4E+01	mg/kg	2.4E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	2.0E+04	mg/kg	3.5E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.4E+03	mg/kg	2.4E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Aluminum	1.0E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	1.0E+01	mg/kg	3.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
	Chromium	1.8E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	1.4E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	2.0E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.4E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								5E-07
Inhalation	Aluminum	7.5E-06	mg/m <sup>3</sup>	6.5E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	7.4E-09	mg/m <sup>3</sup>	6.4E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
	Chromium	1.3E-08	mg/m <sup>3</sup>	See Table for Mutagenic Risks				6E-08
	Cobalt	1.0E-08	mg/m <sup>3</sup>	8.6E-10	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
	Iron	1.5E-05	mg/m <sup>3</sup>	1.3E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	1.0E-06	mg/m <sup>3</sup>	8.7E-08	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								7E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	1.8E+01	mg/kg	2.3E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	1.1E-05	2E-05
	Age 2 - 6 years	1.8E+01	mg/kg	4.5E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	6.8E-06	
	Age 6 - 9 years	1.8E+01	mg/kg	3.6E-07	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	5.5E-07	
	Dermal Absorption									
	Age 0 -2 years	1.8E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0E+00
	Age 2 - 6 years	1.8E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	1.8E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	1.3E-08	mg/m3	2.5E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	3.0E-08	6E-08	
Age 2 - 6 years	1.3E-08	mg/m3	5.0E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.8E-08		
Age 6 - 9 years	1.3E-08	mg/m3	3.7E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.3E-08		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	1.1E-03	mg/L	2.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
	Zinc	1.3E+00	mg/L	2.3E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								3E-06
Dermal Absorption	Arsenic	1.1E-03	mg/L	7.8E-09	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-08
	Zinc	1.3E+00	mg/L	5.3E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								1E-08
Total of Receptor Hazards Across All Media								3E-06

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0093 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0E+00
			Arsenic	2.7.E-06	2.8.E-09	5.0.E-07	3E-06
			Chromium	1.9.E-05	6.1.E-08	0.0.E+00	2E-05
			Cobalt	NV	7.8.E-09	NV	8E-09
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Chemical Total	2.1.E-05	7.2.E-08	5.0.E-07	2E-05
Exposure Medium Total						2E-05	
Soil Total						2E-05	
Groundwater	Groundwater	Potable Well	Arsenic	3.1.E-06	--	1.2.E-08	3E-06
			Zinc	NV	--	NV	0E+00
			Chemical Total	3.1.E-06	--	1.2.E-08	3E-06
Groundwater Total						3E-06	

Total risks across all exposure routes and media = 2E-05

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	7.35E+00		mg/kg	7.4E+00	3.9E-01	C	YES	ASL
Barium	1.37E+02		mg/kg	1.4E+02	1.5E+03	N	NO	BSL
Nickel	1.32E+01		mg/kg	1.3E+01	1.5E+02	N	NO	BSL
Zinc	6.98E+01		mg/kg	7.0E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.35E+00		7.35E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	9.48E+01		µg/L	9.5E+01	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	9.48E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0095 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0095 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0095 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0095 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0095 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.4E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.4E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.4E+00	mg/kg	9.40E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.4E+00	mg/kg	7.89E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.4E-09	mg/m <sup>3</sup>	5.18E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	3E-01
			Chemical Total		3E-01	--	3E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
 Total Skin HI = 3E-01  
 Total Vascular HI = 3E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 3E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.4E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.4E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.4E-09	mg/m <sup>3</sup>	2.2E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.4E+00	mg/kg	3.3E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.4E+00	mg/kg	5.5E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.4E-09	mg/m <sup>3</sup>	3.6E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
	Soil Total							1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.4E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.4E+00	mg/kg	2.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.4E-09	mg/m <sup>3</sup>	4.7E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0095 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.91E+00		mg/kg	5.9E+00	3.9E-01	C	YES ASL
Barium	1.33E+02		mg/kg	1.3E+02	1.5E+03	N	NO BSL
Nickel	8.49E+00		mg/kg	8.5E+00	1.5E+02	N	NO BSL
Zinc	7.49E+01		mg/kg	7.5E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.91E+00		5.91E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0096 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0096 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0096 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0096 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0096 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.9E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.9E+00	mg/kg	7.56E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	5.9E+00	mg/kg	6.35E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.3E-09	mg/m <sup>3</sup>	4.17E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
	Exposure Medium Total							3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
	Exposure Medium Total							3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
 Total Skin HI = 3E-01  
 Total Vascular HI = 3E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 3E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.9E+00	mg/kg	9.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.9E+00	mg/kg	8.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.3E-09	mg/m <sup>3</sup>	1.8E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.9E+00	mg/kg	2.6E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	5.9E+00	mg/kg	4.4E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	4.3E-09	mg/m <sup>3</sup>	2.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	1E-02	1E-01
			Chemical Total		9E-02	--	1E-02	1E-01
	Exposure Medium Total							1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
	Exposure Medium Total							2E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.9E+00	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	5.9E+00	mg/kg	1.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.3E-09	mg/m <sup>3</sup>	3.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0096 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum	5.90E+03		mg/kg	5.9E+03	7.7E+03	N	NO	BSL
Arsenic	8.03E+00		mg/kg	8.0E+00	3.9E-01	C	YES	ASL
Barium	7.00E+02		mg/kg	7.0E+02	1.5E+03	N	NO	BSL
Beryllium	5.60E-01		mg/kg	5.6E-01	1.6E+01	N	NO	BSL
Cadmium	3.98E+00		mg/kg	4.0E+00	7.0E+00	N	NO	BSL
Calcium	1.09E+04		mg/kg	1.1E+04	NA		NO	NUT
Chromium	1.00E+01		mg/kg	1.0E+01	2.9E-01	C	YES	ASL
Cobalt	1.33E+01		mg/kg	1.3E+01	2.3E+00	N	YES	ASL
Copper	3.24E+01		mg/kg	3.2E+01	3.1E+02	N	NO	BSL
Iron	1.27E+04		mg/kg	1.3E+04	5.5E+03	N	YES	ASL
Magnesium	5.61E+03		mg/kg	5.6E+03	NA		NO	NUT
Manganese	1.08E+03		mg/kg	1.1E+03	1.8E+02	N	YES	ASL
Nickel	1.76E+01		mg/kg	1.8E+01	1.5E+02	N	NO	BSL
Potassium	8.20E+02		mg/kg	8.2E+02	NA		NO	NUT
Vanadium	2.02E+01		mg/kg	2.0E+01	3.9E+01	N	NO	BSL
Zinc	2.71E+02		mg/kg	2.7E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	8.03E+00		8.03E+00	Maximum Detection
Chromium	mg/kg	1.00E+01		1.00E+01	Maximum Detection
Cobalt	mg/kg	1.33E+01		1.33E+01	Maximum Detection
Iron	mg/kg	1.27E+04		1.27E+04	Maximum Detection
Manganese	mg/kg	1.08E+03		1.08E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	3.07E+02		µg/L	3.1E+02	7.3E+02	N	NO	BSL
Copper	3.13E+01		µg/L	3.1E+01	1.5E+02	N	NO	BSL
Manganese	1.40E+00		µg/L	1.4E+00	8.8E+01	N	NO	BSL
Nickel	1.20E+00		µg/L	1.2E+00	7.3E+01	N	NO	BSL
Zinc	1.69E+02	J	µg/L	1.7E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	3.07E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	3.13E-02		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	1.40E-03		0.00E+00	Not a COPC
Nickel	mg/L	1.20E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	1.69E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0098 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0098 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0098 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0098 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0098 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	8.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	1.0E+01
Cobalt	1.3E+01
Copper	0.0E+00
Iron	1.3E+04
Manganese	1.1E+03
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.9E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	7.4E-09
Cobalt	No	9.8E-09
Copper	No	0.0E+00
Iron	No	9.3E-06
Manganese	No	7.9E-07
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.03E-04	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Chromium	1.0E+01	mg/kg	1.3E-04	mg/kg-day	3.0E-03	mg/kg-day	4E-02
	Cobalt	1.3E+01	mg/kg	1.7E-04	mg/kg-day	3.0E-04	mg/kg-day	6E-01
	Iron	1.3E+04	mg/kg	1.6E-01	mg/kg-day	7.0E-01	mg/kg-day	2E-01
	Manganese	1.1E+03	mg/kg	1.4E-02	mg/kg-day	2.3E-02	mg/kg-day	6E-01
Ingestion Route Total								2E+00
Dermal Absorption	Arsenic	8.0E+00	mg/kg	8.62E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Chromium	1.0E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.3E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	1.3E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	1.1E+03	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	5.66E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
	Chromium	7.4E-09	mg/m <sup>3</sup>	7.1E-09	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	7E-05
	Cobalt	9.8E-09	mg/m <sup>3</sup>	9.4E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	2E-03
	Iron	9.3E-06	mg/m <sup>3</sup>	9.0E-06	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	7.9E-07	mg/m <sup>3</sup>	7.6E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	2E-02
Inhalation Route Total								2E-02
Total of Receptor Hazards Across All Media								2E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chromium	None Reported	4E-02	--	0E+00	4E-02
			Cobalt	Blood	6E-01	--	0E+00	6E-01
			Iron	Gastrointestinal Tract	2E-01	--	0E+00	2E-01
			Manganese	Neurological	6E-01	--	0E+00	6E-01
			Chemical Total		2E+00	--	3E-02	2E+00
	Exposure Medium Total							
	2E+00							
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chromium	Lungs	--	7E-05	--	7E-05
			Cobalt	Respiratory System	--	2E-03	--	2E-03
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	2E-02	--	2E-02
			Chemical Total		--	2E-02	--	2E-02
	Exposure Medium Total							
2E-02								
Soil Total								
2E+00								

Total Hazard Across All Media = 2E+00

Total Neurological/Nervous System HI = 6E-01  
Total Skin HI = 4E-01  
Total Vascular HI = 4E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 4E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 2E-01  
Total Blood HI = 6E-01  
Total Lungs and Respiratory System HI = 2E-03  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.3E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Chromium	1.0E+01	mg/kg	See Table for Mutagenic Risks				3E-05
	Cobalt	1.3E+01	mg/kg	2.1E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.3E+04	mg/kg	2.0E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.1E+03	mg/kg	1.7E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								5E-05
Dermal Absorption	Arsenic	8.0E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Chromium	1.0E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	1.3E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.3E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.1E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Chromium	7.4E-09	mg/m <sup>3</sup>	See Table for Mutagenic Risks				9E-08
	Cobalt	9.8E-09	mg/m <sup>3</sup>	4.0E-09	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	4E-08
	Iron	9.3E-06	mg/m <sup>3</sup>	3.8E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	7.9E-07	mg/m <sup>3</sup>	3.3E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								1E-07
Total of Receptor Hazards Across All Media								5E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										3E-05
	Age 0 -2 years	1.0E+01	mg/kg	3.7E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	1.8E-05		
	Age 2 - 6 years	1.0E+01	mg/kg	7.3E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	1.1E-05		
	Age 6 - 16 years	1.0E+01	mg/kg	2.0E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	2.9E-06		
	Age 16 - 30 years	1.0E+01	mg/kg	2.7E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	1.4E-06		
	Dermal Absorption										0E+00
	Age 0 -2 years	1.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	1.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	1.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	1.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										9E-08
	Age 0 -2 years	7.4E-09	mg/m3	2.0E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	2.4E-08		
	Age 2 - 6 years	7.4E-09	mg/m3	4.0E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.5E-08		
Age 6 - 16 years	7.4E-09	mg/m3	1.0E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	3.6E-08			
Age 16 - 30 years	7.4E-09	mg/m3	1.4E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	1.7E-08			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L		See Table for Mutagenic Risks				0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L		See Table for Mutagenic Risks				0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chromium	3E-05	9E-08	0E+00	3E-05
			Cobalt	NV	4E-08	NV	4E-08
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Chemical Total	5E-05	1E-07	2E-06	5E-05
Exposure Medium Total						5E-05	
Soil Total						5E-05	

Total risks across all exposure routes and media = 5.E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	3.6E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Chromium	1.0E+01	mg/kg	4.5E-05	mg/kg-day	3.0E-03	mg/kg-day	1E-02
	Cobalt	1.3E+01	mg/kg	6.0E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Iron	1.3E+04	mg/kg	5.7E-02	mg/kg-day	7.0E-01	mg/kg-day	8E-02
	Manganese	1.1E+03	mg/kg	4.8E-03	mg/kg-day	2.3E-02	mg/kg-day	2E-01
Ingestion Route Total								6E-01
Dermal Absorption	Arsenic	8.0E+00	mg/kg	6.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Chromium	1.0E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	1.3E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	1.3E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	1.1E+03	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	4.0E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Chromium	7.4E-09	mg/m <sup>3</sup>	4.9E-09	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	5E-05
	Cobalt	9.8E-09	mg/m <sup>3</sup>	6.6E-09	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	1E-03
	Iron	9.3E-06	mg/m <sup>3</sup>	6.3E-06	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	7.9E-07	mg/m <sup>3</sup>	5.3E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	1E-02
Inhalation Route Total								1E-02
Total of Receptor Hazards Across All Media								7E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chromium	None Reported	1E-02	--	0E+00	1E-02
			Cobalt	Blood	2E-01	--	0E+00	2E-01
			Iron	Gastrointestinal Tract	8E-02	--	0E+00	8E-02
			Manganese	Neurological	2E-01	--	0E+00	2E-01
			Chemical Total		6E-01	--	2E-02	6E-01
	Exposure Medium Total							
	6E-01							
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chromium	Lungs	--	5E-05	--	5E-05
			Cobalt	Respiratory System	--	1E-03	--	1E-03
			Iron	NA	--	NV	--	0E+00
Manganese			Neurological	--	1E-02	--	1E-02	
Chemical Total				--	1E-02	--	1E-02	
Exposure Medium Total								
1E-02								
Soil Total								
7E-01								

Total Hazard Across All Media = 7E-01

Total Neurological/Nervous System HI = 2E-01  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 8E-02  
Total Blood HI = 2E-01  
Total Lungs and Respiratory System HI = 1E-03  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Chromium	1.0E+01	mg/kg	See Table for Mutagenic Risks				1E-05
	Cobalt	1.3E+01	mg/kg	2.3E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.3E+04	mg/kg	2.2E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.1E+03	mg/kg	1.9E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	8.0E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
	Chromium	1.0E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	1.3E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.3E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	1.1E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	5.1E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Chromium	7.4E-09	mg/m <sup>3</sup>	See Table for Mutagenic Risks				3E-08
	Cobalt	9.8E-09	mg/m <sup>3</sup>	8.4E-10	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
	Iron	9.3E-06	mg/m <sup>3</sup>	8.1E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	7.9E-07	mg/m <sup>3</sup>	6.9E-08	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								4E-08
Total of Receptor Hazards Across All Media								1E-05



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	1.0E+01	mg/kg	1.3E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	6.4E-06	1E-05
	Age 2 - 6 years	1.0E+01	mg/kg	2.6E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	3.8E-06	
	Age 6 - 9 years	1.0E+01	mg/kg	2.1E-07	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	3.1E-07	
	Dermal Absorption									
	Age 0 -2 years	1.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0E+00
	Age 2 - 6 years	1.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	1.0E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	7.4E-09	mg/m <sup>3</sup>	1.4E-10	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	1.7E-08	3E-08	
Age 2 - 6 years	7.4E-09	mg/m <sup>3</sup>	2.8E-10	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.0E-08		
Age 6 - 9 years	7.4E-09	mg/m <sup>3</sup>	2.1E-10	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	7.6E-09		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0098 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2.1.E-06	2.2.E-09	4.0.E-07	3E-06
			Chromium	1.1.E-05	3.5.E-08	0.0.E+00	1E-05
			Cobalt	NV	7.6.E-09	NV	8E-09
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Chemical Total	1.3.E-05	4.4.E-08	4.0.E-07	1E-05
Exposure Medium Total						1E-05	
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.12E+00		mg/kg	6.1E+00	3.9E-01	C	YES ASL
Barium	4.22E+02		mg/kg	4.2E+02	1.5E+03	N	NO BSL
Nickel	1.25E+01		mg/kg	1.3E+01	1.5E+02	N	NO BSL
Zinc	1.65E+02		mg/kg	1.7E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.12E+00		6.12E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.92E+02		µg/L	1.9E+02	7.3E+02	N	NO	BSL
Zinc	9.54E+01		µg/L	9.5E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	1.92E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	9.54E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0102 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0102 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0102 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0102 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0102 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.1E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.5E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.1E+00	mg/kg	7.82E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.1E+00	mg/kg	6.57E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.5E-09	mg/m <sup>3</sup>	4.32E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.1E+00	mg/kg	9.6E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.1E+00	mg/kg	9.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.5E-09	mg/m <sup>3</sup>	1.8E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 - 2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.1E+00	mg/kg	2.7E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	6.1E+00	mg/kg	4.6E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.5E-09	mg/m <sup>3</sup>	3.0E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	2E-02	1E-01
			Chemical Total		9E-02	--	2E-02	1E-01
	Exposure Medium Total							1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
	Exposure Medium Total							2E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.1E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.1E+00	mg/kg	2.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.5E-09	mg/m <sup>3</sup>	3.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0102 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.08E+00		mg/kg	7.1E+00	3.9E-01	C	YES ASL
Barium	1.08E+03		mg/kg	1.1E+03	1.5E+03	N	NO BSL
Cadmium	1.28E+01		mg/kg	1.3E+01	7.0E+00	N	YES ASL
Nickel	1.10E+01		mg/kg	1.1E+01	1.5E+02	N	NO BSL
Zinc	1.77E+03		mg/kg	1.8E+03	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.08E+00		7.08E+00	Maximum Detection
Cadmium	mg/kg	1.28E+01		1.28E+01	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	7.66E+01		µg/L	7.7E+01	7.3E+02	N	NO	BSL
Cadmium	1.21E+00		µg/L	1.2E+00	1.8E+00	N	NO	BSL
Nickel	4.80E+00		µg/L	4.8E+00	7.3E+01	N	NO	BSL
Zinc	1.11E+03	J	µg/L	1.1E+03	1.1E+03	N	YES	ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Zinc	mg/L	1.11E+00		1.11E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0105 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0105 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0105 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0105 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

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Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.1E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	1.3E+01
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.2E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	9.4E-09
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.1E+00	mg/kg	9.05E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Cadmium	1.3E+01	mg/kg	1.6E-04	mg/kg-day	1.0E-03	mg/kg-day	2E-01
Ingestion Route Total								5E-01
Dermal Absorption	Arsenic	7.1E+00	mg/kg	7.60E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Cadmium	1.3E+01	mg/kg	4.6E-07	mg/kg-day	2.5E-05	mg/kg-day	2E-02
Dermal Absorption Route Total								4E-02
Inhalation	Arsenic	5.2E-09	mg/m <sup>3</sup>	4.99E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Cadmium	9.4E-09	mg/m <sup>3</sup>	9.0E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	5E-04
Inhalation Route Total								8E-04
Total of Receptor Hazards Across All Media								5E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Zinc	1.1E+00	mg/L	7.1E-02	mg/kg-day	3.0E-01	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Zinc	1.1E+00	mg/L	2.8E-04	mg/kg-day	3.0E-01	mg/kg-day	9E-04
Dermal Absorption Route Total								9E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Residen  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	3E-01
			Cadmium		2E-01	--	2E-02	2E-01
			Chemical Total	5E-01	--	4E-02	5E-01	
	Exposure Medium Total							5E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Cadmium		--	5E-04	--	5E-04
			Chemical Total	--	8E-04	--	8E-04	
	Exposure Medium Total							8E-04
	Soil Total							5E-01
	Groundwater	Groundwater	Potable Well	Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	2E-01	--	9E-04
Chemical Total				2E-01	--	9E-04	2E-01	
Groundwater Total							2E-01	

Total Hazard Across All Media = 7E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	2E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	2E-01
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.1E+00	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Cadmium	1.3E+01	mg/kg	2.0E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.1E+00	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Cadmium	1.3E+01	mg/kg	6.3E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.2E-09	mg/m <sup>3</sup>	2.1E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
	Cadmium	9.4E-09	mg/m <sup>3</sup>	3.9E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
Inhalation Route Total								2E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Zinc	1.1E+00	mg/L	1.7E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Zinc	1.1E+00	mg/L	5.7E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	9E-09	2E-06	2E-05
			Cadmium	NV	7E-09	NV	7E-09
			Chemical Total	2E-05	2E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total							2E-05
Groundwater	Groundwater	Potable Well	Zinc	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.1E+00	mg/kg	3.2E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Cadmium	1.3E+01	mg/kg	5.7E-05	mg/kg-day	1.0E-03	mg/kg-day	6E-02
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	7.1E+00	mg/kg	5.3E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Cadmium	1.3E+01	mg/kg	3.2E-07	mg/kg-day	2.5E-05	mg/kg-day	1E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.2E-09	mg/m <sup>3</sup>	3.5E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
	Cadmium	9.4E-09	mg/m <sup>3</sup>	6.3E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								5E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Zinc	1.1E+00	mg/L	6.6E-03	mg/kg-day	3.0E-01	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Zinc	1.1E+00	mg/L	2.2E-05	mg/kg-day	3.0E-01	mg/kg-day	7E-05
Dermal Absorption Route Total								7E-05
Total of Receptor Hazards Across All Media								2E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular Kidneys	1E-01	--	2E-02	1E-01
			Cadmium		6E-02	--	1E-02	
			Chemical Total		2E-01	--	3E-02	
	Exposure Medium Total							2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system Kidneys	--	2E-04	--	2E-04
			Cadmium		--	3E-04	--	3E-04
			Chemical Total		--	5E-04	--	5E-04
	Exposure Medium Total							5E-04
	Soil Total							2E-01
	Groundwater	Groundwater	Potable Well	Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	2E-02	--	7E-05
Chemical Total				2E-02		--	7E-05	2E-02
Groundwater Total							2E-02	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	7E-02
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	2E-02
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.1E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Cadmium	1.3E+01	mg/kg	2.3E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.1E+00	mg/kg	2.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
	Cadmium	1.3E+01	mg/kg	1.4E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.2E-09	mg/m <sup>3</sup>	4.5E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Cadmium	9.4E-09	mg/m <sup>3</sup>	8.1E-10	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Zinc	1.1E+00	mg/L	2.1E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Zinc	1.1E+00	mg/L	4.7E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0105 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Cadmium	NV	1E-09	NV	1E-09
			Chemical Total	2E-06	3E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total							2E-06
Groundwater	Groundwater	Potable Well	Zinc	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.96E+00		mg/kg	8.0E+00	3.9E-01	C	YES ASL
Barium	4.46E+02		mg/kg	4.5E+02	1.5E+03	N	NO BSL
Nickel	1.34E+01		mg/kg	1.3E+01	1.5E+02	N	NO BSL
Zinc	2.45E+02		mg/kg	2.5E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.96E+00		7.96E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.58E+02	J	µg/L	4.6E+02	7.3E+02	N	NO	BSL
Nickel	1.91E+00		µg/L	1.9E+00	7.3E+01	N	NO	BSL
Zinc	6.66E+02	J	µg/L	6.7E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00	J	0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.58E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	1.91E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	6.66E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Soil
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Child Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Resident
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0107 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0107 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0107 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0107 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0107 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	8.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.9E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.02E-04	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	8.0E+00	mg/kg	8.55E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	5.61E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total						4E-01		

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
Total Skin HI = 4E-01  
Total Vascular HI = 4E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 4E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	8.0E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									0.0E+00
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									0.0E+00
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	3.6E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	8.0E+00	mg/kg	6.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	3.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	8.0E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	5.1E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0107 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.71E+00		mg/kg	6.7E+00	3.9E-01	C	YES ASL
Barium	4.34E+02		mg/kg	4.3E+02	1.5E+03	N	NO BSL
Nickel	1.95E+01		mg/kg	2.0E+01	1.5E+02	N	NO BSL
Zinc	1.73E+02		mg/kg	1.7E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.71E+00		6.71E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

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Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0110 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0110 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0110 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0110 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0110 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.7E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.9E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.7E+00	mg/kg	8.58E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.7E+00	mg/kg	7.21E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.9E-09	mg/m <sup>3</sup>	4.73E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.7E+00	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	6.7E+00	mg/kg	9.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.9E-09	mg/m <sup>3</sup>	2.0E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
Inhalation Route Total								9E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	9E-09	1E-06	2E-05
			Chemical Total	2E-05	9E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.7E+00	mg/kg	3.0E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	6.7E+00	mg/kg	5.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.9E-09	mg/m <sup>3</sup>	3.3E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.7E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.7E+00	mg/kg	2.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.9E-09	mg/m <sup>3</sup>	4.3E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0110 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.67E+00		mg/kg	7.7E+00	3.9E-01	C	YES ASL
Barium	2.63E+02		mg/kg	2.6E+02	1.5E+03	N	NO BSL
Cadmium	1.09E+00		mg/kg	1.1E+00	7.0E+00	N	NO BSL
Nickel	1.07E+01		mg/kg	1.1E+01	1.5E+02	N	NO BSL
Zinc	9.00E+01		mg/kg	9.0E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.67E+00		7.67E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Zinc	6.38E+01		µg/L	6.4E+01	1.1E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	6.38E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0112 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0112 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0112 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0112 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0112 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.7E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.6E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.7E+00	mg/kg	9.81E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.7E+00	mg/kg	8.24E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	5.41E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total						4E-01		

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
 Total Skin HI = 4E-01  
 Total Vascular HI = 4E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 4E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.7E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.7E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	2.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.7E+00	mg/kg	3.4E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.7E+00	mg/kg	5.8E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	3.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.7E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.7E+00	mg/kg	2.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	4.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0112 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	9.29E+00		mg/kg	9.3E+00	3.9E-01	C	YES ASL
Barium	1.59E+02		mg/kg	1.6E+02	1.5E+03	N	NO BSL
Cadmium	1.46E+00		mg/kg	1.5E+00	7.0E+00	N	NO BSL
Nickel	1.26E+01		mg/kg	1.3E+01	1.5E+02	N	NO BSL
Zinc	4.60E+01		mg/kg	4.6E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	9.29E+00		9.29E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.06E+02		µg/L	2.1E+02	7.3E+02	N	NO	BSL
Nickel	1.39E+00		µg/L	1.4E+00	7.3E+01	N	NO	BSL
Zinc	2.37E+02	J	µg/L	2.4E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	2.06E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	1.39E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	2.37E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0117 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0117 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0117 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0117 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0117 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	9.3E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	6.8E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.3E+00	mg/kg	1.19E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	9.3E+00	mg/kg	9.98E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	6.8E-09	mg/m <sup>3</sup>	6.55E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	4E-01	--	3E-02	4E-01
			Chemical Total		4E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total							4E-01	

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
Total Skin HI = 4E-01  
Total Vascular HI = 4E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 4E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.3E+00	mg/kg	1.5E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	9.3E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	6.8E-09	mg/m <sup>3</sup>	2.8E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion									0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption									0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.3E+00	mg/kg	4.2E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	9.3E+00	mg/kg	7.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	6.8E-09	mg/m <sup>3</sup>	4.6E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	2E-01
			Chemical Total		1E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
			Soil Total					2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.3E+00	mg/kg	1.6E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	9.3E+00	mg/kg	3.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
Dermal Absorption Route Total								5E-07
Inhalation	Arsenic	6.8E-09	mg/m <sup>3</sup>	5.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								3E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0117 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	3E-09	5E-07	3E-06
			Chemical Total	2E-06	3E-09	5E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.87E+00		mg/kg	7.9E+00	3.9E-01	C	YES ASL
Barium	1.66E+03		mg/kg	1.7E+03	1.5E+03	N	YES ASL
Cadmium	5.35E+00		mg/kg	5.4E+00	7.0E+00	N	NO BSL
Nickel	6.81E+00		mg/kg	6.8E+00	1.5E+02	N	NO BSL
Zinc	8.28E+02		mg/kg	8.3E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.87E+00		7.87E+00	Maximum Detection
Barium	mg/kg	1.66E+03		1.66E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	3.70E+02		µg/L	3.7E+02	7.3E+02	N	NO	BSL
Cadmium	2.14E+00		µg/L	2.1E+00	1.8E+00	N	YES	ASL
Nickel	2.08E+00		µg/L	2.1E+00	7.3E+01	N	NO	BSL
Zinc	1.29E+03	J	µg/L	1.3E+03	1.1E+03	N	YES	ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Cadmium	mg/L	2.14E-03		2.14E-03	Maximum Detection
Zinc	mg/L	1.29E+00		1.29E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0120 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0120 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0120 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0120 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0120 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.9E+00
Barium	1.7E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.8E-09
Barium	No	1.2E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.9E+00	mg/kg	1.01E-04	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Barium	1.7E+03	mg/kg	2.1E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	7.9E+00	mg/kg	8.45E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Barium	1.7E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.8E-09	mg/m <sup>3</sup>	5.55E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
	Barium	1.2E-06	mg/m <sup>3</sup>	1.2E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								3E-03
Total of Receptor Hazards Across All Media								5E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	2.1E-03	mg/L	1.4E-04	mg/kg-day	1.0E-03	mg/kg-day	0.1
	Zinc	1.3E+00	mg/L	8.2E-02	mg/kg-day	3.0E-01	mg/kg-day	0.3
Ingestion Route Total								0.4
Dermal Absorption	Cadmium	2.1E-03	mg/L	9.0E-07	mg/kg-day	2.5E-05	mg/kg-day	0.04
	Zinc	1.3E+00	mg/L	3.3E-04	mg/kg-day	3.0E-01	mg/kg-day	0.001
Dermal Absorption Route Total								0.04
Total of Receptor Hazards Across All Media								0.4

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01	
			Barium		1E-01	--	0E+00	1E-01	
			Chemical Total	4E-01	--	3E-02	5E-01		
	Exposure Medium Total								5E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04	
			Barium		--	2E-03	--	2E-03	
			Chemical Total	--	3E-03	--	3E-03		
	Exposure Medium Total								3E-03
	Soil Total								5E-01
	Groundwater	Groundwater	Potable Well	Cadmium	Kidneys Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	1E-01	--	4E-02	2E-01
Zinc				3E-01		--	1E-03	3E-01	
Chemical Total				4E-01	--	4E-02	4E-01		
Groundwater Total								4E-01	

Total Hazard Across All Media = 9E-01

Total Neurological/Nervous System HI = 4E-04  
Total Skin HI = 4E-01  
Total Vascular HI = 4E-01  
Total Kidneys HI = 3E-01  
Total Development HI = 4E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 3E-01  
Total Fetotoxicity = 2E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.9E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Barium	1.7E+03	mg/kg	2.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.9E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	1.7E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.8E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Barium	1.2E-06	mg/m <sup>3</sup>	5.0E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Barium	NV	NV	NV	0E+00
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				
Soil Total							2E-05
Groundwater	Groundwater	Potable Well	Cadmium	NV	--	NV	0E+00
			Zinc	NV	--	NV	0E+00
			Chemical Total	0.E+00	--	0.E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.9E+00	mg/kg	3.5E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Barium	1.7E+03	mg/kg	7.4E-03	mg/kg-day	2.0E-01	mg/kg-day	4E-02
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	7.9E+00	mg/kg	5.9E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Barium	1.7E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.8E-09	mg/m <sup>3</sup>	3.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Barium	1.2E-06	mg/m <sup>3</sup>	8.2E-07	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								2E-03
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	2.1E-03	mg/L	1.3E-05	mg/kg-day	1.0E-03	mg/kg-day	0.01
	Zinc	1.3E+00	mg/L	7.7E-03	mg/kg-day	3.0E-01	mg/kg-day	0.03
Ingestion Route Total								0.04
Dermal Absorption	Cadmium	2.1E-03	mg/L	7.0E-08	mg/kg-day	2.5E-05	mg/kg-day	0.003
	Zinc	1.3E+00	mg/L	2.5E-05	mg/kg-day	3.0E-01	mg/kg-day	0.00008
Dermal Absorption Route Total								0.003
Total of Receptor Hazards Across All Media								0.04

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01	
			Barium		4E-02	--	0E+00	4E-02	
			Chemical Total		2E-01	--	2E-02	2E-01	
	Exposure Medium Total								2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04	
			Barium		--	2E-03	--	2E-03	
			Chemical Total		--	2E-03	--	2E-03	
	Exposure Medium Total								2E-03
	Soil Total								2E-01
	Groundwater	Groundwater	Potable Well	Cadmium	Kidneys Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	1E-02	--	3E-03	2E-02
Zinc				3E-02		--	8E-05	3E-02	
Chemical Total				4E-02		--	3E-03	4E-02	
Groundwater Total								4E-02	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 5E-02  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 3E-02  
Total Fetotoxicity = 2E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.9E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	1.7E+03	mg/kg	2.9E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.9E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
	Barium	1.7E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.8E-09	mg/m <sup>3</sup>	5.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Barium	1.2E-06	mg/m <sup>3</sup>	1.1E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0120 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Barium	NV	NV	NV	0E+00
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	
Groundwater	Groundwater	Potable Well	Cadmium	NV	--	NV	0E+00
			Zinc	NV	--	NV	0E+00
			Chemical Total	0.E+00	--	0.E+00	0E+00
Groundwater Total						0E+00	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	9.47E+00		mg/kg	9.5E+00	3.9E-01	C	YES ASL
Barium	1.87E+02		mg/kg	1.9E+02	1.5E+03	N	NO BSL
Cadmium	1.28E+00		mg/kg	1.3E+00	7.0E+00	N	NO BSL
Nickel	8.83E+00		mg/kg	8.8E+00	1.5E+02	N	NO BSL
Zinc	2.84E+02		mg/kg	2.8E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	9.47E+00		9.47E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	3.45E+02		µg/L	3.5E+02	7.3E+02	N	NO	BSL
Nickel	1.78E+00		µg/L	1.8E+00	7.3E+01	N	NO	BSL
Zinc	4.39E+02	J	µg/L	4.4E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	3.45E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	1.78E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	4.39E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Soil
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0121 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0121 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0121 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0121 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0121 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	9.5E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	7.0E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.5E+00	mg/kg	1.21E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	9.5E+00	mg/kg	1.02E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	7.0E-09	mg/m <sup>3</sup>	6.68E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	4E-01	--	3E-02	4E-01
			Chemical Total		4E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
			Soil Total					4E-01

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
 Total Skin HI = 4E-01  
 Total Vascular HI = 4E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 4E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.5E+00	mg/kg	1.5E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	9.5E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	7.0E-09	mg/m <sup>3</sup>	2.9E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.5E+00	mg/kg	4.2E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	9.5E+00	mg/kg	7.1E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	7.0E-09	mg/m <sup>3</sup>	4.7E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	2E-01
			Chemical Total		1E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
			Soil Total					2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.5E+00	mg/kg	1.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	9.5E+00	mg/kg	3.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
Dermal Absorption Route Total								5E-07
Inhalation	Arsenic	7.0E-09	mg/m <sup>3</sup>	6.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								3E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0121 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	3E-09	5E-07	3E-06
			Chemical Total	2E-06	3E-09	5E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.51E+00		mg/kg	6.5E+00	3.9E-01	C	YES ASL
Barium	9.28E+01		mg/kg	9.3E+01	1.5E+03	N	NO BSL
Nickel	8.33E+00		mg/kg	8.3E+00	1.5E+02	N	NO BSL
Zinc	3.13E+01		mg/kg	3.1E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.51E+00		6.51E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.14E+02		µg/L	2.1E+02	7.3E+02	N	NO	BSL
Cadmium	1.51E+00		µg/L	1.5E+00	1.8E+00	N	NO	BSL
Nickel	1.73E+00		µg/L	1.7E+00	7.3E+01	N	NO	BSL
Zinc	1.36E+03		µg/L	1.4E+03	1.1E+03	N	YES	ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Zinc	mg/L	1.36E+00		1.36E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0126 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0126 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0126 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0126 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0126 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.5E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.8E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.5E+00	mg/kg	8.32E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.5E+00	mg/kg	6.99E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.8E-09	mg/m <sup>3</sup>	4.59E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Zinc	1.4E+00	mg/L	8.7E-02	mg/kg-day	3.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Zinc	1.4E+00	mg/L	3.4E-04	mg/kg-day	3.0E-01	mg/kg-day	1E-03
Dermal Absorption Route Total								1E-03
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	
Groundwater	Groundwater	Potable Well	Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3E-01	--	1E-03	3E-01
			Chemical Total		3E-01	--	1E-03	3E-01
			Groundwater Total					3E-01

Total Hazard Across All Media = 6E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	3E-01
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.5E+00	mg/kg	1.0E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	6.5E+00	mg/kg	9.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.8E-09	mg/m <sup>3</sup>	2.0E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Zinc	1.4E+00	mg/L	2.0E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Zinc	1.4E+00	mg/L	7.0E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-05	8E-09	1E-06	2E-05	
			Chemical Total	2E-05	8E-09	1E-06	2E-05	
			Exposure Medium Total					2E-05
			Soil Total					2E-05
Groundwater	Groundwater	Potable Well	Zinc	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.5E+00	mg/kg	2.9E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	6.5E+00	mg/kg	4.9E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.8E-09	mg/m <sup>3</sup>	3.2E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Zinc	1.4E+00	mg/L	8.1E-03	mg/kg-day	3.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Zinc	1.4E+00	mg/L	2.7E-05	mg/kg-day	3.0E-01	mg/kg-day	9E-05
Dermal Absorption Route Total								9E-05
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							1E-01	
Groundwater	Groundwater	Potable Well	Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3E-02	--	9E-05	3E-02
			Chemical Total		3E-02	--	9E-05	3E-02
			Groundwater Total					3E-02

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	3E-02
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.5E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.5E+00	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.8E-09	mg/m <sup>3</sup>	4.1E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Zinc	1.4E+00	mg/L	2.5E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Zinc	1.4E+00	mg/L	5.8E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0126 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06	
			Chemical Total	2E-06	2E-09	3E-07	2E-06	
			Exposure Medium Total					2E-06
			Soil Total					2E-06
Groundwater	Groundwater	Potable Well	Zinc	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	6.20E+00		mg/kg	6.2E+00	3.9E-01	C	YES	ASL
Barium	3.39E+02		mg/kg	3.4E+02	1.5E+03	N	NO	BSL
Nickel	1.25E+01		mg/kg	1.3E+01	1.5E+02	N	NO	BSL
Zinc	6.72E+01		mg/kg	6.7E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.20E+00		6.20E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.83E+01		µg/L	8.8E+01	7.3E+02	N	NO	BSL
Zinc	8.65E+01	J	µg/L	8.7E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	8.83E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	8.65E-02		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0127 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0127 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0127 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0127 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0127 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.2E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.6E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	7.93E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.2E+00	mg/kg	6.66E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	4.37E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	9.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.2E+00	mg/kg	9.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	1.9E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	6.2E+00	mg/kg	4.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	2E-02	1E-01
			Chemical Total		9E-02	--	2E-02	1E-01
	Exposure Medium Total							1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
	Exposure Medium Total							2E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.2E+00	mg/kg	2.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	3.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0127 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	9.43E+00		mg/kg	9.4E+00	3.9E-01	C	YES ASL
Barium	6.25E+03		mg/kg	6.3E+03	1.5E+03	N	YES ASL
Nickel	9.95E+00		mg/kg	1.0E+01	1.5E+02	N	NO BSL
Zinc	2.25E+02		mg/kg	2.3E+02	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	9.43E+00		9.43E+00	Maximum Detection
Barium	mg/kg	6.25E+03		6.25E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	9.01E+02		µg/L	9.0E+02	7.3E+02	N	YES	ASL
Zinc	9.81E+01		µg/L	9.8E+01	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	9.01E-01		9.01E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IRage-adj x EF / AT-C  IRage-adj = (EDc x IRc/BWc) + (EDa x IRa/BWa)
	IRage-adj	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent - c	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	tevent - a	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0128 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0128 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0128 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0128 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0128 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	9.4E+00
Barium	6.3E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	6.9E-09
Barium	No	4.6E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.4E+00	mg/kg	1.21E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
	Barium	6.3E+03	mg/kg	8.0E-02	mg/kg-day	2.0E-01	mg/kg-day	4E-01
Ingestion Route Total								8E-01
Dermal Absorption	Arsenic	9.4E+00	mg/kg	1.01E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Barium	6.3E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	6.9E-09	mg/m <sup>3</sup>	6.65E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
	Barium	4.6E-06	mg/m <sup>3</sup>	4.4E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	9E-03
Inhalation Route Total								9E-03
Total of Receptor Hazards Across All Media								8E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	9.0E-01	mg/L	5.8E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	9.0E-01	mg/L	3.8E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	4E-01	--	3E-02	4E-01
			Barium		4E-01	--	0E+00	4E-01
			Chemical Total	8E-01	--	3E-02	8E-01	
	Exposure Medium Total							8E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Barium		--	9E-03	--	9E-03
			Chemical Total	--	9E-03	--	9E-03	
	Exposure Medium Total							9E-03
	Soil Total							8E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02
Chemical Total				3E-01	--	3E-02	3E-01	
Groundwater Total							3E-01	

Total Hazard Across All Media = 1E+00

Total Neurological/Nervous System HI =	4E-04
Total Skin HI =	4E-01
Total Vascular HI =	4E-01
Total Kidneys HI =	7E-01
Total Development HI =	4E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	9E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.4E+00	mg/kg	1.5E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Barium	6.3E+03	mg/kg	9.8E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	9.4E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	6.3E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	6.9E-09	mg/m <sup>3</sup>	2.8E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Barium	4.6E-06	mg/m <sup>3</sup>	1.9E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	9.0E-01	mg/L	1.3E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	9.0E-01	mg/L	7.7E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Barium	NV	NV	NV	0E+00
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total							2E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.4E+00	mg/kg	4.2E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Barium	6.3E+03	mg/kg	2.8E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	9.4E+00	mg/kg	7.1E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Barium	6.3E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	6.9E-09	mg/m <sup>3</sup>	4.7E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Barium	4.6E-06	mg/m <sup>3</sup>	3.1E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	6E-03
Inhalation Route Total								6E-03
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	9.0E-01	mg/L	5.4E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	9.0E-01	mg/L	2.9E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	2E-01	
			Barium		1E-01	--	0E+00	1E-01	
			Chemical Total	3E-01	--	2E-02	3E-01		
	Exposure Medium Total							3E-01	
	Air	Volatile and Fugitive Dust Emissions		Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
				Barium		--	6E-03	--	6E-03
				Chemical Total	--	6E-03	--	6E-03	
				Exposure Medium Total					
	Soil Total							3E-01	
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03	3E-02
Chemical Total				3E-02	--	2E-03	3E-02		
Groundwater Total							3E-02		

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	2E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	6E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.4E+00	mg/kg	1.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	6.3E+03	mg/kg	1.1E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	9.4E+00	mg/kg	3.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
	Barium	6.3E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								5E-07
Inhalation	Arsenic	6.9E-09	mg/m <sup>3</sup>	6.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
	Barium	4.6E-06	mg/m <sup>3</sup>	4.0E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								3E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	9.0E-01	mg/L	1.7E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	9.0E-01	mg/L	6.4E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0128 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	3E-09	5E-07	3E-06
			Barium	NV	NV	NV	0E+00
			Chemical Total	2E-06	3E-09	5E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total							3E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.20E+00		mg/kg	5.2E+00	3.9E-01	C	YES ASL
Barium	1.06E+02		mg/kg	1.1E+02	1.5E+03	N	NO BSL
Nickel	8.67E+00		mg/kg	8.7E+00	1.5E+02	N	NO BSL
Zinc	4.14E+01		mg/kg	4.1E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.20E+00		5.20E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0133 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0133 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0133 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0133 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0133 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.2E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.8E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.2E+00	mg/kg	6.65E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	5.2E+00	mg/kg	5.58E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.8E-09	mg/m <sup>3</sup>	3.67E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
	Exposure Medium Total							2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
	Exposure Medium Total							2E-04
Soil Total							2E-01	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 2E-04  
 Total Skin HI = 2E-01  
 Total Vascular HI = 2E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 2E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.2E+00	mg/kg	8.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.2E+00	mg/kg	7.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	3.8E-09	mg/m <sup>3</sup>	1.6E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
Inhalation Route Total								7E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	7E-09	1E-06	1E-05
			Chemical Total	1E-05	7E-09	1E-06	1E-05
			Exposure Medium Total				1E-05
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.2E+00	mg/kg	2.3E-05	mg/kg-day	3.0E-04	mg/kg-day	8E-02
Ingestion Route Total								8E-02
Dermal Absorption	Arsenic	5.2E+00	mg/kg	3.9E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.8E-09	mg/m <sup>3</sup>	2.6E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								9E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	8E-02	--	1E-02	9E-02
			Chemical Total		8E-02	--	1E-02	9E-02
			Exposure Medium Total					9E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					9E-02

Total Hazard Across All Media = 9E-02

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	9E-02
Total Vascular HI =	9E-02
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.2E+00	mg/kg	9.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	5.2E+00	mg/kg	1.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	3.8E-09	mg/m <sup>3</sup>	3.3E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0133 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	3E-07	2E-06
			Chemical Total	1E-06	1E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.99E+00		mg/kg	8.0E+00	3.9E-01	C	YES ASL
Barium	1.82E+02		mg/kg	1.8E+02	1.5E+03	N	NO BSL
Cadmium	1.68E+00		mg/kg	1.7E+00	7.0E+00	N	NO BSL
Nickel	1.49E+01		mg/kg	1.5E+01	1.5E+02	N	NO BSL
Zinc	7.20E+01		mg/kg	7.2E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.99E+00		7.99E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0134 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0134 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0134 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0134 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0134 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	8.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.9E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.02E-04	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	8.0E+00	mg/kg	8.58E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	5.63E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
			Soil Total					4E-01

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
Total Skin HI = 4E-01  
Total Vascular HI = 4E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 4E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.3E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	8.0E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	3.6E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	8.0E+00	mg/kg	6.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	3.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.0E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	8.0E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.9E-09	mg/m <sup>3</sup>	5.1E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								3E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0134 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	3E-06
			Chemical Total	2E-06	2E-09	4E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	9.09E+00		mg/kg	9.1E+00	3.9E-01	C	YES ASL
Barium	6.34E+02		mg/kg	6.3E+02	1.5E+03	N	NO BSL
Cadmium	1.79E+00		mg/kg	1.8E+00	7.0E+00	N	NO BSL
Nickel	1.36E+01		mg/kg	1.4E+01	1.5E+02	N	NO BSL
Zinc	6.46E+01		mg/kg	6.5E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	9.09E+00		9.09E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Zinc	8.83E+00		µg/L	8.8E+00	1.1E+03	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	8.83E-03		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0136 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0136 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0136 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0136 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0136 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	9.1E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	6.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.1E+00	mg/kg	1.16E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	9.1E+00	mg/kg	9.76E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	6.7E-09	mg/m <sup>3</sup>	6.41E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	4E-01	--	3E-02	4E-01
			Chemical Total		4E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total							4E-01	

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
 Total Skin HI = 4E-01  
 Total Vascular HI = 4E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 4E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.1E+00	mg/kg	1.4E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	9.1E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	6.7E-09	mg/m <sup>3</sup>	2.7E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.1E+00	mg/kg	4.1E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	9.1E+00	mg/kg	6.8E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	6.7E-09	mg/m <sup>3</sup>	4.5E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	2E-01
			Chemical Total		1E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
			Soil Total					2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.1E+00	mg/kg	1.6E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	9.1E+00	mg/kg	3.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	6.7E-09	mg/m <sup>3</sup>	5.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								3E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0136 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	3E-06
			Chemical Total	2E-06	2E-09	4E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	YES	NO	Rationale for Selection or Deletion [3]
Arsenic	5.65E+00		mg/kg	5.7E+00	3.9E-01	C	YES		ASL
Barium	2.34E+03		mg/kg	2.3E+03	1.5E+03	N	YES		ASL
Cadmium	2.55E+01		mg/kg	2.6E+01	7.0E+00	N	YES		ASL
Nickel	5.33E+00		mg/kg	5.3E+00	1.5E+02	N	NO		BSL
Zinc	5.01E+03		mg/kg	5.0E+03	2.3E+03	N	YES		ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.65E+00		5.65E+00	Maximum Detection
Barium	mg/kg	2.34E+03		2.34E+03	Maximum Detection
Cadmium	mg/kg	2.55E+01		2.55E+01	Maximum Detection
Zinc	mg/kg	5.01E+03		5.01E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.06E+02	J	µg/L	2.1E+02	7.3E+02	N	NO	BSL
Nickel	3.60E+00	J	µg/L	3.6E+00	7.3E+01	N	NO	BSL
Zinc	1.05E+03	J	µg/L	1.1E+03	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	2.06E-01	J	0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	3.60E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00	J	0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	1.05E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0138 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0138 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0138 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0138 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0138 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.7E+00
Barium	2.3E+03
Beryllium	0.0E+00
Cadmium	2.6E+01
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	5.0E+03

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.2E-09
Barium	No	1.7E-06
Beryllium	No	0.0E+00
Cadmium	No	1.9E-08
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	3.7E-06

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	7.22E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Barium	2.3E+03	mg/kg	3.0E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
	Cadmium	2.6E+01	mg/kg	3.3E-04	mg/kg-day	1.0E-03	mg/kg-day	3E-01
	Zinc	5.0E+03	mg/kg	6.4E-02	mg/kg-day	3.0E-01	mg/kg-day	2E-01
<b>Ingestion Route Total</b>								<b>9E-01</b>
Dermal Absorption	Arsenic	5.7E+00	mg/kg	6.07E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Barium	2.3E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
	Cadmium	2.6E+01	mg/kg	9.1E-07	mg/kg-day	2.5E-05	mg/kg-day	4E-02
	Zinc	5.0E+03	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0E+00
<b>Dermal Absorption Route Total</b>								<b>6E-02</b>
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	3.98E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Barium	1.7E-06	mg/m <sup>3</sup>	1.6E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	3E-03
	Cadmium	1.9E-08	mg/m <sup>3</sup>	1.8E-08	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	9E-04
	Zinc	3.7E-06	mg/m <sup>3</sup>	3.5E-06	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
<b>Inhalation Route Total</b>								<b>4E-03</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>1E+00</b>

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	3E-01
			Barium	Kidneys	1E-01	--	0E+00	1E-01
			Cadmium	Kidneys	3E-01	--	4E-02	4E-01
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	2E-01	--	0E+00	2E-01
			Chemical Total		9E-01	--	6E-02	1E+00
	Exposure Medium Total							
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Barium	Fetotoxicity	--	3E-03	--	3E-03
			Cadmium	Kidneys	--	9E-04	--	9E-04
			Zinc	NA	--	NV	--	0E+00
Chemical Total				--	4E-03	--	4E-03	
Exposure Medium Total								
Soil Total								

Total Hazard Across All Media = 1E+00

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	5E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	2E-01
Total Fetotoxicity =	3E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	8.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
	Barium	2.3E+03	mg/kg	3.7E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	2.6E+01	mg/kg	4.0E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	5.0E+03	mg/kg	7.8E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.7E+00	mg/kg	8.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
	Barium	2.3E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	2.6E+01	mg/kg	1.3E-07	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	5.0E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	1.7E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
	Barium	1.7E-06	mg/m <sup>3</sup>	7.1E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Cadmium	1.9E-08	mg/m <sup>3</sup>	7.7E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Zinc	3.7E-06	mg/m <sup>3</sup>	1.5E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								2E-08
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	7E-09	1E-06	1E-05
			Barium	NV	NV	NV	0E+00
			Cadmium	NV	1E-08	NV	1E-08
			Zinc	NV	NV	NV	0E+00
			Chemical Total	1E-05	2E-08	1E-06	1E-05
Exposure Medium Total						1E-05	
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	2.5E-05	mg/kg-day	3.0E-04	mg/kg-day	8E-02
	Barium	2.3E+03	mg/kg	1.0E-02	mg/kg-day	2.0E-01	mg/kg-day	5E-02
	Cadmium	2.6E+01	mg/kg	1.1E-04	mg/kg-day	1.0E-03	mg/kg-day	1E-01
	Zinc	5.0E+03	mg/kg	2.2E-02	mg/kg-day	3.0E-01	mg/kg-day	7E-02
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	5.7E+00	mg/kg	4.2E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
	Barium	2.3E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
	Cadmium	2.6E+01	mg/kg	6.4E-07	mg/kg-day	2.5E-05	mg/kg-day	3E-02
	Zinc	5.0E+03	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0E+00
Dermal Absorption Route Total								4E-02
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	2.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
	Barium	1.7E-06	mg/m <sup>3</sup>	1.2E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
	Cadmium	1.9E-08	mg/m <sup>3</sup>	1.3E-08	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	6E-04
	Zinc	3.7E-06	mg/m <sup>3</sup>	2.5E-06	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Inhalation Route Total								3E-03
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	8E-02	--	1E-02	1E-01
			Barium	Kidneys	5E-02	--	0E+00	5E-02
			Cadmium	Kidneys	1E-01	--	3E-02	1E-01
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	7E-02	--	0E+00	7E-02
			Chemical Total		3E-01	--	4E-02	4E-01
	Exposure Medium Total							
	Air	Volatile and Fugitive Dust Emissions						
	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04		
	Barium	Fetotoxicity	--	2E-03	--	2E-03		
	Cadmium	Kidneys	--	6E-04	--	6E-04		
Zinc	NA	--	NV	--	0E+00			
Chemical Total		--	3E-03	--	3E-03			
Exposure Medium Total								
Soil Total								
4E-01								

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	2E-01
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	7E-02
Total Fetotoxicity =	2E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	9.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
	Barium	2.3E+03	mg/kg	4.1E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	2.6E+01	mg/kg	4.5E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	5.0E+03	mg/kg	8.8E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	5.7E+00	mg/kg	1.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
	Barium	2.3E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	2.6E+01	mg/kg	2.8E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	5.0E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	3.6E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Barium	1.7E-06	mg/m <sup>3</sup>	1.5E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Cadmium	1.9E-08	mg/m <sup>3</sup>	1.6E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
	Zinc	3.7E-06	mg/m <sup>3</sup>	3.2E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								4E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0138 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	2E-09	3E-07	2E-06
			Barium	NV	NV	NV	0E+00
			Cadmium	NV	3E-09	NV	3E-09
			Zinc	NV	NV	NV	0E+00
			Chemical Total	1E-06	4E-09	3E-07	2E-06
Exposure Medium Total						2E-06	
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	4.40E+00		mg/kg	4.4E+00	3.9E-01	C	YES	ASL
Barium	5.30E+03		mg/kg	5.3E+03	1.5E+03	N	YES	ASL
Zinc	7.71E+01		mg/kg	7.7E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	4.40E+00		4.40E+00	Maximum Detection
Barium	mg/kg	5.30E+03		5.30E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.09E+02		µg/L	1.1E+02	7.3E+02	N	NO	BSL
Nickel	2.73E+00		µg/L	2.7E+00	7.3E+01	N	NO	BSL
Zinc	2.92E+02		µg/L	2.9E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	1.09E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	2.73E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	2.92E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Child Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0139 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0139 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0139 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0139 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0139 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	4.4E+00
Barium	5.3E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.2E-09
Barium	No	3.9E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.4E+00	mg/kg	5.63E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Barium	5.3E+03	mg/kg	6.8E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								5E-01
Dermal Absorption	Arsenic	4.4E+00	mg/kg	4.73E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Barium	5.3E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.2E-09	mg/m <sup>3</sup>	3.10E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
	Barium	3.9E-06	mg/m <sup>3</sup>	3.7E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	7E-03
Inhalation Route Total								8E-03
Total of Receptor Hazards Across All Media								5E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01	
			Barium		3E-01	--	0E+00	3E-01	
			Chemical Total	5E-01	--	2E-02	5E-01		
	Exposure Medium Total								5E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04	
			Barium		--	7E-03	--	7E-03	
			Chemical Total	--	8E-03	--	8E-03		
	Exposure Medium Total								8E-03
	Soil Total								5E-01

Total Hazard Across All Media = 5E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	3E-01
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	7E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.4E+00	mg/kg	6.9E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
	Barium	5.3E+03	mg/kg	8.3E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	4.4E+00	mg/kg	6.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
	Barium	5.3E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	3.2E-09	mg/m <sup>3</sup>	1.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
	Barium	3.9E-06	mg/m <sup>3</sup>	1.6E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								6E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	6E-09	1E-06	1E-05
			Barium	NV	NV	NV	0E+00
			Chemical Total	1E-05	6E-09	1E-06	1E-05
Exposure Medium Total						1E-05	
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.4E+00	mg/kg	2.0E-05	mg/kg-day	3.0E-04	mg/kg-day	7E-02
	Barium	5.3E+03	mg/kg	2.4E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	4.4E+00	mg/kg	3.3E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
	Barium	5.3E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.2E-09	mg/m <sup>3</sup>	2.2E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-04
	Barium	3.9E-06	mg/m <sup>3</sup>	2.6E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	5E-03
Inhalation Route Total								5E-03
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	7E-02	--	1E-02	8E-02	
			Barium		1E-01	--	0E+00	1E-01	
			Chemical Total		2E-01	--	1E-02	2E-01	
	Exposure Medium Total							2E-01	
	Air	Volatile and Fugitive Dust Emissions		Arsenic	Development, vascular, nervous system	--	1E-04	--	1E-04
				Barium		--	5E-03	--	5E-03
				Chemical Total		--	5E-03	--	5E-03
				Exposure Medium Total					
	Soil Total							2E-01	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	1E-04
Total Skin HI =	8E-02
Total Vascular HI =	8E-02
Total Kidneys HI =	1E-01
Total Development HI =	1E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	5E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.4E+00	mg/kg	7.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
	Barium	5.3E+03	mg/kg	9.3E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	4.4E+00	mg/kg	1.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
	Barium	5.3E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	3.2E-09	mg/m <sup>3</sup>	2.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
	Barium	3.9E-06	mg/m <sup>3</sup>	3.4E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								1E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0139 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	2E-07	1E-06
			Barium	NV	NV	NV	0E+00
			Chemical Total	1E-06	1E-09	2E-07	1E-06
Exposure Medium Total						1E-06	
Soil Total						1E-06	

Total risks across all exposure routes and media = 1E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.83E+02		mg/kg	1.8E+02	1.5E+03	N	NO	BSL
Nickel	3.60E+00		mg/kg	3.6E+00	1.5E+02	N	NO	BSL
Zinc	1.44E+02		mg/kg	1.4E+02	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	1.83E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	3.60E+00		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	1.44E+02		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.30E+02		µg/L	2.3E+02	7.3E+02	N	NO	BSL
Nickel	4.85E+00		µg/L	4.9E+00	7.3E+01	N	NO	BSL
Zinc	6.03E+02		µg/L	6.0E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	2.30E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	4.85E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	6.03E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Child Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0142 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0142 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0142 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0142 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0142 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0142 - Jefferson County Mining Site

Scenario: Fimelname: Current/Future Receptor: Population: Resident Receptor Age: Child											
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient							
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total				0.00				
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00			
Barium	Phototoxicity	--				0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00			
Cadmium	Kidneys	--				0.00	--	0.00			
Chromium	Lungs	--				0.00	--	0.00			
Cobalt	Respiratory System	--				0.00	--	0.00			
Copper	NA	--				NV	--	0.00			
Iron	NA	--				NV	--	0.00			
Manganese	Neurological	--				0.00	--	0.00			
Nickel	Respiratory System	--				0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00			
Silver	NA	--				NV	--	0.00			
Thallium	NA	--				NV	--	0.00			
Vanadium	NA	--				NV	--	0.00			
Zinc	NA	--				NV	--	0.00			
Chemical Total						--	0.00	--	0.00		
Exposure Medium Total						0.00					
Soil Total						0.00					
Groundwater	Groundwater	Potable Well				Aluminum	Neurological	0.00	--	0.00	0.00
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Groundwater Total				0.00				
			Total Hazard Across All Media				0.00				
			Total Neurological/Nervous System HI				0.00				
Total Skin HI				0.00							
Total Vascular HI				0.00							
Total Kidneys HI				0.00							
Total Development HI				0.00							
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI				0.00							
Total Blood HI				0.00							
Total Lungs and Respiratory System HI				0.00							
Total Beryllium Sensitization HI				0.00							
Total Hair, Nails, and Teeth HI				0.00							
Total Body and Organ Weights HI				0.00							
Total ESOD HI				0.00							
Total Phototoxicity				0.00							

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
Exposure Medium Total							0.E+00
Soil Total							0.E+00
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
			Chemical Total	0.E+00	--	0.E+00	0.E+00
Groundwater Total							0.E+00

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0142 Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	0.00	--	0.00	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							
				Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--
			Antimony	0	--	NV	--	0.00		
			Arsenic	Development, vascular, nervous system	--	0.00	--	0.00		
			Barium	Phototoxicity	--	0.00	--	0.00		
			Beryllium	Beryllium sensitization (respiratory system)	--	0.00	--	0.00		
			Cadmium	Kidneys	--	0.00	--	0.00		
			Chromium	Lungs	--	0.00	--	0.00		
			Cobalt	Respiratory System	--	0.00	--	0.00		
			Copper	NA	--	NV	--	0.00		
			Iron	NA	--	NV	--	0.00		
			Manganese	Neurological	--	0.00	--	0.00		
			Nickel	Respiratory System	--	0.00	--	0.00		
			Selenium	Alimentary system, cardiovascular system, nervous system	--	0.00	--	0.00		
			Silver	NA	--	NV	--	0.00		
			Thallium	NA	--	NV	--	0.00		
			Vanadium	NA	--	NV	--	0.00		
			Zinc	NA	--	NV	--	0.00		
Chemical Total					--	0.00	--	0.00		
Exposure Medium Total										
Soil Total										
0.00										
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	0.00	--	0.00	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Groundwater Total							
			0.00							
Total Hazard Across All Media										
0.00										
Total Neurological/Nervous System HI										
0.00										
Total Skin HI										
0.00										
Total Vascular HI										
0.00										
Total Kidneys HI										
0.00										
Total Development HI										
0.00										
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI										
0.00										
Total Blood HI										
0.00										
Total Lungs and Respiratory System HI										
0.00										
Total Beryllium Sensitization HI										
0.00										
Total Hair, Nails, and Teeth HI										
0.00										
Total Body and Organ Weights HI										
0.00										
Total ESOD HI										
0.00										
Total Phototoxicity										
0.00										

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks				0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks				0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks				0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
Inhalation Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0142 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	4.77E+00		mg/kg	4.8E+00	3.9E-01	C	YES ASL
Barium	1.33E+02		mg/kg	1.3E+02	1.5E+03	N	NO BSL
Nickel	8.84E+00		mg/kg	8.8E+00	1.5E+02	N	NO BSL
Zinc	5.84E+01		mg/kg	5.8E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	4.77E+00		4.77E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0144 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0144 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0144 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0144 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0144 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	4.8E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.5E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.8E+00	mg/kg	6.10E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	4.8E+00	mg/kg	5.12E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.5E-09	mg/m <sup>3</sup>	3.36E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
	Exposure Medium Total							2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
	Exposure Medium Total							2E-04
Soil Total							2E-01	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 2E-01  
Total Vascular HI = 2E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.8E+00	mg/kg	7.5E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	4.8E+00	mg/kg	7.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	3.5E-09	mg/m <sup>3</sup>	1.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
Inhalation Route Total								6E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	6E-09	1E-06	1E-05
			Chemical Total	1E-05	6E-09	1E-06	1E-05
			Exposure Medium Total				1E-05
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.8E+00	mg/kg	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	7E-02
Ingestion Route Total								7E-02
Dermal Absorption	Arsenic	4.8E+00	mg/kg	3.6E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.5E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								8E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	7E-02	--	1E-02	8E-02
			Chemical Total		7E-02	--	1E-02	8E-02
			Exposure Medium Total					8E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					8E-02

Total Hazard Across All Media = 8E-02

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	8E-02
Total Vascular HI =	8E-02
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.8E+00	mg/kg	8.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	4.8E+00	mg/kg	1.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	3.5E-09	mg/m <sup>3</sup>	3.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								1E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0144 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	2E-07	1E-06
			Chemical Total	1E-06	1E-09	2E-07	1E-06
			Exposure Medium Total				
Soil Total						1E-06	

Total risks across all exposure routes and media = 1E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	3.35E+00		mg/kg	3.4E+00	3.9E-01	C	YES ASL
Barium	1.45E+02		mg/kg	1.5E+02	1.5E+03	N	NO BSL
Nickel	8.74E+00		mg/kg	8.7E+00	1.5E+02	N	NO BSL
Zinc	3.95E+01		mg/kg	4.0E+01	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	3.35E+00		3.35E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IRage-adj x EF / AT-C  IRage-adj = (EDc x IRc/BWc) + (EDa x IRa/BWa)
	IRage-adj	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent - c	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	tevent - a	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0146 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0146 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0146 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0146 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0146 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	3.4E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	2.5E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	3.4E+00	mg/kg	4.28E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	3.4E+00	mg/kg	3.60E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	2.5E-09	mg/m <sup>3</sup>	2.36E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	1E-02	2E-01
			Chemical Total		1E-01	--	1E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 2E-04  
 Total Skin HI = 2E-01  
 Total Vascular HI = 2E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 2E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	3.4E+00	mg/kg	5.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	8E-06
Ingestion Route Total								8E-06
Dermal Absorption	Arsenic	3.4E+00	mg/kg	5.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	7E-07
Dermal Absorption Route Total								7E-07
Inhalation	Arsenic	2.5E-09	mg/m <sup>3</sup>	1.0E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	4E-09
Inhalation Route Total								4E-09
Total of Receptor Hazards Across All Media								9E-06



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	8E-06	4E-09	7E-07	9E-06
			Chemical Total	8E-06	4E-09	7E-07	9E-06
			Exposure Medium Total				9E-06
Soil Total						9E-06	

Total risks across all exposure routes and media = 9E-06

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	3.4E+00	mg/kg	1.5E-05	mg/kg-day	3.0E-04	mg/kg-day	5E-02
Ingestion Route Total								5E-02
Dermal Absorption	Arsenic	3.4E+00	mg/kg	2.5E-06	mg/kg-day	3.0E-04	mg/kg-day	8E-03
Dermal Absorption Route Total								8E-03
Inhalation	Arsenic	2.5E-09	mg/m <sup>3</sup>	1.7E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-04
Inhalation Route Total								1E-04
Total of Receptor Hazards Across All Media								6E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	5E-02	--	8E-03	6E-02
			Chemical Total		5E-02	--	8E-03	6E-02
			Exposure Medium Total					6E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-04	--	1E-04
			Chemical Total		--	1E-04	--	1E-04
			Exposure Medium Total					1E-04
			Soil Total					6E-02

Total Hazard Across All Media = 6E-02

Total Neurological/Nervous System HI =	1E-04
Total Skin HI =	6E-02
Total Vascular HI =	6E-02
Total Kidneys HI =	0E+00
Total Development HI =	1E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	3.4E+00	mg/kg	5.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	9E-07
Ingestion Route Total								9E-07
Dermal Absorption	Arsenic	3.4E+00	mg/kg	1.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	2.5E-09	mg/m <sup>3</sup>	2.1E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-10
Inhalation Route Total								9E-10
Total of Receptor Hazards Across All Media								1E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0146 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	9E-07	9E-10	2E-07	1E-06
			Chemical Total	9E-07	9E-10	2E-07	1E-06
			Exposure Medium Total				1E-06
Soil Total						1E-06	

Total risks across all exposure routes and media = 1E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.23E+00		mg/kg	7.2E+00	3.9E-01	C	YES ASL
Barium	4.26E+03		mg/kg	4.3E+03	1.5E+03	N	YES ASL
Nickel	1.27E+01		mg/kg	1.3E+01	1.5E+02	N	NO BSL
Zinc	1.22E+03		mg/kg	1.2E+03	2.3E+03	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.23E+00		7.23E+00	Maximum Detection
Barium	mg/kg	4.26E+03		4.26E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0149 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0149 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0149 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0149 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0149 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.2E+00
Barium	4.3E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.3E-09
Barium	No	3.1E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.2E+00	mg/kg	9.24E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Barium	4.3E+03	mg/kg	5.4E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								6E-01
Dermal Absorption	Arsenic	7.2E+00	mg/kg	7.76E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Barium	4.3E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	5.10E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Barium	3.1E-06	mg/m <sup>3</sup>	3.0E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	6E-03
Inhalation Route Total								6E-03
Total of Receptor Hazards Across All Media								6E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	3E-01	
			Barium		3E-01	--	0E+00	3E-01	
			Chemical Total	6E-01	--	3E-02	6E-01		
	Exposure Medium Total							6E-01	
	Air	Volatile and Fugitive Dust Emissions		Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
				Barium		--	6E-03	--	6E-03
				Chemical Total	--	6E-03	--	6E-03	
				Exposure Medium Total					
	Soil Total							6E-01	

Total Hazard Across All Media = 6E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	3E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	6E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.2E+00	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Barium	4.3E+03	mg/kg	6.7E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.2E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	4.3E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	2.2E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
	Barium	3.1E-06	mg/m <sup>3</sup>	1.3E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								9E-09
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	9E-09	2E-06	2E-05
			Barium	NV	NV	NV	0E+00
			Chemical Total	2E-05	9E-09	2E-06	2E-05
Exposure Medium Total						2E-05	
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.2E+00	mg/kg	3.2E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Barium	4.3E+03	mg/kg	1.9E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	7.2E+00	mg/kg	5.4E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Barium	4.3E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	3.6E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
	Barium	3.1E-06	mg/m <sup>3</sup>	2.1E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	4E-03
Inhalation Route Total								4E-03
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Barium		1E-01	--	0E+00	1E-01
			Chemical Total	2E-01	--	2E-02	2E-01	
	Exposure Medium Total							2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Barium		--	4E-03	--	4E-03
			Chemical Total	--	4E-03	--	4E-03	
	Exposure Medium Total							4E-03
	Soil Total							2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 1E-01  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 4E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.2E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	4.3E+03	mg/kg	7.5E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.2E+00	mg/kg	2.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
	Barium	4.3E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	4.6E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Barium	3.1E-06	mg/m <sup>3</sup>	2.7E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0149 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Barium	NV	NV	NV	0E+00
			Chemical Total	2E-06	2E-09	4E-07	2E-06
Exposure Medium Total						2E-06	
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.14E+00		mg/kg	7.1E+00	3.9E-01	C	YES ASL
Barium	1.13E+02		mg/kg	1.1E+02	1.5E+03	N	NO BSL
Cadmium	8.68E+00		mg/kg	8.7E+00	7.0E+00	N	YES ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.14E+00		7.14E+00	Maximum Detection
Cadmium	mg/kg	8.68E+00		8.68E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.01E+03		µg/L	1.0E+03	7.3E+02	N	YES

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.01E+00		1.01E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0156 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0156 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0156 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0156 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0156 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.1E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	8.7E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	6.4E-09
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.1E+00	mg/kg	9.13E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Cadmium	8.7E+00	mg/kg	1.1E-04	mg/kg-day	1.0E-03	mg/kg-day	1E-01
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	7.1E+00	mg/kg	7.67E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Cadmium	8.7E+00	mg/kg	3.1E-07	mg/kg-day	2.5E-05	mg/kg-day	1E-02
Dermal Absorption Route Total								4E-02
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	5.03E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Cadmium	6.4E-09	mg/m <sup>3</sup>	6.1E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								6E-04
Total of Receptor Hazards Across All Media								5E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	6.5E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	1.0E+00	mg/L	4.3E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Residen  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0.30	--	0.03	3E-01
			Cadmium		0.11	--	0.01	1E-01
			Chemical Total	0.42	--	0.04	5E-01	
	Exposure Medium Total							5E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0.00	--	3E-04
			Cadmium		--	0.00	--	3E-04
			Chemical Total	--	0.00	--	6E-04	
	Exposure Medium Total							6E-04
	Soil Total							5E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	0.32	--	0.03
Chemical Total				0.32		--	0.03	4E-01
Groundwater Total							4E-01	

Total Hazard Across All Media = 8E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	5E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.1E+00	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Cadmium	8.7E+00	mg/kg	1.4E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.1E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Cadmium	8.7E+00	mg/kg	4.3E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	2.2E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
	Cadmium	6.4E-09	mg/m <sup>3</sup>	2.6E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	5E-09
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 - 2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	1.5E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.0E+00	mg/L	8.6E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	9E-09	2E-06	2E-05
			Cadmium	NV	5E-09	NV	5E-09
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total							2E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.1E+00	mg/kg	3.2E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Cadmium	8.7E+00	mg/kg	3.9E-05	mg/kg-day	1.0E-03	mg/kg-day	4E-02
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.1E+00	mg/kg	5.4E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Cadmium	8.7E+00	mg/kg	2.2E-07	mg/kg-day	2.5E-05	mg/kg-day	9E-03
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	3.5E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
	Cadmium	6.4E-09	mg/m <sup>3</sup>	4.3E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	6.0E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	1.0E+00	mg/L	3.3E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Cadmium		4E-02	--	9E-03	
			Chemical Total	1E-01	--	3E-02	2E-01	
	Exposure Medium Total							2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Cadmium		--	2E-04	--	2E-04
			Chemical Total	--	4E-04	--	4E-04	
	Exposure Medium Total							4E-04
	Soil Total							2E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03
Chemical Total				3E-02		--	2E-03	3E-02
Groundwater Total							3E-02	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	8E-02
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.1E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Cadmium	8.7E+00	mg/kg	1.5E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.1E+00	mg/kg	2.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
	Cadmium	8.7E+00	mg/kg	9.5E-09	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	4.5E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Cadmium	6.4E-09	mg/m <sup>3</sup>	5.5E-10	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	1.9E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.0E+00	mg/L	7.2E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0156 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Cadmium	NV	1E-09	NV	1E-09
			Chemical Total	2E-06	3E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total							2E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.04E+00		mg/kg	5.0E+00	3.9E-01	C	YES ASL
Barium	1.10E+02		mg/kg	1.1E+02	1.5E+03	N	NO BSL
Cadmium	6.99E-01		mg/kg	7.0E-01	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.04E+00		5.04E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0161 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0161 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0161 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0161 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0161 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.0E+00	mg/kg	6.44E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	5.0E+00	mg/kg	5.41E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.7E-09	mg/m <sup>3</sup>	3.55E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
	Exposure Medium Total							2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
	Exposure Medium Total							2E-04
Soil Total							2E-01	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 2E-04  
 Total Skin HI = 2E-01  
 Total Vascular HI = 2E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 2E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.0E+00	mg/kg	7.9E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.0E+00	mg/kg	7.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	3.7E-09	mg/m <sup>3</sup>	1.5E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
Inhalation Route Total								7E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	7E-09	1E-06	1E-05
			Chemical Total	1E-05	7E-09	1E-06	1E-05
			Exposure Medium Total				1E-05
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.0E+00	mg/kg	2.3E-05	mg/kg-day	3.0E-04	mg/kg-day	8E-02
Ingestion Route Total								8E-02
Dermal Absorption	Arsenic	5.0E+00	mg/kg	3.8E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.7E-09	mg/m <sup>3</sup>	2.5E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								9E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	8E-02	--	1E-02	9E-02
			Chemical Total		8E-02	--	1E-02	9E-02
			Exposure Medium Total					9E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							9E-02	

Total Hazard Across All Media = 9E-02

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	9E-02
Total Vascular HI =	9E-02
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.0E+00	mg/kg	8.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	5.0E+00	mg/kg	1.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	3.7E-09	mg/m <sup>3</sup>	3.2E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								2E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										0.0E+00
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0161 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	2E-07	2E-06
			Chemical Total	1E-06	1E-09	2E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum	1.18E+04		mg/kg	1.2E+04	7.7E+03	N	YES	ASL
Arsenic	8.50E+00		mg/kg	8.5E+00	3.9E-01	C	YES	ASL
Barium	1.52E+02		mg/kg	1.5E+02	1.5E+03	N	NO	BSL
Beryllium	5.70E-01		mg/kg	5.7E-01	1.6E+01	N	NO	BSL
Calcium	5.31E+04		mg/kg	5.3E+04	NA		NO	NUT
Chromium	1.66E+01		mg/kg	1.7E+01	2.9E-01	C	YES	ASL
Cobalt	2.23E+01		mg/kg	2.2E+01	2.3E+00	N	YES	ASL
Copper	1.42E+01		mg/kg	1.4E+01	3.1E+02	N	NO	BSL
Iron	1.83E+04		mg/kg	1.8E+04	5.5E+03	N	YES	ASL
Magnesium	5.55E+03		mg/kg	5.6E+03	NA		NO	NUT
Manganese	8.10E+02		mg/kg	8.1E+02	1.8E+02	N	YES	ASL
Nickel	1.32E+01		mg/kg	1.3E+01	1.5E+02	N	NO	BSL
Potassium	8.41E+02		mg/kg	8.4E+02	NA		NO	NUT
Vanadium	3.09E+01		mg/kg	3.1E+01	3.9E+01	N	NO	BSL
Zinc	4.67E+01		mg/kg	4.7E+01	2.3E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	1.18E+04		1.18E+04	Maximum Detection
Arsenic	mg/kg	8.50E+00		8.50E+00	Maximum Detection
Chromium	mg/kg	1.66E+01		1.66E+01	Maximum Detection
Cobalt	mg/kg	2.23E+01		2.23E+01	Maximum Detection
Iron	mg/kg	1.83E+04		1.83E+04	Maximum Detection
Manganese	mg/kg	8.10E+02		8.10E+02	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	7.94E+01		µg/L	7.9E+01	7.3E+02	N	NO	BSL
Copper	3.40E+01		µg/L	3.4E+01	1.5E+02	N	NO	BSL
Manganese	3.80E+00		µg/L	3.8E+00	8.8E+01	N	NO	BSL
Nickel	1.80E+00		µg/L	1.8E+00	7.3E+01	N	NO	BSL
Zinc	3.27E+02		µg/L	3.3E+02	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	7.94E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	3.40E-02		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	3.80E-03		0.00E+00	Not a COPC
Nickel	mg/L	1.80E-03		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	3.27E-01		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SA <sub>c</sub> x ED <sub>c</sub> x EF/(BW <sub>c</sub> x AT-C) + Deventa x SA <sub>a</sub> x ED <sub>a</sub> x EF/(BW <sub>a</sub> x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0165 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0165 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0165 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0165 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0165 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	1.2E+04
Antimony	0.0E+00
Arsenic	8.5E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	1.7E+01
Cobalt	2.2E+01
Copper	0.0E+00
Iron	1.8E+04
Manganese	8.1E+02
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	8.7E-06
Antimony	No	0.0E+00
Arsenic	No	6.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	1.2E-08
Cobalt	No	1.6E-08
Copper	No	0.0E+00
Iron	No	1.3E-05
Manganese	No	6.0E-07
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	1.2E+04	mg/kg	1.5E-01	mg/kg-day	1.0E+00	mg/kg-day	2E-01
	Arsenic	8.5E+00	mg/kg	1.09E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
	Chromium	1.7E+01	mg/kg	2.1E-04	mg/kg-day	3.0E-03	mg/kg-day	7E-02
	Cobalt	2.2E+01	mg/kg	2.9E-04	mg/kg-day	3.0E-04	mg/kg-day	1E+00
	Iron	1.8E+04	mg/kg	2.3E-01	mg/kg-day	7.0E-01	mg/kg-day	3E-01
	Manganese	8.1E+02	mg/kg	1.0E-02	mg/kg-day	2.3E-02	mg/kg-day	4E-01
Ingestion Route Total								2E+00
Dermal Absorption	Aluminum	1.2E+04	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Arsenic	8.5E+00	mg/kg	9.13E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Chromium	1.7E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	2.2E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	1.8E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	8.1E+02	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Aluminum	8.7E-06	mg/m <sup>3</sup>	8.3E-06	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	2E-03
	Arsenic	6.3E-09	mg/m <sup>3</sup>	5.99E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
	Chromium	1.2E-08	mg/m <sup>3</sup>	1.2E-08	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	1E-04
	Cobalt	1.6E-08	mg/m <sup>3</sup>	1.6E-08	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	3E-03
	Iron	1.3E-05	mg/m <sup>3</sup>	1.3E-05	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	6.0E-07	mg/m <sup>3</sup>	5.7E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	1E-02
Inhalation Route Total								2E-02
Total of Receptor Hazards Across All Media								2E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Aluminum	Neurological	2E-01	--	0E+00	2E-01
			Arsenic	Skin/Vascular	4E-01	--	3E-02	4E-01
			Chromium	None Reported	7E-02	--	0E+00	7E-02
			Cobalt	Blood	1E+00	--	0E+00	1E+00
			Iron	Gastrointestinal Tract	3E-01	--	0E+00	3E-01
			Manganese	Neurological	4E-01	--	0E+00	4E-01
			Chemical Total		2E+00	--	3E-02	2E+00
	Exposure Medium Total					2E+00		
	Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	2E-03	--	2E-03
			Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chromium	Lungs	--	1E-04	--	1E-04
			Cobalt	Respiratory System	--	3E-03	--	3E-03
			Iron	NA	--	NV	--	0E+00
			Manganese	Neurological	--	1E-02	--	1E-02
Chemical Total				--	2E-02	--	2E-02	
Exposure Medium Total					2E-02			
Soil Total					2E+00			

Total Hazard Across All Media = 2E+00

Total Neurological/Nervous System HI = 6E-01  
 Total Skin HI = 4E-01  
 Total Vascular HI = 4E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 4E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 3E-01  
 Total Blood HI = 1E+00  
 Total Lungs and Respiratory System HI = 3E-03  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	1.2E+04	mg/kg	1.8E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	8.5E+00	mg/kg	1.3E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05	
	Chromium	1.7E+01	mg/kg	See Table for Mutagenic Risks					6E-05
	Cobalt	2.2E+01	mg/kg	3.5E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	1.8E+04	mg/kg	2.9E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	8.1E+02	mg/kg	1.3E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								8E-05	
Dermal Absorption	Aluminum	1.2E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	8.5E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06	
	Chromium	1.7E+01	mg/kg	See Table for Mutagenic Risks					0E+00
	Cobalt	2.2E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	1.8E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	8.1E+02	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								2E-06	
Inhalation	Aluminum	8.7E-06	mg/m <sup>3</sup>	3.6E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	6.3E-09	mg/m <sup>3</sup>	2.6E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08	
	Chromium	1.2E-08	mg/m <sup>3</sup>	See Table for Mutagenic Risks					2E-07
	Cobalt	1.6E-08	mg/m <sup>3</sup>	6.7E-09	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-08	
	Iron	1.3E-05	mg/m <sup>3</sup>	5.5E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	6.0E-07	mg/m <sup>3</sup>	2.4E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
Inhalation Route Total								2E-07	
Total of Receptor Hazards Across All Media								8E-05	



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										6E-05	
	Age 0 -2 years	1.7E+01	mg/kg	6.1E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	3.0E-05			
	Age 2 - 6 years	1.7E+01	mg/kg	1.2E-05	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	1.8E-05			
	Age 6 - 16 years	1.7E+01	mg/kg	3.2E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	4.9E-06			
	Age 16 - 30 years	1.7E+01	mg/kg	4.5E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	2.3E-06			
	Dermal Absorption											0E+00
	Age 0 -2 years	1.7E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	1.7E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	1.7E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	1.7E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											2E-07
	Age 0 -2 years	1.2E-08	mg/m3	3.3E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	4.0E-08			
Age 2 - 6 years	1.2E-08	mg/m3	6.7E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	2.4E-08				
Age 6 - 16 years	1.2E-08	mg/m3	1.7E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	6.0E-08				
Age 16 - 30 years	1.2E-08	mg/m3	2.3E-09	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	2.8E-08				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0E+00
			Arsenic	2E-05	1E-08	2E-06	2E-05
			Chromium	6E-05	2E-07	0E+00	6E-05
			Cobalt	NV	6E-08	NV	6E-08
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			Chemical Total	8E-05	2E-07	2E-06	8E-05
Exposure Medium Total						8E-05	
Soil Total						8E-05	

Total risks across all exposure routes and media = 8E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	1.2E+04	mg/kg	5.3E-02	mg/kg-day	1.0E+00	mg/kg-day	5E-02
	Arsenic	8.5E+00	mg/kg	3.8E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Chromium	1.7E+01	mg/kg	7.4E-05	mg/kg-day	3.0E-03	mg/kg-day	2E-02
	Cobalt	2.2E+01	mg/kg	1.0E-04	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Iron	1.8E+04	mg/kg	8.2E-02	mg/kg-day	7.0E-01	mg/kg-day	1E-01
	Manganese	8.1E+02	mg/kg	3.6E-03	mg/kg-day	2.3E-02	mg/kg-day	2E-01
Ingestion Route Total								8E-01
Dermal Absorption	Aluminum	1.2E+04	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0E+00
	Arsenic	8.5E+00	mg/kg	6.4E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Chromium	1.7E+01	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0E+00
	Cobalt	2.2E+01	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
	Iron	1.8E+04	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0E+00
	Manganese	8.1E+02	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Aluminum	8.7E-06	mg/m <sup>3</sup>	5.8E-06	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	1E-03
	Arsenic	6.3E-09	mg/m <sup>3</sup>	4.2E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Chromium	1.2E-08	mg/m <sup>3</sup>	8.2E-09	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	8E-05
	Cobalt	1.6E-08	mg/m <sup>3</sup>	1.1E-08	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	2E-03
	Iron	1.3E-05	mg/m <sup>3</sup>	9.0E-06	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	6.0E-07	mg/m <sup>3</sup>	4.0E-07	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	8E-03
Inhalation Route Total								1E-02
Total of Receptor Hazards Across All Media								8E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Aluminum	Neurological	5E-02	--	0E+00	5E-02	
			Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01	
			Chromium	None Reported	2E-02	--	0E+00	2E-02	
			Cobalt	Blood	3E-01	--	0E+00	3E-01	
			Iron	Gastrointestinal Tract	1E-01	--	0E+00	1E-01	
			Manganese	Neurological	2E-01	--	0E+00	2E-01	
			Chemical Total		8E-01	--	2E-02	8E-01	
	Exposure Medium Total							8E-01	
		Air	Volatile and Fugitive Dust Emissions	Aluminum	Neurological	--	1E-03	--	1E-03
				Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
				Chromium	Lungs	--	8E-05	--	8E-05
				Cobalt	Respiratory System	--	2E-03	--	2E-03
				Iron	NA	--	NV	--	0E+00
				Manganese	Neurological	--	8E-03	--	8E-03
				Chemical Total		--	1E-02	--	1E-02
Exposure Medium Total							1E-02		
Soil Total							8E-01		

Total Hazard Across All Media = 8E-01

Total Neurological/Nervous System HI =	2E-01
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	1E-01
Total Blood HI =	3E-01
Total Lungs and Respiratory System HI =	2E-03
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	1.2E+04	mg/kg	2.1E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	8.5E+00	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Chromium	1.7E+01	mg/kg	See Table for Mutagenic Risks				2E-05
	Cobalt	2.2E+01	mg/kg	3.9E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.8E+04	mg/kg	3.2E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	8.1E+02	mg/kg	1.4E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Aluminum	1.2E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	8.5E+00	mg/kg	2.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
	Chromium	1.7E+01	mg/kg	See Table for Mutagenic Risks				0E+00
	Cobalt	2.2E+01	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	1.8E+04	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	8.1E+02	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-07
Inhalation	Aluminum	8.7E-06	mg/m <sup>3</sup>	7.5E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	6.3E-09	mg/m <sup>3</sup>	5.4E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Chromium	1.2E-08	mg/m <sup>3</sup>	See Table for Mutagenic Risks				6E-08
	Cobalt	1.6E-08	mg/m <sup>3</sup>	1.4E-09	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Iron	1.3E-05	mg/m <sup>3</sup>	1.2E-06	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	6.0E-07	mg/m <sup>3</sup>	5.1E-08	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								7E-08
Total of Receptor Hazards Across All Media								2E-05



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	1.7E+01	mg/kg	2.1E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	1.1E-05	2E-05
	Age 2 - 6 years	1.7E+01	mg/kg	4.2E-06	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	6.4E-06	
	Age 6 - 9 years	1.7E+01	mg/kg	3.4E-07	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	5.1E-07	
	Dermal Absorption									0E+00
	Age 0 -2 years	1.7E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	
	Age 2 - 6 years	1.7E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	1.7E+01	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									6E-08
Age 0 -2 years	1.2E-08	mg/m3	2.3E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	2.8E-08		
Age 2 - 6 years	1.2E-08	mg/m3	4.7E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.7E-08		
Age 6 - 9 years	1.2E-08	mg/m3	3.5E-10	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	1.3E-08		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Ingestion Route Total								0.E+00	
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0165 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0E+00
			Arsenic	2E-06	2E-09	4E-07	3E-06
			Chromium	2E-05	6E-08	0E+00	2E-05
			Cobalt	NV	1E-08	NV	1E-08
			Iron	NV	NV	NV	0E+00
			Manganese	NV	NV	NV	0E+00
			<b>Chemical Total</b>	<b>2E-05</b>	<b>7E-08</b>	<b>4E-07</b>	<b>2E-05</b>
<b>Exposure Medium Total</b>						<b>2E-05</b>	
<b>Soil Total</b>						<b>2E-05</b>	

Total risks across all exposure routes and media = 2E-05

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.22E+02		mg/kg	1.2E+02	1.5E+03	N	NO	BSL
Cadmium	6.53E-01	J	mg/kg	6.5E-01	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00	J	0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	1.22E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	6.53E-01		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.66E+01	J	µg/L	8.7E+01	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00	J	0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	8.66E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0166 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0166 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0166 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0166 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0166 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0166 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child											
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient							
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total							0.00	
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00			
Barium	Phototoxicity	--				0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00			
Cadmium	Kidneys	--				0.00	--	0.00			
Chromium	Lungs	--				0.00	--	0.00			
Cobalt	Respiratory System	--				0.00	--	0.00			
Copper	NA	--				NV	--	0.00			
Iron	NA	--				NV	--	0.00			
Manganese	Neurological	--				0.00	--	0.00			
Nickel	Respiratory System	--				0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00			
Silver	NA	--				NV	--	0.00			
Thallium	NA	--				NV	--	0.00			
Vanadium	NA	--				NV	--	0.00			
Zinc	NA	--				NV	--	0.00			
Chemical Total							--	0.00	--	0.00	
Exposure Medium Total										0.00	
Soil Total								0.00			
Groundwater	Groundwater	Potable Well				Aluminum	Neurological	0.00	--	0.00	0.00
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Groundwater Total							0.00	
			Total Hazard Across All Media								0.00
			Total Neurological/Nervous System HI								0.00
Total Skin HI								0.00			
Total Vascular HI								0.00			
Total Kidneys HI								0.00			
Total Development HI								0.00			
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI								0.00			
Total Blood HI								0.00			
Total Lungs and Respiratory System HI								0.00			
Total Beryllium Sensitization HI								0.00			
Total Hair, Nails, and Teeth HI								0.00			
Total Body and Organ Weights HI								0.00			
Total ESOD HI								0.00			
Total Phototoxicity								0.00			

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Ingestion Route Total							
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Dermal Absorption Route Total							
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0166 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	0.00	--	0.00	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							
				Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--
			Antimony	0	--	NV	--	0.00		
			Arsenic	Development, vascular, nervous system	--	0.00	--	0.00		
			Barium	Phototoxicity	--	0.00	--	0.00		
			Beryllium	Beryllium sensitization (respiratory system)	--	0.00	--	0.00		
			Cadmium	Kidneys	--	0.00	--	0.00		
			Chromium	Lungs	--	0.00	--	0.00		
			Cobalt	Respiratory System	--	0.00	--	0.00		
			Copper	NA	--	NV	--	0.00		
			Iron	NA	--	NV	--	0.00		
			Manganese	Neurological	--	0.00	--	0.00		
			Nickel	Respiratory System	--	0.00	--	0.00		
			Selenium	Alimentary system, cardiovascular system, nervous system	--	0.00	--	0.00		
			Silver	NA	--	NV	--	0.00		
			Thallium	NA	--	NV	--	0.00		
			Vanadium	NA	--	NV	--	0.00		
			Zinc	NA	--	NV	--	0.00		
Chemical Total					--	0.00	--	0.00		
Exposure Medium Total										
Soil Total										
0.00										
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	0.00	--	0.00	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Groundwater Total							
			0.00							
Total Hazard Across All Media										
0.00										
Total Neurological/Nervous System HI										
0.00										
Total Skin HI										
0.00										
Total Vascular HI										
0.00										
Total Kidneys HI										
0.00										
Total Development HI										
0.00										
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI										
0.00										
Total Blood HI										
0.00										
Total Lungs and Respiratory System HI										
0.00										
Total Beryllium Sensitization HI										
0.00										
Total Hair, Nails, and Teeth HI										
0.00										
Total Body and Organ Weights HI										
0.00										
Total ESOD HI										
0.00										
Total Phototoxicity										
0.00										

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L						0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L					0.E+00	
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0166 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	2.32E+00		mg/kg	2.3E+00	3.9E-01	C	YES ASL
Barium	1.42E+02		mg/kg	1.4E+02	1.5E+03	N	NO BSL
Cadmium	7.69E-01	J	mg/kg	7.7E-01	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	2.32E+00		2.32E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.01E+02		µg/L	1.0E+02	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	1.01E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989		
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0168 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0168 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0168 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0168 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0168 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	2.3E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	1.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	2.3E+00	mg/kg	2.97E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	2.3E+00	mg/kg	2.49E-06	mg/kg-day	3.0E-04	mg/kg-day	8E-03
Dermal Absorption Route Total								8E-03
Inhalation	Arsenic	1.7E-09	mg/m <sup>3</sup>	1.64E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-04
Inhalation Route Total								1E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	8E-03	1E-01
			Chemical Total		1E-01	--	8E-03	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-04	--	1E-04
			Chemical Total		--	1E-04	--	1E-04
			Exposure Medium Total					1E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 1E-04  
 Total Skin HI = 1E-01  
 Total Vascular HI = 1E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 1E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	2.3E+00	mg/kg	3.6E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-06
Ingestion Route Total								5E-06
Dermal Absorption	Arsenic	2.3E+00	mg/kg	3.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
Dermal Absorption Route Total								5E-07
Inhalation	Arsenic	1.7E-09	mg/m <sup>3</sup>	7.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								6E-06



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	5E-06	3E-09	5E-07	6E-06
			Chemical Total	5E-06	3E-09	5E-07	6E-06
			Exposure Medium Total				6E-06
Soil Total						6E-06	

Total risks across all exposure routes and media = 6E-06

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	2.3E+00	mg/kg	1.0E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Arsenic	2.3E+00	mg/kg	1.7E-06	mg/kg-day	3.0E-04	mg/kg-day	6E-03
Dermal Absorption Route Total								6E-03
Inhalation	Arsenic	1.7E-09	mg/m <sup>3</sup>	1.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	8E-05
Inhalation Route Total								8E-05
Total of Receptor Hazards Across All Media								4E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-02	--	6E-03	4E-02
			Chemical Total		3E-02	--	6E-03	4E-02
			Exposure Medium Total					4E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	8E-05	--	8E-05
			Chemical Total		--	8E-05	--	8E-05
			Exposure Medium Total					8E-05
			Soil Total					4E-02

Total Hazard Across All Media = 4E-02

Total Neurological/Nervous System HI = 8E-05  
Total Skin HI = 4E-02  
Total Vascular HI = 4E-02  
Total Kidneys HI = 0E+00  
Total Development HI = 8E-05  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	2.3E+00	mg/kg	4.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	6E-07
Ingestion Route Total								6E-07
Dermal Absorption	Arsenic	2.3E+00	mg/kg	7.6E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-07
Dermal Absorption Route Total								1E-07
Inhalation	Arsenic	1.7E-09	mg/m <sup>3</sup>	1.5E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-10
Inhalation Route Total								6E-10
Total of Receptor Hazards Across All Media								7E-07



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0168 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	6E-07	6E-10	1E-07	7E-07
			Chemical Total	6E-07	6E-10	1E-07	7E-07
			Exposure Medium Total				7E-07
Soil Total						7E-07	

Total risks across all exposure routes and media = 7E-07

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.14E+02		mg/kg	1.1E+02	1.5E+03	N	NO	BSL
Cadmium	6.56E-01	J	mg/kg	6.6E-01	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00	J	0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	1.14E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	6.56E-01		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.03E+02		µg/L	1.0E+02	7.3E+02	N	NO

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	1.03E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0171 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0171 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0171 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0171 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0171 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0771 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child											
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient							
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total				0.00				
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00			
Barium	Phototoxicity	--				0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00			
Cadmium	Kidneys	--				0.00	--	0.00			
Chromium	Lungs	--				0.00	--	0.00			
Cobalt	Respiratory System	--				0.00	--	0.00			
Copper	NA	--				NV	--	0.00			
Iron	NA	--				NV	--	0.00			
Manganese	Neurological	--				0.00	--	0.00			
Nickel	Respiratory System	--				0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00			
Silver	NA	--				NV	--	0.00			
Thallium	NA	--				NV	--	0.00			
Vanadium	NA	--				NV	--	0.00			
Zinc	NA	--				NV	--	0.00			
Chemical Total						--	0.00	--	0.00		
Exposure Medium Total						0.00					
Soil Total						0.00					
Groundwater	Groundwater	Potable Well				Aluminum	Neurological	0.00	--	0.00	0.00
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Groundwater Total				0.00				
			Total Hazard Across All Media				0.00				
			Total Neurological/Nervous System HI				0.00				
Total Skin HI				0.00							
Total Vascular HI				0.00							
Total Kidneys HI				0.00							
Total Development HI				0.00							
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI				0.00							
Total Blood HI				0.00							
Total Lungs and Respiratory System HI				0.00							
Total Beryllium Sensitization HI				0.00							
Total Hair, Nails, and Teeth HI				0.00							
Total Body and Organ Weights HI				0.00							
Total ESOD HI				0.00							
Total Phototoxicity				0.00							

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/kg			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Inhalation		Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Inhalation Route Total								0.E+00
	Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00	
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00	
Barium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00	
Cobalt		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.E+00	
Total of Receptor Hazards Across All Media								0.E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
Exposure Medium Total							0.E+00
Soil Total							0.E+00
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
			Chemical Total	0.E+00	--	0.E+00	0.E+00
Groundwater Total							0.E+00

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0711 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total				0.00			
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--
Antimony	0	--				NV	--	0.00		
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00		
Barium	Phototoxicity	--				0.00	--	0.00		
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00		
Cadmium	Kidneys	--				0.00	--	0.00		
Chromium	Lungs	--				0.00	--	0.00		
Cobalt	Respiratory System	--				0.00	--	0.00		
Copper	NA	--				NV	--	0.00		
Iron	NA	--				NV	--	0.00		
Manganese	Neurological	--				0.00	--	0.00		
Nickel	Respiratory System	--				0.00	--	0.00		
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00		
Silver	NA	--				NV	--	0.00		
Thallium	NA	--				NV	--	0.00		
Vanadium	NA	--				NV	--	0.00		
Zinc	NA	--				NV	--	0.00		
Chemical Total						--	0.00	--	0.00	
Exposure Medium Total						0.00				
Soil Total						0.00				
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Groundwater Total				0.00			
			Total Hazard Across All Media				0.00			
Total Neurological/Nervous System HI				0.00						
Total Skin HI				0.00						
Total Vascular HI				0.00						
Total Kidneys HI				0.00						
Total Development HI				0.00						
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI				0.00						
Total Blood HI				0.00						
Total Lungs and Respiratory System HI				0.00						
Total Beryllium Sensitization HI				0.00						
Total Hair, Nails, and Teeth HI				0.00						
Total Body and Organ Weights HI				0.00						
Total ESOD HI				0.00						
Total Phototoxicity				0.00						

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0171 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	1.17E+00		mg/kg	1.2E+00	3.9E-01	C	YES ASL
Barium	1.42E+02		mg/kg	1.4E+02	1.5E+03	N	NO BSL
Cadmium	5.50E-01	J	mg/kg	5.5E-01	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	1.17E+00		1.17E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
h	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Resident
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0172 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0172 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0172 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0172 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0172 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	1.2E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	8.6E-10
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.2E+00	mg/kg	1.50E-05	mg/kg-day	3.0E-04	mg/kg-day	5E-02
Ingestion Route Total								5E-02
Dermal Absorption	Arsenic	1.2E+00	mg/kg	1.26E-06	mg/kg-day	3.0E-04	mg/kg-day	4E-03
Dermal Absorption Route Total								4E-03
Inhalation	Arsenic	8.6E-10	mg/m <sup>3</sup>	8.25E-10	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	5E-05
Inhalation Route Total								5E-05
Total of Receptor Hazards Across All Media								5E-02

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	5E-02	--	4E-03	5E-02
			Chemical Total		5E-02	--	4E-03	5E-02
			Exposure Medium Total					5E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	5E-05	--	5E-05
			Chemical Total		--	5E-05	--	5E-05
			Exposure Medium Total					5E-05
Soil Total							5E-02	

Total Hazard Across All Media = 5E-02

Total Neurological/Nervous System HI = 5E-05  
Total Skin HI = 5E-02  
Total Vascular HI = 5E-02  
Total Kidneys HI = 0E+00  
Total Development HI = 5E-05  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.2E+00	mg/kg	1.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
Ingestion Route Total								3E-06
Dermal Absorption	Arsenic	1.2E+00	mg/kg	1.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	8.6E-10	mg/m <sup>3</sup>	3.5E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								3E-06



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	3E-06	2E-09	3E-07	3E-06
			Chemical Total	3E-06	2E-09	3E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.2E+00	mg/kg	5.2E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Arsenic	1.2E+00	mg/kg	8.8E-07	mg/kg-day	3.0E-04	mg/kg-day	3E-03
Dermal Absorption Route Total								3E-03
Inhalation	Arsenic	8.6E-10	mg/m <sup>3</sup>	5.8E-10	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-05
Inhalation Route Total								4E-05
Total of Receptor Hazards Across All Media								2E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-02	--	3E-03	2E-02
			Chemical Total		2E-02	--	3E-03	2E-02
			Exposure Medium Total					2E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-05	--	4E-05
			Chemical Total		--	4E-05	--	4E-05
			Exposure Medium Total					4E-05
Soil Total							2E-02	

Total Hazard Across All Media = 2E-02

Total Neurological/Nervous System HI =	4E-05
Total Skin HI =	2E-02
Total Vascular HI =	2E-02
Total Kidneys HI =	0E+00
Total Development HI =	4E-05
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.2E+00	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Ingestion Route Total								3E-07
Dermal Absorption	Arsenic	1.2E+00	mg/kg	3.9E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	6E-08
Dermal Absorption Route Total								6E-08
Inhalation	Arsenic	8.6E-10	mg/m <sup>3</sup>	7.4E-11	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-10
Inhalation Route Total								3E-10
Total of Receptor Hazards Across All Media								4E-07



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0172 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	3E-07	3E-10	6E-08	4E-07
			Chemical Total	3E-07	3E-10	6E-08	4E-07
			Exposure Medium Total				4E-07
Soil Total						4E-07	

Total risks across all exposure routes and media = 4E-07

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	4.67E+00		mg/kg	4.7E+00	3.9E-01	C	YES ASL
Barium	1.72E+02		mg/kg	1.7E+02	1.5E+03	N	NO BSL
Cadmium	5.48E-01	J	mg/kg	5.5E-01	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	4.67E+00		4.67E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.83E+01		µg/L	1.8E+01	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	1.83E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0173 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0173 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0173 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0173 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0173 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	4.7E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.4E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.7E+00	mg/kg	5.97E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	4.7E+00	mg/kg	5.02E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.4E-09	mg/m <sup>3</sup>	3.29E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.7E+00	mg/kg	7.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	4.7E+00	mg/kg	6.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	3.4E-09	mg/m <sup>3</sup>	1.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
Inhalation Route Total								6E-09
Total of Receptor Hazards Across All Media								1E-05



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	6E-09	1E-06	1E-05
			Chemical Total	1E-05	6E-09	1E-06	1E-05
			Exposure Medium Total				1E-05
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.7E+00	mg/kg	2.1E-05	mg/kg-day	3.0E-04	mg/kg-day	7E-02
Ingestion Route Total								7E-02
Dermal Absorption	Arsenic	4.7E+00	mg/kg	3.5E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.4E-09	mg/m <sup>3</sup>	2.3E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								8E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	7E-02	--	1E-02	8E-02
			Chemical Total		7E-02	--	1E-02	8E-02
			Exposure Medium Total					8E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					8E-02

Total Hazard Across All Media = 8E-02

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	8E-02
Total Vascular HI =	8E-02
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.7E+00	mg/kg	8.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	4.7E+00	mg/kg	1.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	3.4E-09	mg/m <sup>3</sup>	3.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								1E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0173 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	2E-07	1E-06
			Chemical Total	1E-06	1E-09	2E-07	1E-06
			Exposure Medium Total				1E-06
Soil Total						1E-06	

Total risks across all exposure routes and media = 1E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	1.14E+00		mg/kg	1.1E+00	3.9E-01	C	YES	ASL
Barium	1.90E+02		mg/kg	1.9E+02	1.5E+03	N	NO	BSL
Cadmium	1.06E+00		mg/kg	1.1E+00	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	1.14E+00		1.14E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.12E+02	J	µg/L	1.1E+02	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00	J	0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	1.12E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0175 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0175 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0175 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0175 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0175 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	1.1E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	8.4E-10
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.1E+00	mg/kg	1.46E-05	mg/kg-day	3.0E-04	mg/kg-day	5E-02
Ingestion Route Total								5E-02
Dermal Absorption	Arsenic	1.1E+00	mg/kg	1.22E-06	mg/kg-day	3.0E-04	mg/kg-day	4E-03
Dermal Absorption Route Total								4E-03
Inhalation	Arsenic	8.4E-10	mg/m <sup>3</sup>	8.04E-10	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	5E-05
Inhalation Route Total								5E-05
Total of Receptor Hazards Across All Media								5E-02

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	5E-02	--	4E-03	5E-02
			Chemical Total		5E-02	--	4E-03	5E-02
			Exposure Medium Total					5E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	5E-05	--	5E-05
			Chemical Total		--	5E-05	--	5E-05
			Exposure Medium Total					5E-05
Soil Total							5E-02	

Total Hazard Across All Media = 5E-02

Total Neurological/Nervous System HI = 5E-05  
Total Skin HI = 5E-02  
Total Vascular HI = 5E-02  
Total Kidneys HI = 0E+00  
Total Development HI = 5E-05  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.1E+00	mg/kg	1.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
Ingestion Route Total								3E-06
Dermal Absorption	Arsenic	1.1E+00	mg/kg	1.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	8.4E-10	mg/m <sup>3</sup>	3.4E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								3E-06



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	3E-06	1E-09	3E-07	3E-06
			Chemical Total	3E-06	1E-09	3E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.1E+00	mg/kg	5.1E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Arsenic	1.1E+00	mg/kg	8.6E-07	mg/kg-day	3.0E-04	mg/kg-day	3E-03
Dermal Absorption Route Total								3E-03
Inhalation	Arsenic	8.4E-10	mg/m <sup>3</sup>	5.6E-10	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-05
Inhalation Route Total								4E-05
Total of Receptor Hazards Across All Media								2E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-02	--	3E-03	2E-02
			Chemical Total		2E-02	--	3E-03	2E-02
			Exposure Medium Total					2E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-05	--	4E-05
			Chemical Total		--	4E-05	--	4E-05
			Exposure Medium Total					4E-05
			Soil Total					2E-02

Total Hazard Across All Media = 2E-02

Total Neurological/Nervous System HI =	4E-05
Total Skin HI =	2E-02
Total Vascular HI =	2E-02
Total Kidneys HI =	0E+00
Total Development HI =	4E-05
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.1E+00	mg/kg	2.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Ingestion Route Total								3E-07
Dermal Absorption	Arsenic	1.1E+00	mg/kg	3.8E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	6E-08
Dermal Absorption Route Total								6E-08
Inhalation	Arsenic	8.4E-10	mg/m <sup>3</sup>	7.2E-11	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-10
Inhalation Route Total								3E-10
Total of Receptor Hazards Across All Media								4E-07



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0175 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	3E-07	3E-10	6E-08	4E-07
			Chemical Total	3E-07	3E-10	6E-08	4E-07
			Exposure Medium Total				4E-07
Soil Total						4E-07	

Total risks across all exposure routes and media = 4E-07

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.92E+02		mg/kg	1.9E+02	1.5E+03	N	NO	BSL
Cadmium	8.54E-01		mg/kg	8.5E-01	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.22E+01	J	µg/L	4.2E+01	7.3E+02	N	NO

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00	J	0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.22E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0178 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0178 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0178 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0178 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0178 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0.00	--	0.00	0.0
			Chemical Total		0.00	--	0.00	0.00
			Exposure Medium Total					0.0
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0.00	--	0.0
			Chemical Total		--	0.00	--	0.00
			Exposure Medium Total					0.00
Soil Total							0.0	

Total Hazard Across All Media = 0.0

Total Neurological/Nervous System HI = 0.0  
Total Skin HI = 0.0  
Total Vascular HI = 0.0  
Total Kidneys HI = 0.0  
Total Development HI = 0.0  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0.0  
Total Blood HI = 0.0  
Total Lungs and Respiratory System HI = 0.0  
Total Beryllium Sensitization HI = 0.0  
Total Hair, Nails, and Teeth HI = 0.0  
Total Body and Organ Weights HI = 0.0  
Total ESOD HI = 0.0  
Total Fetotoxicity = 0.0

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
Ingestion Route Total								0.E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
Dermal Absorption Route Total								0.E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
			Exposure Medium Total				0.E+00
Soil Total						0.E+00	

Total risks across all exposure routes and media = 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0.00	--	0.00	0.0
			Chemical Total		0.00	--	0.00	0.00
			Exposure Medium Total					0.0
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0.00	--	0.0
			Chemical Total		--	0.00	--	0.00
			Exposure Medium Total					0.0
Soil Total							0.0	

Total Hazard Across All Media = 0.0

Total Neurological/Nervous System HI =	0.0
Total Skin HI =	0.0
Total Vascular HI =	0.0
Total Kidneys HI =	0.0
Total Development HI =	0.0
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0.0
Total Blood HI =	0.0
Total Lungs and Respiratory System HI =	0.0
Total Beryllium Sensitization HI =	0.0
Total Hair, Nails, and Teeth HI =	0.0
Total Body and Organ Weights HI =	0.0
Total ESOD HI =	0.0
Total Fetotoxicity =	0.0

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
Ingestion Route Total								0.E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
Dermal Absorption Route Total								0.E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0178 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
			Exposure Medium Total				0.E+00
Soil Total						0.E+00	

Total risks across all exposure routes and media = 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	3.67E+00		mg/kg	3.7E+00	3.9E-01	C	YES	ASL
Barium	1.45E+02		mg/kg	1.5E+02	1.5E+03	N	NO	BSL
Cadmium	6.78E-01	J	mg/kg	6.8E-01	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	3.67E+00		3.67E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0183 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0183 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched



TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0183 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0183 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0183 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	3.7E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	2.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	3.7E+00	mg/kg	4.69E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	3.7E+00	mg/kg	3.94E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	2.7E-09	mg/m <sup>3</sup>	2.59E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	1E-02	2E-01
			Chemical Total		2E-01	--	1E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							2E-01	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 2E-01  
Total Vascular HI = 2E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	3.7E+00	mg/kg	5.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	9E-06
Ingestion Route Total								9E-06
Dermal Absorption	Arsenic	3.7E+00	mg/kg	5.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	8E-07
Dermal Absorption Route Total								8E-07
Inhalation	Arsenic	2.7E-09	mg/m <sup>3</sup>	1.1E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	5E-09
Inhalation Route Total								5E-09
Total of Receptor Hazards Across All Media								9E-06



Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	9E-06	5E-09	8E-07	9E-06
			Chemical Total	9E-06	5E-09	8E-07	9E-06
			Exposure Medium Total				9E-06
Soil Total						9E-06	

Total risks across all exposure routes and media = 9E-06

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	3.7E+00	mg/kg	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	5E-02
Ingestion Route Total								5E-02
Dermal Absorption	Arsenic	3.7E+00	mg/kg	2.8E-06	mg/kg-day	3.0E-04	mg/kg-day	9E-03
Dermal Absorption Route Total								9E-03
Inhalation	Arsenic	2.7E-09	mg/m <sup>3</sup>	1.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-04
Inhalation Route Total								1E-04
Total of Receptor Hazards Across All Media								6E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	5E-02	--	9E-03	6E-02
			Chemical Total		5E-02	--	9E-03	6E-02
			Exposure Medium Total					6E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-04	--	1E-04
			Chemical Total		--	1E-04	--	1E-04
			Exposure Medium Total					1E-04
Soil Total							6E-02	

Total Hazard Across All Media = 6E-02

Total Neurological/Nervous System HI =	1E-04
Total Skin HI =	6E-02
Total Vascular HI =	6E-02
Total Kidneys HI =	0E+00
Total Development HI =	1E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	3.7E+00	mg/kg	6.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	3.7E+00	mg/kg	1.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	2.7E-09	mg/m <sup>3</sup>	2.3E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								1E-06



Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		

Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0183 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	2E-07	1E-06
			Chemical Total	1E-06	1E-09	2E-07	1E-06
			Exposure Medium Total				1E-06
Soil Total						1E-06	

Total risks across all exposure routes and media = 1E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	1.59E+01		mg/kg	1.6E+01	3.9E-01	C	YES	ASL
Barium	1.69E+03		mg/kg	1.7E+03	1.5E+03	N	YES	ASL
Cadmium	2.97E+00		mg/kg	3.0E+00	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	1.59E+01		1.59E+01	Maximum Detection
Barium	mg/kg	1.69E+03		1.69E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	9.73E+02		µg/L	9.7E+02	7.3E+02	N	YES	ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	9.73E-01		9.73E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.



Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x CF x EF x [(IR-C x ED-C/BW-C) + (IR-A x ED-A/BW-A)] x 1/AT
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x CF x DABS x EF x 1/AT x [(SA-C x SSAF-C x ED-C/BW-C) + (SA-A x SSAF-A x ED-A/BW-A)]
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991		
AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989		

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Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.



Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Water Well  
 Receptor Population: Resident  
 Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$ $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAC	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	

BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991
BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991
AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0188 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0188 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0188 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0188 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0188 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	1.6E+01
Barium	1.7E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00



PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	1.2E-08
Barium	No	1.2E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.6E+01	mg/kg	2.03E-04	mg/kg-day	3.0E-04	mg/kg-day	7E-01
	Barium	1.7E+03	mg/kg	2.2E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								8E-01
Dermal Absorption	Arsenic	1.6E+01	mg/kg	1.71E-05	mg/kg-day	3.0E-04	mg/kg-day	6E-02
	Barium	1.7E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								6E-02
Inhalation	Arsenic	1.2E-08	mg/m <sup>3</sup>	1.12E-08	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	7E-04
	Barium	1.2E-06	mg/m <sup>3</sup>	1.2E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								3E-03
Total of Receptor Hazards Across All Media								8E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	9.7E-01	mg/L	6.2E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	9.7E-01	mg/L	4.1E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	7E-01	--	6E-02	7E-01
			Barium	Kidneys	1E-01	--	0E+00	1E-01
			Chemical Total		8E-01	--	6E-02	8E-01
			Exposure Medium Total					8E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	7E-04	--	7E-04
			Barium	Fetotoxicity	--	2E-03	--	2E-03
			Chemical Total		--	3E-03	--	3E-03
			Exposure Medium Total					3E-03
	Soil Total						8E-01	
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02
Chemical Total					3E-01	--	3E-02	3E-01
Groundwater Total								3E-01

Total Hazard Across All Media 1E+00

Total Neurological/Nervous System HI = 7E-04

Total Skin HI = 7E-01

Total Vascular HI = 7E-01

Total Kidneys HI = 4E-01

Total Development HI = 7E-04

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
				Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =				0E+00
				Total Blood HI =				0E+00
				Total Lungs and Respiratory System HI =				0E+00
				Total Beryllium Sensitization HI =				0E+00
				Total Hair, Nails, and Teeth HI =				0E+00
				Total Body and Organ Weights HI =				0E+00
				Total ESOD HI =				0E+00
				Total Fetotoxicity =				2E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	1.6E+01	mg/kg	2.5E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-05
	Barium	1.7E+03	mg/kg	2.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								4E-05
Dermal Absorption	Arsenic	1.6E+01	mg/kg	2.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-06
	Barium	1.7E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-06
Inhalation	Arsenic	1.2E-08	mg/m <sup>3</sup>	4.8E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-08
	Barium	1.2E-06	mg/m <sup>3</sup>	5.1E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								2E-08
Total of Receptor Hazards Across All Media								4E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				

Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	9.7E-01	mg/L	1.4E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	9.7E-01	mg/L	8.3E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00



Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	4E-05	2E-08	4E-06	4E-05
			Barium	NV	NV	NV	0E+00
			Chemical Total	4E-05	2E-08	4E-06	4E-05
			Exposure Medium Total				
Soil Total						4E-05	
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total						0E+00	

Total risks across all exposure routes and media = 4E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.6E+01	mg/kg	7.1E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
	Barium	1.7E+03	mg/kg	7.6E-03	mg/kg-day	2.0E-01	mg/kg-day	4E-02
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	1.6E+01	mg/kg	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	4E-02
	Barium	1.7E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								4E-02
Inhalation	Arsenic	1.2E-08	mg/m <sup>3</sup>	7.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	5E-04
	Barium	1.2E-06	mg/m <sup>3</sup>	8.3E-07	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	9.7E-01	mg/L	5.8E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	9.7E-01	mg/L	3.2E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	4E-02	3E-01
			Barium	Kidneys	4E-02	--	0E+00	4E-02
			Chemical Total		3E-01	--	4E-02	3E-01
	Exposure Medium Total							3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	5E-04	--	5E-04
			Barium	Fetotoxicity	--	2E-03	--	2E-03
			Chemical Total		--	2E-03	--	2E-03
			Exposure Medium Total					
	Soil Total							3E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03
Chemical Total					3E-02	--	2E-03	3E-02
Groundwater Total								3E-02

Total Hazard Across All Media 3E-01

Total Neurological/Nervous System HI = 5E-04

Total Skin HI = 3E-01

Total Vascular HI = 3E-01

Total Kidneys HI = 7E-02

Total Development HI = 5E-04

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
				Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =				0E+00
				Total Blood HI =				0E+00
				Total Lungs and Respiratory System HI =				0E+00
				Total Beryllium Sensitization HI =				0E+00
				Total Hair, Nails, and Teeth HI =				0E+00
				Total Body and Organ Weights HI =				0E+00
				Total ESOD HI =				0E+00
				Total Fetotoxicity =				2E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	1.6E+01	mg/kg	2.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-06
	Barium	1.7E+03	mg/kg	3.0E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								4E-06
Dermal Absorption	Arsenic	1.6E+01	mg/kg	5.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	8E-07
	Barium	1.7E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								8E-07
Inhalation	Arsenic	1.2E-08	mg/m <sup>3</sup>	1.0E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	4E-09
	Barium	1.2E-06	mg/m <sup>3</sup>	1.1E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								4E-09
Total of Receptor Hazards Across All Media								5E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	9.7E-01	mg/L	1.8E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	9.7E-01	mg/L	6.9E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0188 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	4E-06	4E-09	8E-07	5E-06
			Barium	NV	NV	NV	0E+00
			Chemical Total	4E-06	4E-09	8E-07	5E-06
Exposure Medium Total						5E-06	
Soil Total						5E-06	
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total						0E+00	

Total risks across all exposure routes and media = 5E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	2.45E+00		mg/kg	2.5E+00	3.9E-01	C	YES ASL
Barium	1.93E+03		mg/kg	1.9E+03	1.5E+03	N	YES ASL
Cadmium	2.93E+00		mg/kg	2.9E+00	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	2.45E+00		2.45E+00	Maximum Detection
Barium	mg/kg	1.93E+03		1.93E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0191 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0191 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0191 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0191 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0191 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	2.5E+00
Barium	1.9E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	1.8E-09
Barium	No	1.4E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	2.5E+00	mg/kg	3.13E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Barium	1.9E+03	mg/kg	2.5E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	2.5E+00	mg/kg	2.63E-06	mg/kg-day	3.0E-04	mg/kg-day	9E-03
	Barium	1.9E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								9E-03
Inhalation	Arsenic	1.8E-09	mg/m <sup>3</sup>	1.73E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-04
	Barium	1.4E-06	mg/m <sup>3</sup>	1.4E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	3E-03
Inhalation Route Total								3E-03
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	9E-03	1E-01	
			Barium		1E-01	--	0E+00	1E-01	
			Chemical Total	2E-01	--	9E-03	2E-01		
	Exposure Medium Total								2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-04	--	1E-04	
			Barium		--	3E-03	--	3E-03	
			Chemical Total	--	3E-03	--	3E-03		
	Exposure Medium Total								3E-03
	Soil Total								2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 1E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 1E-01  
Total Development HI = 1E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 3E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	2.5E+00	mg/kg	3.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	6E-06
	Barium	1.9E+03	mg/kg	3.0E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								6E-06
Dermal Absorption	Arsenic	2.5E+00	mg/kg	3.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
	Barium	1.9E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								5E-07
Inhalation	Arsenic	1.8E-09	mg/m <sup>3</sup>	7.4E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
	Barium	1.4E-06	mg/m <sup>3</sup>	5.8E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								6E-06

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	6E-06	3E-09	5E-07	6E-06
			Barium	NV	NV	NV	0E+00
			Chemical Total	6E-06	3E-09	5E-07	6E-06
Exposure Medium Total						6E-06	
Soil Total						6E-06	

Total risks across all exposure routes and media = 6E-06

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	2.5E+00	mg/kg	1.1E-05	mg/kg-day	3.0E-04	mg/kg-day	4E-02
	Barium	1.9E+03	mg/kg	8.6E-03	mg/kg-day	2.0E-01	mg/kg-day	4E-02
Ingestion Route Total								8E-02
Dermal Absorption	Arsenic	2.5E+00	mg/kg	1.8E-06	mg/kg-day	3.0E-04	mg/kg-day	6E-03
	Barium	1.9E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								6E-03
Inhalation	Arsenic	1.8E-09	mg/m <sup>3</sup>	1.2E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	8E-05
	Barium	1.4E-06	mg/m <sup>3</sup>	9.5E-07	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								2E-03
Total of Receptor Hazards Across All Media								9E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	4E-02	--	6E-03	4E-02	
			Barium		4E-02	--	0E+00	4E-02	
			Chemical Total	8E-02	--	6E-03	9E-02		
	Exposure Medium Total								9E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	8E-05	--	8E-05	
			Barium		--	2E-03	--	2E-03	
			Chemical Total	--	2E-03	--	2E-03		
	Exposure Medium Total								2E-03
	Soil Total								9E-02

Total Hazard Across All Media = 9E-02

Total Neurological/Nervous System HI = 8E-05  
Total Skin HI = 4E-02  
Total Vascular HI = 4E-02  
Total Kidneys HI = 4E-02  
Total Development HI = 8E-05  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 2E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	2.5E+00	mg/kg	4.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	6E-07
	Barium	1.9E+03	mg/kg	3.4E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								6E-07
Dermal Absorption	Arsenic	2.5E+00	mg/kg	8.1E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-07
	Barium	1.9E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								1E-07
Inhalation	Arsenic	1.8E-09	mg/m <sup>3</sup>	1.6E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-10
	Barium	1.4E-06	mg/m <sup>3</sup>	1.2E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								7E-10
Total of Receptor Hazards Across All Media								8E-07

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0191 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	6E-07	7E-10	1E-07	8E-07
			Barium	NV	NV	NV	0E+00
			Chemical Total	6E-07	7E-10	1E-07	8E-07
Exposure Medium Total						8E-07	
Soil Total						8E-07	

Total risks across all exposure routes and media = 8E-07

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.71E+00		mg/kg	5.7E+00	3.9E-01	C	YES ASL
Barium	4.00E+02		mg/kg	4.0E+02	1.5E+03	N	NO BSL
Cadmium	1.32E+00		mg/kg	1.3E+00	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.71E+00		5.71E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SA <sub>c</sub> x ED <sub>c</sub> x EF/(BW <sub>c</sub> x AT-C) + Deventa x SA <sub>a</sub> x ED <sub>a</sub> x EF/(BW <sub>a</sub> x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0193 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0193 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0193 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0193 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0193 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.7E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.2E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	7.30E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	5.7E+00	mg/kg	6.13E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	4.03E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	3E-01
			Chemical Total		2E-01	--	2E-02	3E-01
	Exposure Medium Total							3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
	Exposure Medium Total							3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	8.9E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.7E+00	mg/kg	8.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	1.7E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
Inhalation Route Total								7E-09
Total of Receptor Hazards Across All Media								1E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	7E-09	1E-06	1E-05
			Chemical Total	1E-05	7E-09	1E-06	1E-05
			Exposure Medium Total				1E-05
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	2.6E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	5.7E+00	mg/kg	4.3E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	2.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	1E-02	1E-01
			Chemical Total		9E-02	--	1E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.7E+00	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	5.7E+00	mg/kg	1.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.2E-09	mg/m <sup>3</sup>	3.6E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0193 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	3.33E+03		mg/kg	3.3E+03	1.5E+03	N	YES	ASL
Cadmium	9.67E-01		mg/kg	9.7E-01	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	BSL
Calcium			µg/L	0.0E+00	NA	NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	BSL
Magnesium			µg/L	0.0E+00	NA	NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	BSL
Potassium			µg/L	0.0E+00	NA	NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	BSL
Sodium			µg/L	0.0E+00	NA	NO	NUT
Thallium			µg/L	0.0E+00	NSV	YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SA <sub>c</sub> x ED <sub>c</sub> x EF/(BW <sub>c</sub> x AT-C) + Deventa x SA <sub>a</sub> x ED <sub>a</sub> x EF/(BW <sub>a</sub> x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0195 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0195 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0195 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0195 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0195 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	3.3E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	2.4E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								0E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0E+00
Inhalation Route Total								5E-03
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0E+00	--	0E+00	0E+00
			Chemical Total		2E-01	--	0E+00	2E-01
	Exposure Medium Total							2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0E+00	--	0E+00
			Chemical Total		--	5E-03	--	5E-03
	Exposure Medium Total							5E-03
Soil Total							2E-01	

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	2E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	5E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0E+00
Ingestion Route Total								0E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0E+00
Dermal Absorption Route Total								0E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0E+00
Inhalation Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	0E+00	0E+00	0E+00	0E+00
			Chemical Total	0E+00	0E+00	0E+00	0E+00
			Exposure Medium Total				
Soil Total						0E+00	

Total risks across all exposure routes and media = 0E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
Ingestion Route Total								7E-02
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0E+00
Dermal Absorption Route Total								0E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0E+00
Inhalation Route Total								3E-03
Total of Receptor Hazards Across All Media								8E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0E+00	--	0E+00	0E+00
			Chemical Total		7E-02	--	0E+00	7E-02
			Exposure Medium Total					7E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0E+00	--	0E+00
			Chemical Total		--	3E-03	--	3E-03
			Exposure Medium Total					3E-03
			Soil Total					8E-02

Total Hazard Across All Media = 8E-02

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	7E-02
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	3E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0E+00
Ingestion Route Total								0E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0E+00
Dermal Absorption Route Total								0E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0E+00
Inhalation Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0195 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	0E+00	0E+00	0E+00	0E+00
			Chemical Total	0E+00	0E+00	0E+00	0E+00
			Exposure Medium Total				0E+00
Soil Total							0E+00

Total risks across all exposure routes and media = 0E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	4.47E+00		mg/kg	4.5E+00	3.9E-01	C	YES ASL
Barium	2.57E+02		mg/kg	2.6E+02	1.5E+03	N	NO BSL
Cadmium	1.20E+00		mg/kg	1.2E+00	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	4.47E+00		4.47E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	6.42E+01		µg/L	6.4E+01	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	6.42E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS

JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0196 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0196 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0196 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0196 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0196 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	4.5E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.5E+00	mg/kg	5.72E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	4.5E+00	mg/kg	4.80E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.3E-09	mg/m <sup>3</sup>	3.15E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 2E-01  
Total Vascular HI = 2E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.5E+00	mg/kg	7.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	4.5E+00	mg/kg	6.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	3.3E-09	mg/m <sup>3</sup>	1.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
Inhalation Route Total								6E-09
Total of Receptor Hazards Across All Media								1E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	6E-09	1E-06	1E-05
			Chemical Total	1E-05	6E-09	1E-06	1E-05
			Exposure Medium Total				
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.5E+00	mg/kg	2.0E-05	mg/kg-day	3.0E-04	mg/kg-day	7E-02
Ingestion Route Total								7E-02
Dermal Absorption	Arsenic	4.5E+00	mg/kg	3.4E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.3E-09	mg/m <sup>3</sup>	2.2E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-04
Inhalation Route Total								1E-04
Total of Receptor Hazards Across All Media								8E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	7E-02	--	1E-02	8E-02
			Chemical Total		7E-02	--	1E-02	8E-02
			Exposure Medium Total					8E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-04	--	1E-04
			Chemical Total		--	1E-04	--	1E-04
			Exposure Medium Total					1E-04
Soil Total							8E-02	

Total Hazard Across All Media = 8E-02

Total Neurological/Nervous System HI =	1E-04
Total Skin HI =	8E-02
Total Vascular HI =	8E-02
Total Kidneys HI =	0E+00
Total Development HI =	1E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.5E+00	mg/kg	7.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	4.5E+00	mg/kg	1.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-07
Dermal Absorption Route Total								2E-07
Inhalation	Arsenic	3.3E-09	mg/m <sup>3</sup>	2.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								1E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0196 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	2E-07	1E-06
			Chemical Total	1E-06	1E-09	2E-07	1E-06
			Exposure Medium Total				1E-06
Soil Total						1E-06	

Total risks across all exposure routes and media = 1E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.21E+02		mg/kg	8.2E+02	1.5E+03	N	NO	BSL
Cadmium	1.66E+00		mg/kg	1.7E+00	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	8.21E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	1.66E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989		
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989		

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0197 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0197 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0197 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0197 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

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Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0197 - Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0197 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child											
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient							
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Chemical Total				0.00	--	0.00	0.00	
			Exposure Medium Total								
				Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
						Arsenic	Development, vascular, nervous system	--	0.00	--	0.00
						Barium	Phototoxicity	--	0.00	--	0.00
			Beryllium	Beryllium sensitization (respiratory system)	--	0.00	--	0.00			
			Cadmium	Kidneys	--	0.00	--	0.00			
			Chromium	Lungs	--	0.00	--	0.00			
			Cobalt	Respiratory System	--	0.00	--	0.00			
			Copper	NA	--	NV	--	0.00			
			Iron	NA	--	NV	--	0.00			
			Manganese	Neurological	--	0.00	--	0.00			
			Nickel	Respiratory System	--	0.00	--	0.00			
			Selenium	Alimentary system, cardiovascular system, nervous system	--	0.00	--	0.00			
			Silver	NA	--	NV	--	0.00			
			Thallium	NA	--	NV	--	0.00			
			Vanadium	NA	--	NV	--	0.00			
			Zinc	NA	--	NV	--	0.00			
Chemical Total					--	0.00	--	0.00			
Exposure Medium Total											
Soil Total											
	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/Zn-Superoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
Chemical Total					0.00	--	0.00	0.00			
Groundwater Total											
Total Hazard Across All Media											
0.00											
Total Neurological/Nervous System HI											
0.00											
Total Skin HI											
0.00											
Total Vascular HI											
0.00											
Total Kidneys HI											
0.00											
Total Development HI											
0.00											
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI											
0.00											
Total Blood HI											
0.00											
Total Lungs and Respiratory System HI											
0.00											
Total Beryllium Sensitization HI											
0.00											
Total Hair, Nails, and Teeth HI											
0.00											
Total Body and Organ Weights HI											
0.00											
Total ESOD HI											
0.00											
Total Phototoxicity											
0.00											

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0197 - Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
Chemical Total			0.E+00	0.E+00	0.E+00	0.E+00	
Exposure Medium Total						0.E+00	
Soil Total						0.E+00	
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
Chemical Total			0.E+00	--	0.E+00	0.E+00	
Groundwater Total						0.E+00	

Total risks across all exposure routes and media: 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0197 - Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0197 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							0.00
			Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
					Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--			0.00	--	0.00			
Barium	Phototoxicity	--			0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--			0.00	--	0.00			
Cadmium	Kidneys	--			0.00	--	0.00			
Chromium	Lungs	--			0.00	--	0.00			
Cobalt	Respiratory System	--			0.00	--	0.00			
Copper	NA	--			NV	--	0.00			
Iron	NA	--			NV	--	0.00			
Manganese	Neurological	--			0.00	--	0.00			
Nickel	Respiratory System	--			0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--			0.00	--	0.00			
Silver	NA	--			NV	--	0.00			
Thallium	NA	--			NV	--	0.00			
Vanadium	NA	--	NV	--	0.00					
Zinc	NA	--	NV	--	0.00					
Chemical Total				--	0.00	--	0.00			
Exposure Medium Total							0.00			
Soil Total							0.00			
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	Skin	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
Groundwater Total							0.00			
Total Hazard Across All Media								0.00		
Total Neurological/Nervous System HI								0.00		
Total Skin HI								0.00		
Total Vascular HI								0.00		
Total Kidneys HI								0.00		
Total Development HI								0.00		
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI								0.00		
Total Blood HI								0.00		
Total Lungs and Respiratory System HI								0.00		
Total Beryllium Sensitization HI								0.00		
Total Hair, Nails, and Teeth HI								0.00		
Total Body and Organ Weights HI								0.00		
Total ESOD HI								0.00		
Total Phototoxicity								0.00		

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0197 - Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.E+00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0197 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.E+00
			Antimony	NV	NV	NV	0.E+00
			Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Barium	NV	NV	NV	0.E+00
			Beryllium	NV	0.E+00	NV	0.E+00
			Cadmium	NV	0.E+00	NV	0.E+00
			Chromium	0.E+00	0.E+00	0.E+00	0.E+00
			Cobalt	NV	0.E+00	NV	0.E+00
			Copper	NV	NV	NV	0.E+00
			Iron	NV	NV	NV	0.E+00
			Manganese	NV	NV	NV	0.E+00
			Nickel	NV	0.E+00	NV	0.E+00
			Selenium	NV	NV	NV	0.E+00
			Silver	NV	NV	NV	0.E+00
			Thallium	NV	NV	NV	0.E+00
			Vanadium	NV	NV	NV	0.E+00
			Zinc	NV	NV	NV	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
Exposure Medium Total							0.E+00
Soil Total							0.E+00
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.E+00
			Antimony	NV	--	NV	0.E+00
			Arsenic	0.E+00	--	0.E+00	0.E+00
			Barium	NV	--	NV	0.E+00
			Beryllium	NV	--	NV	0.E+00
			Cadmium	NV	--	NV	0.E+00
			Chromium	0.E+00	--	0.E+00	0.E+00
			Cobalt	NV	--	NV	0.E+00
			Copper	NV	--	NV	0.E+00
			Iron	NV	--	NV	0.E+00
			Manganese	NV	--	NV	0.E+00
			Nickel	NV	--	NV	0.E+00
			Selenium	NV	--	NV	0.E+00
			Silver	NV	--	NV	0.E+00
			Thallium	NV	--	NV	0.E+00
			Vanadium	NV	--	NV	0.E+00
			Zinc	NV	--	NV	0.E+00
			Chemical Total	0.E+00	--	0.E+00	0.E+00
Groundwater Total							0.E+00

Total risks across all exposure routes and media: 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	1.32E+00		mg/kg	1.3E+00	3.9E-01	C	YES ASL
Barium	1.88E+02		mg/kg	1.9E+02	1.5E+03	N	NO BSL
Cadmium	5.48E-01	J	mg/kg	5.5E-01	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	1.32E+00		1.32E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Water Well
Receptor Population: Child Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0199 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0199 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0199 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0199 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0199 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	1.3E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	9.7E-10
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.3E+00	mg/kg	1.69E-05	mg/kg-day	3.0E-04	mg/kg-day	6E-02
Ingestion Route Total								6E-02
Dermal Absorption	Arsenic	1.3E+00	mg/kg	1.42E-06	mg/kg-day	3.0E-04	mg/kg-day	5E-03
Dermal Absorption Route Total								5E-03
Inhalation	Arsenic	9.7E-10	mg/m <sup>3</sup>	9.31E-10	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	6E-05
Inhalation Route Total								6E-05
Total of Receptor Hazards Across All Media								6E-02

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	6E-02	--	5E-03	6E-02
			Chemical Total		6E-02	--	5E-03	6E-02
			Exposure Medium Total					6E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	6E-05	--	6E-05
			Chemical Total		--	6E-05	--	6E-05
			Exposure Medium Total					6E-05
			Soil Total					6E-02

Total Hazard Across All Media = 6E-02

Total Neurological/Nervous System HI = 6E-05  
Total Skin HI = 6E-02  
Total Vascular HI = 6E-02  
Total Kidneys HI = 0E+00  
Total Development HI = 6E-05  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.3E+00	mg/kg	2.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
Ingestion Route Total								3E-06
Dermal Absorption	Arsenic	1.3E+00	mg/kg	2.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	9.7E-10	mg/m <sup>3</sup>	4.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								3E-06

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	3E-06	2E-09	3E-07	3E-06
			Chemical Total	3E-06	2E-09	3E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.3E+00	mg/kg	5.9E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Arsenic	1.3E+00	mg/kg	9.9E-07	mg/kg-day	3.0E-04	mg/kg-day	3E-03
Dermal Absorption Route Total								3E-03
Inhalation	Arsenic	9.7E-10	mg/m <sup>3</sup>	6.5E-10	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-05
Inhalation Route Total								4E-05
Total of Receptor Hazards Across All Media								2E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-02	--	3E-03	2E-02
			Chemical Total		2E-02	--	3E-03	2E-02
			Exposure Medium Total					2E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-05	--	4E-05
			Chemical Total		--	4E-05	--	4E-05
			Exposure Medium Total					4E-05
			Soil Total					2E-02

Total Hazard Across All Media = 2E-02

Total Neurological/Nervous System HI = 4E-05  
Total Skin HI = 2E-02  
Total Vascular HI = 2E-02  
Total Kidneys HI = 0E+00  
Total Development HI = 4E-05  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.3E+00	mg/kg	2.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Ingestion Route Total								3E-07
Dermal Absorption	Arsenic	1.3E+00	mg/kg	4.4E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	7E-08
Dermal Absorption Route Total								7E-08
Inhalation	Arsenic	9.7E-10	mg/m <sup>3</sup>	8.4E-11	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	4E-10
Inhalation Route Total								4E-10
Total of Receptor Hazards Across All Media								4E-07

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0199 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	3E-07	4E-10	7E-08	4E-07
			Chemical Total	3E-07	4E-10	7E-08	4E-07
			Exposure Medium Total				4E-07
Soil Total						4E-07	

Total risks across all exposure routes and media = 4E-07

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	4.04E+01		mg/kg	4.0E+01	3.9E-01	C	YES ASL
Barium	2.21E+03		mg/kg	2.2E+03	1.5E+03	N	YES ASL
Cadmium	1.41E+00		mg/kg	1.4E+00	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	4.04E+01		4.04E+01	Maximum Detection
Barium	mg/kg	2.21E+03		2.21E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0200 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0200 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0200 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0200 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0200 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	4.0E+01
Barium	2.2E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.0E-08
Barium	No	1.6E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.0E+01	mg/kg	5.17E-04	mg/kg-day	3.0E-04	mg/kg-day	2E+00
	Barium	2.2E+03	mg/kg	2.8E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								2E+00
Dermal Absorption	Arsenic	4.0E+01	mg/kg	4.34E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Barium	2.2E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								1E-01
Inhalation	Arsenic	3.0E-08	mg/m <sup>3</sup>	2.85E-08	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-03
	Barium	1.6E-06	mg/m <sup>3</sup>	1.6E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	3E-03
Inhalation Route Total								5E-03
Total of Receptor Hazards Across All Media								2E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E+00	--	1E-01	2E+00
			Barium		1E-01	--	0E+00	1E-01
			Chemical Total	2E+00	--	1E-01	2E+00	
	Exposure Medium Total							2E+00
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-03	--	2E-03
			Barium		--	3E-03	--	3E-03
			Chemical Total	--	5E-03	--	5E-03	
	Exposure Medium Total							5E-03
	Soil Total							2E+00

Total Hazard Across All Media = 2E+00

Total Neurological/Nervous System HI = 2E-03  
Total Skin HI = 2E+00  
Total Vascular HI = 2E+00  
Total Kidneys HI = 1E-01  
Total Development HI = 2E-03  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 3E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.0E+01	mg/kg	6.3E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	9E-05
	Barium	2.2E+03	mg/kg	3.5E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								9E-05
Dermal Absorption	Arsenic	4.0E+01	mg/kg	6.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	9E-06
	Barium	2.2E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								9E-06
Inhalation	Arsenic	3.0E-08	mg/m <sup>3</sup>	1.2E-08	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	5E-08
	Barium	1.6E-06	mg/m <sup>3</sup>	6.7E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								5E-08
Total of Receptor Hazards Across All Media								1E-04

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	9E-05	5E-08	9E-06	1E-04
			Barium	NV	NV	NV	0E+00
			Chemical Total	9E-05	5E-08	9E-06	1E-04
Exposure Medium Total						1E-04	
Soil Total						1E-04	

Total risks across all exposure routes and media = 

1E-04
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TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.0E+01	mg/kg	1.8E-04	mg/kg-day	3.0E-04	mg/kg-day	6E-01
	Barium	2.2E+03	mg/kg	9.9E-03	mg/kg-day	2.0E-01	mg/kg-day	5E-02
Ingestion Route Total								7E-01
Dermal Absorption	Arsenic	4.0E+01	mg/kg	3.0E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Barium	2.2E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								1E-01
Inhalation	Arsenic	3.0E-08	mg/m <sup>3</sup>	2.0E-08	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-03
	Barium	1.6E-06	mg/m <sup>3</sup>	1.1E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								4E-03
Total of Receptor Hazards Across All Media								8E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	6E-01	--	1E-01	7E-01
			Barium		5E-02	--	0E+00	5E-02
			Chemical Total		7E-01	--	1E-01	8E-01
	Exposure Medium Total							8E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-03	--	1E-03
			Barium		--	2E-03	--	2E-03
			Chemical Total		--	4E-03	--	4E-03
	Exposure Medium Total							4E-03
	Soil Total							8E-01

Total Hazard Across All Media = 8E-01

Total Neurological/Nervous System HI =	1E-03
Total Skin HI =	7E-01
Total Vascular HI =	7E-01
Total Kidneys HI =	5E-02
Total Development HI =	1E-03
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	2E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	4.0E+01	mg/kg	7.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
	Barium	2.2E+03	mg/kg	3.9E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	4.0E+01	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	2.2E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	3.0E-08	mg/m <sup>3</sup>	2.6E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Barium	1.6E-06	mg/m <sup>3</sup>	1.4E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								1E-05

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0200 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	1E-08	2E-06	1E-05
			Barium	NV	NV	NV	0E+00
			Chemical Total	1E-05	1E-08	2E-06	1E-05
Exposure Medium Total						1E-05	
Soil Total						1E-05	

Total risks across all exposure routes and media = 1E-05

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	7.02E+00		mg/kg	7.0E+00	3.9E-01	C	YES	ASL
Barium	1.80E+02		mg/kg	1.8E+02	1.5E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.02E+00		7.02E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0206 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0206 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0206 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0206 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0206 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.2E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.0E+00	mg/kg	8.98E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.0E+00	mg/kg	7.54E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.2E-09	mg/m <sup>3</sup>	4.95E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	3E-01
			Chemical Total		3E-01	--	3E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
			Soil Total					3E-01

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.0E+00	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.0E+00	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.2E-09	mg/m <sup>3</sup>	2.1E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
Inhalation Route Total								9E-09
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	9E-09	2E-06	2E-05
			Chemical Total	2E-05	9E-09	2E-06	2E-05
			Exposure Medium Total				
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.0E+00	mg/kg	3.1E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.0E+00	mg/kg	5.3E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.2E-09	mg/m <sup>3</sup>	3.5E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.0E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.0E+00	mg/kg	2.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	5.2E-09	mg/m <sup>3</sup>	4.5E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0206 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.24E+00		mg/kg	6.2E+00	3.9E-01	C	YES ASL
Barium	1.07E+03		mg/kg	1.1E+03	1.5E+03	N	NO BSL
Cadmium	6.24E-01	J	mg/kg	6.2E-01	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.24E+00		6.24E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0209 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0209 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0209 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0209 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0209 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.2E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.6E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	7.98E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.2E+00	mg/kg	6.70E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	4.40E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	9.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.2E+00	mg/kg	9.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	1.9E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	6.2E+00	mg/kg	4.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	2E-02	1E-01
			Chemical Total		9E-02	--	2E-02	1E-01
	Exposure Medium Total							1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
	Exposure Medium Total							2E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.2E+00	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	4.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0209 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	1.91E+00		mg/kg	1.9E+00	3.9E-01	C	YES	ASL
Barium	4.24E+02		mg/kg	4.2E+02	1.5E+03	N	NO	BSL
Cadmium	1.48E+00		mg/kg	1.5E+00	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	1.91E+00		1.91E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IRage-adj x EF / AT-C  IRage-adj = (EDc x IRc/BWc) + (EDa x IRa/BWa)
	IRage-adj	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0210 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0210 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0210 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0210 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0210 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	1.9E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	1.4E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.9E+00	mg/kg	2.44E-05	mg/kg-day	3.0E-04	mg/kg-day	8E-02
Ingestion Route Total								8E-02
Dermal Absorption	Arsenic	1.9E+00	mg/kg	2.05E-06	mg/kg-day	3.0E-04	mg/kg-day	7E-03
Dermal Absorption Route Total								7E-03
Inhalation	Arsenic	1.4E-09	mg/m <sup>3</sup>	1.35E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	9E-05
Inhalation Route Total								9E-05
Total of Receptor Hazards Across All Media								9E-02

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	8E-02	--	7E-03	9E-02
			Chemical Total		8E-02	--	7E-03	9E-02
			Exposure Medium Total					9E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	9E-05	--	9E-05
			Chemical Total		--	9E-05	--	9E-05
			Exposure Medium Total					9E-05
Soil Total							9E-02	

Total Hazard Across All Media = 9E-02

Total Neurological/Nervous System HI =	9E-05
Total Skin HI =	9E-02
Total Vascular HI =	9E-02
Total Kidneys HI =	0E+00
Total Development HI =	9E-05
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.9E+00	mg/kg	3.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-06
Ingestion Route Total								4E-06
Dermal Absorption	Arsenic	1.9E+00	mg/kg	2.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	1.4E-09	mg/m <sup>3</sup>	5.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								5E-06

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium in Groundwater	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	4E-06	2E-09	4E-07	5E-06
			Chemical Total	4E-06	2E-09	4E-07	5E-06
			Exposure Medium Total				5E-06
Soil Total						5E-06	

Total risks across all exposure routes and media = 5E-06

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.9E+00	mg/kg	8.5E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Arsenic	1.9E+00	mg/kg	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	5E-03
Dermal Absorption Route Total								5E-03
Inhalation	Arsenic	1.4E-09	mg/m <sup>3</sup>	9.4E-10	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	6E-05
Inhalation Route Total								6E-05
Total of Receptor Hazards Across All Media								3E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-02	--	5E-03	3E-02
			Chemical Total		3E-02	--	5E-03	3E-02
			Exposure Medium Total					3E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	6E-05	--	6E-05
			Chemical Total		--	6E-05	--	6E-05
			Exposure Medium Total					6E-05
			Soil Total					3E-02

Total Hazard Across All Media = 3E-02

Total Neurological/Nervous System HI =	6E-05
Total Skin HI =	3E-02
Total Vascular HI =	3E-02
Total Kidneys HI =	0E+00
Total Development HI =	6E-05
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.9E+00	mg/kg	3.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
Ingestion Route Total								5E-07
Dermal Absorption	Arsenic	1.9E+00	mg/kg	6.3E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	9E-08
Dermal Absorption Route Total								9E-08
Inhalation	Arsenic	1.4E-09	mg/m <sup>3</sup>	1.2E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	5E-10
Inhalation Route Total								5E-10
Total of Receptor Hazards Across All Media								6E-07

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0210 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	5E-07	5E-10	9E-08	6E-07
			Chemical Total	5E-07	5E-10	9E-08	6E-07
			Exposure Medium Total				6E-07
Soil Total						6E-07	

Total risks across all exposure routes and media = 6E-07

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.38E+00		mg/kg	6.4E+00	3.9E-01	C	YES ASL
Barium	2.50E+02		mg/kg	2.5E+02	1.5E+03	N	NO BSL
Cadmium	2.88E+00		mg/kg	2.9E+00	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.38E+00		6.38E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.02E+03	J	µg/L	1.0E+03	7.3E+02	N YES	ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.02E+00	J	1.02E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS

JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0211 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0211 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0211 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0211 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0211 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.4E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.4E+00	mg/kg	8.16E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.4E+00	mg/kg	6.85E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.7E-09	mg/m <sup>3</sup>	4.50E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	6.5E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	1.0E+00	mg/L	4.3E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Groundwater Total					4E-01

Total Hazard Across All Media = 7E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	4E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.4E+00	mg/kg	1.0E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.4E+00	mg/kg	9.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.7E-09	mg/m <sup>3</sup>	1.9E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	1.5E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.0E+00	mg/L	8.7E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05	
			Chemical Total	1E-05	8E-09	1E-06	2E-05	
			Exposure Medium Total					2E-05
			Soil Total					2E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.4E+00	mg/kg	2.9E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	6.4E+00	mg/kg	4.8E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.7E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	6.1E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	1.0E+00	mg/L	3.3E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							1E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03	3E-02
			Chemical Total		3E-02	--	2E-03	3E-02
			Groundwater Total					3E-02

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	3E-02
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.4E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.4E+00	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.7E-09	mg/m <sup>3</sup>	4.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	1.9E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.0E+00	mg/L	7.2E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0211 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06	
			Chemical Total	2E-06	2E-09	3E-07	2E-06	
			Exposure Medium Total					2E-06
			Soil Total					2E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.87E+02		mg/kg	1.9E+02	1.5E+03	N	NO	BSL
Cadmium	6.08E-01	J	mg/kg	6.1E-01	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0212 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0212 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0212 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0212 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0212 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0.00	--	0.00	0.0
			Chemical Total		0.00	--	0.00	0.00
			Exposure Medium Total					0.0
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0.00	--	0.0
			Chemical Total		--	0.00	--	0.00
			Exposure Medium Total					0.00
			Soil Total					0.0

Total Hazard Across All Media = 0.0

Total Neurological/Nervous System HI = 0.0  
Total Skin HI = 0.0  
Total Vascular HI = 0.0  
Total Kidneys HI = 0.0  
Total Development HI = 0.0  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0.0  
Total Blood HI = 0.0  
Total Lungs and Respiratory System HI = 0.0  
Total Beryllium Sensitization HI = 0.0  
Total Hair, Nails, and Teeth HI = 0.0  
Total Body and Organ Weights HI = 0.0  
Total ESOD HI = 0.0  
Total Fetotoxicity = 0.0

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
Ingestion Route Total								0.E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
Dermal Absorption Route Total								0.E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
			Exposure Medium Total				0.E+00
Soil Total						0.E+00	

Total risks across all exposure routes and media = 0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0.00	--	0.00	0.0
			Chemical Total		0.00	--	0.00	0.00
			Exposure Medium Total					0.0
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0.00	--	0.0
			Chemical Total		--	0.00	--	0.00
			Exposure Medium Total					0.0
	Soil Total							0.0

Total Hazard Across All Media = 0.0

Total Neurological/Nervous System HI = 0.0  
Total Skin HI = 0.0  
Total Vascular HI = 0.0  
Total Kidneys HI = 0.0  
Total Development HI = 0.0  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0.0  
Total Blood HI = 0.0  
Total Lungs and Respiratory System HI = 0.0  
Total Beryllium Sensitization HI = 0.0  
Total Hair, Nails, and Teeth HI = 0.0  
Total Body and Organ Weights HI = 0.0  
Total ESOD HI = 0.0  
Total Fetotoxicity = 0.0

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
Ingestion Route Total								0.E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.E+00
Dermal Absorption Route Total								0.E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.E+00
Inhalation Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0212 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	0.E+00	0.E+00	0.E+00	0.E+00
			Chemical Total	0.E+00	0.E+00	0.E+00	0.E+00
			Exposure Medium Total				0.E+00
Soil Total						0.E+00	

Total risks across all exposure routes and media = 0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	8.11E+00		mg/kg	8.1E+00	3.9E-01	C	YES	ASL
Barium	1.64E+03		mg/kg	1.6E+03	1.5E+03	N	YES	ASL
Cadmium	3.54E+00		mg/kg	3.5E+00	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	8.11E+00		8.11E+00	Maximum Detection
Barium	mg/kg	1.64E+03		1.64E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.00E+02		µg/L	8.0E+02	7.3E+02	N	YES

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	8.00E-01		8.00E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0216 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0216 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0216 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0216 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0216 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	8.1E+00
Barium	1.6E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	6.0E-09
Barium	No	1.2E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.1E+00	mg/kg	1.04E-04	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Barium	1.6E+03	mg/kg	2.1E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								5E-01
Dermal Absorption	Arsenic	8.1E+00	mg/kg	8.71E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
	Barium	1.6E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	6.0E-09	mg/m <sup>3</sup>	5.72E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
	Barium	1.2E-06	mg/m <sup>3</sup>	1.2E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								3E-03
Total of Receptor Hazards Across All Media								5E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.0E-01	mg/L	5.1E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	8.0E-01	mg/L	3.4E-04	mg/kg-day	1.4E-02	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Barium		1E-01	--	0E+00	1E-01
			Chemical Total	5E-01	--	3E-02	5E-01	
	Exposure Medium Total							5E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Barium		--	2E-03	--	2E-03
			Chemical Total	--	3E-03	--	3E-03	
	Exposure Medium Total							3E-03
	Soil Total							5E-01
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	2E-02
Chemical Total				3E-01	--	2E-02	3E-01	
Groundwater Total							3E-01	

Total Hazard Across All Media = 8E-01

Total Neurological/Nervous System HI =	4E-04
Total Skin HI =	4E-01
Total Vascular HI =	4E-01
Total Kidneys HI =	4E-01
Total Development HI =	4E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	2E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.1E+00	mg/kg	1.3E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
	Barium	1.6E+03	mg/kg	2.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	8.1E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	1.6E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	6.0E-09	mg/m <sup>3</sup>	2.5E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
	Barium	1.2E-06	mg/m <sup>3</sup>	5.0E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.0E-01	mg/L	1.2E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.0E-01	mg/L	6.8E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Barium	NV	NV	NV	0E+00
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total							2E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	8.1E+00	mg/kg	3.6E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
	Barium	1.6E+03	mg/kg	7.3E-03	mg/kg-day	2.0E-01	mg/kg-day	4E-02
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	8.1E+00	mg/kg	6.1E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
	Barium	1.6E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	6.0E-09	mg/m <sup>3</sup>	4.0E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
	Barium	1.2E-06	mg/m <sup>3</sup>	8.1E-07	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								2E-03
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.0E-01	mg/L	4.8E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Barium	8.0E-01	mg/L	2.6E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient					
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01	
			Barium		4E-02	--	0E+00	4E-02	
			Chemical Total	2E-01	--	2E-02	2E-01		
	Exposure Medium Total							2E-01	
	Air	Volatile and Fugitive Dust Emissions		Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
				Barium		--	2E-03	--	2E-03
				Chemical Total	--	2E-03	--	2E-03	
				Exposure Medium Total					
	Soil Total							2E-01	
	Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-02	--	2E-03	3E-02
Chemical Total				2E-02	--	2E-03	3E-02		
Groundwater Total							3E-02		

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	6E-02
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	2E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	8.1E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
	Barium	1.6E+03	mg/kg	2.9E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	8.1E+00	mg/kg	2.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
	Barium	1.6E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	6.0E-09	mg/m <sup>3</sup>	5.1E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
	Barium	1.2E-06	mg/m <sup>3</sup>	1.0E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								3E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										0.0E+00
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.0E-01	mg/L	1.5E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.0E-01	mg/L	5.7E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0216 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	3E-06
			Barium	NV	NV	NV	0E+00
			Chemical Total	2E-06	2E-09	4E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	2.07E+01		mg/kg	2.1E+01	3.9E-01	C	YES ASL
Barium	7.16E+02		mg/kg	7.2E+02	1.5E+03	N	NO BSL
Cadmium	8.72E+00		mg/kg	8.7E+00	7.0E+00	N	YES ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	2.07E+01		2.07E+01	Maximum Detection
Cadmium	mg/kg	8.72E+00		8.72E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Barium	5.94E+02	J	µg/L	5.9E+02	7.3E+02	N	NO	BSL
Cadmium	2.08E+00		µg/L	2.1E+00	1.8E+00	N	YES	ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Cadmium	mg/L	2.08E-03		2.08E-03	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0217 :Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0217 :Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0217 :Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0217 :Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0217 :Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	2.1E+01
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	8.7E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	1.5E-08
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	6.4E-09
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	2.1E+01	mg/kg	2.65E-04	mg/kg-day	3.0E-04	mg/kg-day	9E-01
	Cadmium	8.7E+00	mg/kg	1.1E-04	mg/kg-day	1.0E-03	mg/kg-day	1E-01
Ingestion Route Total								1E+00
Dermal Absorption	Arsenic	2.1E+01	mg/kg	2.22E-05	mg/kg-day	3.0E-04	mg/kg-day	7E-02
	Cadmium	8.7E+00	mg/kg	3.1E-07	mg/kg-day	2.5E-05	mg/kg-day	1E-02
Dermal Absorption Route Total								9E-02
Inhalation	Arsenic	1.5E-08	mg/m <sup>3</sup>	1.46E-08	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	1E-03
	Cadmium	6.4E-09	mg/m <sup>3</sup>	6.1E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								1E-03
Total of Receptor Hazards Across All Media								1E+00

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	2.1E-03	mg/L	1.3E-04	mg/kg-day	5.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Cadmium	2.1E-03	mg/L	8.8E-07	mg/kg-day	1.3E-05	mg/kg-day	7E-02
Dermal Absorption Route Total								7E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Residen  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-01	--	7E-02	1E+00
			Cadmium		1E-01	--	1E-02	
			Chemical Total	1E+00	--	9E-02	1E+00	
	Exposure Medium Total							1E+00
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	1E-03	--	1E-03
			Cadmium		--	3E-04	--	3E-04
			Chemical Total	--	1E-03	--	1E-03	
	Exposure Medium Total							1E-03
	Soil Total							1E+00
	Groundwater	Groundwater	Potable Well	Cadmium	Kidneys	3E-01	--	7E-02
Chemical Total				3E-01	--	7E-02	3E-01	
Groundwater Total							3E-01	

Total Hazard Across All Media = 1E+00

Total Neurological/Nervous System HI =	1E-03
Total Skin HI =	1E+00
Total Vascular HI =	1E+00
Total Kidneys HI =	5E-01
Total Development HI =	1E-03
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	2.1E+01	mg/kg	3.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-05
	Cadmium	8.7E+00	mg/kg	1.4E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								5E-05
Dermal Absorption	Arsenic	2.1E+01	mg/kg	3.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-06
	Cadmium	8.7E+00	mg/kg	4.3E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								5E-06
Inhalation	Arsenic	1.5E-08	mg/m <sup>3</sup>	6.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-08
	Cadmium	6.4E-09	mg/m <sup>3</sup>	2.6E-09	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	5E-09
Inhalation Route Total								3E-08
Total of Receptor Hazards Across All Media								5E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Cadmium	2.1E-03	mg/L	3.1E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Cadmium	2.1E-03	mg/L	1.8E-07	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	5E-05	3E-08	5E-06	5E-05
			Cadmium	NV	5E-09	NV	5E-09
			Chemical Total	5E-05	3E-08	5E-06	5E-05
			Exposure Medium Total				5E-05
Soil Total							5E-05
Groundwater	Groundwater	Potable Well	Cadmium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 5E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	2.1E+01	mg/kg	9.3E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
	Cadmium	8.7E+00	mg/kg	3.9E-05	mg/kg-day	1.0E-03	mg/kg-day	4E-02
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	2.1E+01	mg/kg	1.6E-05	mg/kg-day	3.0E-04	mg/kg-day	5E-02
	Cadmium	8.7E+00	mg/kg	2.2E-07	mg/kg-day	2.5E-05	mg/kg-day	9E-03
Dermal Absorption Route Total								6E-02
Inhalation	Arsenic	1.5E-08	mg/m <sup>3</sup>	1.0E-08	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	7E-04
	Cadmium	6.4E-09	mg/m <sup>3</sup>	4.3E-09	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								9E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	2.1E-03	mg/L	1.2E-05	mg/kg-day	5.0E-04	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Cadmium	2.1E-03	mg/L	6.8E-08	mg/kg-day	1.3E-05	mg/kg-day	5E-03
Dermal Absorption Route Total								5E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	5E-02	4E-01
			Cadmium	Kidneys	4E-02	--	9E-03	5E-02
			Chemical Total		3E-01	--	6E-02	4E-01
	Exposure Medium Total							4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	7E-04	--	7E-04
			Cadmium	Kidneys	--	2E-04	--	2E-04
			Chemical Total		--	9E-04	--	9E-04
	Exposure Medium Total							9E-04
	Soil Total							4E-01
	Groundwater	Groundwater	Potable Well	Cadmium	Kidneys	2E-02	--	5E-03
Chemical Total					2E-02	--	5E-03	3E-02
Groundwater Total							3E-02	

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI =	7E-04
Total Skin HI =	4E-01
Total Vascular HI =	4E-01
Total Kidneys HI =	8E-02
Total Development HI =	7E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	2.1E+01	mg/kg	3.6E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-06
	Cadmium	8.7E+00	mg/kg	1.5E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								5E-06
Dermal Absorption	Arsenic	2.1E+01	mg/kg	6.8E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
	Cadmium	8.7E+00	mg/kg	9.6E-09	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	1.5E-08	mg/m <sup>3</sup>	1.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	6E-09
	Cadmium	6.4E-09	mg/m <sup>3</sup>	5.5E-10	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								7E-09
Total of Receptor Hazards Across All Media								6E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Cadmium	2.1E-03	mg/L	3.9E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Cadmium	2.1E-03	mg/L	1.5E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0217 :Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	5E-06	6E-09	1E-06	6E-06
			Cadmium	NV	1E-09	NV	1E-09
			Chemical Total	5E-06	7E-09	1E-06	6E-06
			Exposure Medium Total				6E-06
Soil Total						6E-06	
Groundwater	Groundwater	Potable Well	Cadmium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
			Groundwater Total				0E+00

Total risks across all exposure routes and media = 6.E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.18E+00		mg/kg	6.2E+00	3.9E-01	C	YES ASL
Barium	3.14E+02		mg/kg	3.1E+02	1.5E+03	N	NO BSL
Cadmium	4.25E+00		mg/kg	4.3E+00	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.18E+00		6.18E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.54E+02	J	µg/L	4.5E+02	7.3E+02	N	NO	BSL
Cadmium	1.15E+00		µg/L	1.2E+00	1.8E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00	J	0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.54E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	1.15E-03		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0218 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0218 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0218 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0218 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0218 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.2E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.5E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	7.90E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.2E+00	mg/kg	6.64E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.5E-09	mg/m <sup>3</sup>	4.36E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI = 3E-04  
Total Skin HI = 3E-01  
Total Vascular HI = 3E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 3E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Soil Exposure Media: Soil and Air Exposure Point: Residential Property Receptor Population: Resident Receptor Age: Child/Adult, age-adjusted
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	9.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.2E+00	mg/kg	9.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.5E-09	mg/m <sup>3</sup>	1.9E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
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Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	6.2E+00	mg/kg	4.6E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.5E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	2E-02	1E-01
			Chemical Total		9E-02	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
	Soil Total							1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.2E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.2E+00	mg/kg	2.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.5E-09	mg/m <sup>3</sup>	3.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0218 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	9.92E+00		mg/kg	9.9E+00	3.9E-01	C	YES	ASL
Barium	7.13E+02		mg/kg	7.1E+02	1.5E+03	N	NO	BSL
Cadmium	3.47E+00		mg/kg	3.5E+00	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	9.92E+00		9.92E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS

JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Soil
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

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EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Deventc x SAc x EDc x EF/(BWc x AT-C) + Deventa x SAa x EDa x EF/(BWA x AT-C) For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0219 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0219 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0219 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0219 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0219 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	9.9E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	7.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.9E+00	mg/kg	1.27E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	9.9E+00	mg/kg	1.07E-05	mg/kg-day	3.0E-04	mg/kg-day	4E-02
Dermal Absorption Route Total								4E-02
Inhalation	Arsenic	7.3E-09	mg/m <sup>3</sup>	6.99E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	5E-04
Inhalation Route Total								5E-04
Total of Receptor Hazards Across All Media								5E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	4E-01	--	4E-02	5E-01
			Chemical Total		4E-01	--	4E-02	5E-01
			Exposure Medium Total					5E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	5E-04	--	5E-04
			Chemical Total		--	5E-04	--	5E-04
			Exposure Medium Total					5E-04
Soil Total							5E-01	

Total Hazard Across All Media = 5E-01

Total Neurological/Nervous System HI = 5E-04  
 Total Skin HI = 5E-01  
 Total Vascular HI = 5E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 5E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.9E+00	mg/kg	1.6E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	9.9E+00	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	7.3E-09	mg/m <sup>3</sup>	3.0E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								3E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	3E-05
			Chemical Total	2E-05	1E-08	2E-06	3E-05
			Exposure Medium Total				3E-05
Soil Total						3E-05	

Total risks across all exposure routes and media = 3E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	9.9E+00	mg/kg	4.4E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	9.9E+00	mg/kg	7.5E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	7.3E-09	mg/m <sup>3</sup>	4.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	2E-01
			Chemical Total		1E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
			Soil Total					2E-01

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	9.9E+00	mg/kg	1.7E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
Ingestion Route Total								3E-06
Dermal Absorption	Arsenic	9.9E+00	mg/kg	3.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
Dermal Absorption Route Total								5E-07
Inhalation	Arsenic	7.3E-09	mg/m <sup>3</sup>	6.3E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								3E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0219 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	3E-06	3E-09	5E-07	3E-06
			Chemical Total	3E-06	3E-09	5E-07	3E-06
			Exposure Medium Total				3E-06
Soil Total						3E-06	

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	C	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.56E+00		mg/kg	7.6E+00	3.9E-01	C	YES	ASL
Barium	4.90E+02		mg/kg	4.9E+02	1.5E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.56E+00		7.56E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.00E+02	J	µg/L	8.0E+02	7.3E+02	N YES	ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	8.00E-01	J	8.00E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0223 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0223 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0223 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0223 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0223 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.6E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.6E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.6E+00	mg/kg	9.67E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.6E+00	mg/kg	8.12E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	5.33E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.0E-01	mg/L	5.1E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	8.0E-01	mg/L	3.4E-04	mg/kg-day	1.4E-02	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	3E-01
			Chemical Total		3E-01	--	3E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total							3E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Groundwater Total					3E-01

Total Hazard Across All Media = 6E-01

Total Neurological/Nervous System HI =	4E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	3E-01
Total Development HI =	4E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.6E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.6E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	2.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.0E-01	mg/L	1.2E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.0E-01	mg/L	6.8E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05	
			Chemical Total	2E-05	1E-08	2E-06	2E-05	
			Exposure Medium Total					2E-05
			Soil Total					2E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.6E+00	mg/kg	3.4E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.6E+00	mg/kg	5.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	3.7E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.0E-01	mg/L	4.8E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Barium	8.0E-01	mg/L	2.6E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							1E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-02	--	2E-03	3E-02
			Chemical Total		2E-02	--	2E-03	3E-02
			Groundwater Total					

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	3E-02
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.6E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.6E+00	mg/kg	2.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	4.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										0.0E+00
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.0E-01	mg/L	1.5E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.0E-01	mg/L	5.7E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0223 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06	
			Chemical Total	2E-06	2E-09	4E-07	2E-06	
			Exposure Medium Total					2E-06
			Soil Total					2E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	1.01E+01		mg/kg	1.0E+01	3.9E-01	C	YES ASL
Barium	1.19E+02		mg/kg	1.2E+02	1.5E+03	N	NO BSL
Cadmium	5.92E-01		mg/kg	5.9E-01	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	1.01E+01		1.01E+01	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.66E+02	J	µg/L	8.7E+02	7.3E+02	N	YES	ASL
Cadmium	1.43E+00		µg/L	1.4E+00	1.8E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	8.66E-01	J	8.66E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0224 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0224 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0224 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0224 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0224 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	1.0E+01
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	7.4E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.0E+01	mg/kg	1.29E-04	mg/kg-day	3.0E-04	mg/kg-day	4E-01
Ingestion Route Total								4E-01
Dermal Absorption	Arsenic	1.0E+01	mg/kg	1.08E-05	mg/kg-day	3.0E-04	mg/kg-day	4E-02
Dermal Absorption Route Total								4E-02
Inhalation	Arsenic	7.4E-09	mg/m <sup>3</sup>	7.12E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	5E-04
Inhalation Route Total								5E-04
Total of Receptor Hazards Across All Media								5E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.7E-01	mg/L	5.5E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	8.7E-01	mg/L	3.7E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	4E-01	--	4E-02	5E-01
			Chemical Total		4E-01	--	4E-02	5E-01
			Exposure Medium Total					5E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	5E-04	--	5E-04
			Chemical Total		--	5E-04	--	5E-04
			Exposure Medium Total					5E-04
Soil Total							5E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02	3E-01
			Chemical Total		3E-01	--	3E-02	3E-01
			Groundwater Total					3E-01

Total Hazard Across All Media = 8E-01

Total Neurological/Nervous System HI =	5E-04
Total Skin HI =	5E-01
Total Vascular HI =	5E-01
Total Kidneys HI =	3E-01
Total Development HI =	5E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.0E+01	mg/kg	1.6E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	1.0E+01	mg/kg	1.5E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	7.4E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								3E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.7E-01	mg/L	1.3E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.7E-01	mg/L	7.4E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	3E-05	
			Chemical Total	2E-05	1E-08	2E-06	3E-05	
			Exposure Medium Total					3E-05
			Soil Total					3E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 3E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.0E+01	mg/kg	4.5E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	1.0E+01	mg/kg	7.6E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	7.4E-09	mg/m <sup>3</sup>	5.0E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.7E-01	mg/L	5.2E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	8.7E-01	mg/L	2.8E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS  
CENTRAL TENDENCY EXPOSURE  
JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	3E-02	2E-01
			Chemical Total		2E-01	--	3E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							2E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03	3E-02
			Chemical Total		3E-02	--	2E-03	3E-02
			Groundwater Total					3E-02

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	3E-02
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	1.0E+01	mg/kg	1.8E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
Ingestion Route Total								3E-06
Dermal Absorption	Arsenic	1.0E+01	mg/kg	3.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-07
Dermal Absorption Route Total								5E-07
Inhalation	Arsenic	7.4E-09	mg/m <sup>3</sup>	6.4E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	3E-09
Inhalation Route Total								3E-09
Total of Receptor Hazards Across All Media								3E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.7E-01	mg/L	1.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.7E-01	mg/L	6.1E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0224 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	3E-06	3E-09	5E-07	3E-06	
			Chemical Total	3E-06	3E-09	5E-07	3E-06	
			Exposure Medium Total					3E-06
			Soil Total					3E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 3E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.51E+03		mg/kg	1.5E+03	1.5E+03	N	YES

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/kg	1.51E+03		1.51E+03	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	4.94E+00		µg/L	4.9E+00	4.5E-02	C	YES	ASL
Barium	3.42E+02		µg/L	3.4E+02	7.3E+02	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/L	4.94E-03		4.94E-03	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0226 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0226 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0226 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0226 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0226 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	1.5E+03
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	1.1E-06
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.5E+03	mg/kg	1.9E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Barium	1.5E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								0E+00
Inhalation	Barium	1.1E-06	mg/m <sup>3</sup>	1.1E-06	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	2E-03
Inhalation Route Total								2E-03
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.9E-03	mg/L	3.2E-04	mg/kg-day	3.0E-04	mg/kg-day	1E+00
Ingestion Route Total								1E+00
Dermal Absorption	Arsenic	4.9E-03	mg/L	2.1E-06	mg/kg-day	3.0E-04	mg/kg-day	7E-03
Dermal Absorption Route Total								7E-03
Total of Receptor Hazards Across All Media								1E+00

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Barium	Kidneys	1E-01	--	0E+00	1E-01
			Chemical Total		1E-01	--	0E+00	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Barium	Fetotoxicity	--	2E-03	--	2E-03
			Chemical Total		--	2E-03	--	2E-03
			Exposure Medium Total					2E-03
Soil Total						1E-01		
Groundwater	Groundwater	Potable Well	Arsenic	Skin/Vascular	1E+00	--	7E-03	1E+00
			Chemical Total		1E+00	--	7E-03	1E+00
			Groundwater Total					1E+00

Total Hazard Across All Media = 1E+00

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	1E+00
Total Vascular HI =	1E+00
Total Kidneys HI =	1E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	2E-03

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	1.5E+03	mg/kg	2.4E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.5E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Inhalation	Barium	1.1E-06	mg/m <sup>3</sup>	4.6E-07	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	4.9E-03	mg/L	7.3E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-04
Ingestion Route Total								1E-04
Dermal Absorption	Arsenic	4.9E-03	mg/L	4.2E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	6E-07
Dermal Absorption Route Total								6E-07
Total of Receptor Hazards Across All Media								1E-04

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Barium	NV	NV	NV	0E+00	
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0E+00	
			Exposure Medium Total					0E+00
			Soil Total					0E+00
Groundwater	Groundwater	Potable Well	Arsenic	1.1.E-04	--	6.3.E-07	1E-04	
			Chemical Total	1.1.E-04	--	6.3.E-07	1E-04	
			Groundwater Total					1E-04

Total risks across all exposure routes and media = 1E-04

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.5E+03	mg/kg	6.8E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	1.5E+03	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0E+00
Dermal Absorption Route Total								0E+00
Inhalation	Barium	1.1E-06	mg/m <sup>3</sup>	7.5E-07	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	1E-03
Inhalation Route Total								1E-03
Total of Receptor Hazards Across All Media								4E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	4.9E-03	mg/L	2.9E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	4.9E-03	mg/L	1.6E-07	mg/kg-day	3.0E-04	mg/kg-day	5E-04
Dermal Absorption Route Total								5E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS  
CENTRAL TENDENCY EXPOSURE  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Barium	Kidneys	3E-02	--	0E+00	3E-02
			Chemical Total		3E-02	--	0E+00	3E-02
			Exposure Medium Total					3E-02
	Air	Volatile and Fugitive Dust Emissions	Barium	Fetotoxicity	--	1E-03	--	1E-03
			Chemical Total		--	1E-03	--	1E-03
			Exposure Medium Total					1E-03
Soil Total						4E-02		
Groundwater	Groundwater	Potable Well	Arsenic	Skin/Vascular	1E-01	--	5E-04	1E-01
			Chemical Total		1E-01	--	5E-04	1E-01
			Groundwater Total					1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	3E-02
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	1E-03

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Barium	1.5E+03	mg/kg	2.7E-04	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.5E+03	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Inhalation	Barium	1.1E-06	mg/m <sup>3</sup>	9.6E-08	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
Inhalation Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										0.0E+00
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	4.9E-03	mg/L	9.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	4.9E-03	mg/L	3.5E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	5E-08
Dermal Absorption Route Total								5E-08
Total of Receptor Hazards Across All Media								1E-05

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0226 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Barium	NV	NV	NV	0E+00
			Chemical Total	0E+00	0E+00	0E+00	0E+00
			Exposure Medium Total				0E+00
			Soil Total				0E+00
Groundwater	Groundwater	Potable Well	Arsenic	1E-05	--	5E-08	1E-05
			Chemical Total	1E-05	--	5E-08	1E-05
			Groundwater Total				1E-05

Total risks across all exposure routes and media = 1E-05

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.80E+00		mg/kg	7.8E+00	3.9E-01	C	YES ASL
Barium	5.60E+02		mg/kg	5.6E+02	1.5E+03	N	NO BSL
Cadmium	2.00E+00		mg/kg	2.0E+00	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.80E+00		7.80E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	3.81E+01		µg/L	3.8E+01	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	3.81E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0227 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0227 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0227 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0227 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0227 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.8E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.7E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	9.97E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.8E+00	mg/kg	8.38E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	5.50E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
			Soil Total					4E-01

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
 Total Skin HI = 4E-01  
 Total Vascular HI = 4E-01  
 Total Kidneys HI = 0E+00  
 Total Development HI = 4E-04  
 Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
 Total Blood HI = 0E+00  
 Total Lungs and Respiratory System HI = 0E+00  
 Total Beryllium Sensitization HI = 0E+00  
 Total Hair, Nails, and Teeth HI = 0E+00  
 Total Body and Organ Weights HI = 0E+00  
 Total ESOD HI = 0E+00  
 Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.8E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Inhalation									0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00		



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	3.5E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.8E+00	mg/kg	5.9E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	3.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
			Soil Total					1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.8E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.8E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.7E-09	mg/m <sup>3</sup>	4.9E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0227 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	6.30E+00		mg/kg	6.3E+00	3.9E-01	C	YES	ASL
Barium	3.99E+02		mg/kg	4.0E+02	1.5E+03	N	NO	BSL
Cadmium	7.67E-01		mg/kg	7.7E-01	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.30E+00		6.30E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	7.56E+02		µg/L	7.6E+02	7.3E+02	N	YES	ASL
Cadmium	1.28E+00		µg/L	1.3E+00	1.8E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	7.56E-01		7.56E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0228 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0228 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0228 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0228 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0228 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.3E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.6E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.3E+00	mg/kg	8.05E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.3E+00	mg/kg	6.77E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	4.44E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	7.6E-01	mg/L	4.8E-02	mg/kg-day	2.0E-01	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Barium	7.6E-01	mg/L	3.2E-04	mg/kg-day	1.4E-02	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-01	--	2E-02	3E-01
			Chemical Total		2E-01	--	2E-02	3E-01
			Groundwater Total					3E-01

Total Hazard Across All Media = 6E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	3E-01
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.3E+00	mg/kg	9.9E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.3E+00	mg/kg	9.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	1.9E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	7.6E-01	mg/L	1.1E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	7.6E-01	mg/L	6.4E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05	
			Chemical Total	1E-05	8E-09	1E-06	2E-05	
			Exposure Medium Total					2E-05
			Soil Total					2E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.3E+00	mg/kg	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	6.3E+00	mg/kg	4.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	3.1E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	7.6E-01	mg/L	4.5E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Barium	7.6E-01	mg/L	2.5E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								2E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	2E-02	1E-01
			Chemical Total		9E-02	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							1E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	2E-02	--	2E-03	2E-02
			Chemical Total		2E-02	--	2E-03	2E-02
			Groundwater Total					2E-02

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	2E-02
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.3E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.3E+00	mg/kg	2.1E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.6E-09	mg/m <sup>3</sup>	4.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	7.6E-01	mg/L	1.4E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	7.6E-01	mg/L	5.4E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0228 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06	
			Chemical Total	2E-06	2E-09	3E-07	2E-06	
			Exposure Medium Total					2E-06
			Soil Total					2E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
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Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	7.18E+02		mg/kg	7.2E+02	1.5E+03	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	N	COPC Flag	Rationale for Selection or Deletion [3]
Barium	5.65E+02		µg/L	5.7E+02	7.3E+02	N	NO	BSL
Cadmium	1.84E+00		µg/L	1.8E+00	1.8E+00	N	YES	ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Cadmium	mg/L	1.84E-03		1.84E-03	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Devent \times SA \times ED \times EF / (BW \times AT-N)$  For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0229 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0229 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0229 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0229 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0229 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	1.8E-03	mg/L	1.2E-04	mg/kg-day	5.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Cadmium	1.8E-03	mg/L	7.8E-07	mg/kg-day	1.3E-05	mg/kg-day	6E-02
Dermal Absorption Route Total								6E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Cadmium	Kidneys	2E-01	--	6E-02	3E-01
			Chemical Total		2E-01	--	6E-02	3E-01
Groundwater Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	3E-01
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0.E+00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.0.E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0.E+00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.0.E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0.E+00
Inhalation Route Total								0.0.E+00
Total of Receptor Hazards Across All Media								0.0.E+00

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				



Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Cadmium	1.8E-03	mg/L	2.7E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Cadmium	1.8E-03	mg/L	1.6E-07	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Cadmium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total							0E+00

Total risks across all exposure routes and media = 0E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Cadmium	1.8E-03	mg/L	1.1E-05	mg/kg-day	5.0E-04	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Cadmium	1.8E-03	mg/L	6.0E-08	mg/kg-day	1.3E-05	mg/kg-day	5E-03
Dermal Absorption Route Total								5E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Child
--------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Cadmium	Kidneys	2E-02	--	5E-03	3E-02
			Chemical Total		2E-02	--	5E-03	3E-02
Groundwater Total								3E-02

Total Hazard Across All Media 3E-02

Total Neurological/Nervous System HI =	0E+00
Total Skin HI =	0E+00
Total Vascular HI =	0E+00
Total Kidneys HI =	3E-02
Total Development HI =	0E+00
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0.E+00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.0.E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0.E+00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.0.E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0.E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.8E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0.E+00
Inhalation Route Total								0.0.E+00
Total of Receptor Hazards Across All Media								0.0.E+00

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Cadmium	1.8E-03	mg/L	3.4E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Cadmium	1.8E-03	mg/L	1.3E-08	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0229 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Potable Well	Cadmium	NV	--	NV	0E+00
			Chemical Total	0E+00	--	0E+00	0E+00
Groundwater Total						0E+00	

Total risks across all exposure routes and media = 0E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.69E+02		mg/kg	2.7E+02	1.5E+03	N	NO

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/kg	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/kg	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC
Barium	mg/kg	2.69E+02		0.00E+00	Not a COPC
Beryllium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/kg	0.00E+00		0.00E+00	Not a COPC
Copper	mg/kg	0.00E+00		0.00E+00	Not a COPC
Iron	mg/kg	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/kg	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/kg	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Silver	mg/kg	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/kg	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/kg	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Aluminum			µg/L	0.0E+00	3.7E+03	N	NO	BSL
Antimony			µg/L	0.0E+00	1.5E+00	N	NO	BSL
Arsenic			µg/L	0.0E+00	4.5E-02	C	NO	BSL
Barium			µg/L	0.0E+00	7.3E+02	N	NO	BSL
Beryllium			µg/L	0.0E+00	7.3E+00	N	NO	BSL
Cadmium			µg/L	0.0E+00	1.8E+00	N	NO	BSL
Calcium			µg/L	0.0E+00	NA		NO	NUT
Chromium			µg/L	0.0E+00	4.3E-02	C	NO	BSL
Cobalt			µg/L	0.0E+00	1.1E+00	N	NO	BSL
Copper			µg/L	0.0E+00	1.5E+02	N	NO	BSL
Iron			µg/L	0.0E+00	2.6E+03	N	NO	BSL
Magnesium			µg/L	0.0E+00	NA		NO	NUT
Manganese			µg/L	0.0E+00	8.8E+01	N	NO	BSL
Nickel			µg/L	0.0E+00	7.3E+01	N	NO	BSL
Potassium			µg/L	0.0E+00	NA		NO	NUT
Selenium			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Silver			µg/L	0.0E+00	1.8E+01	N	NO	BSL
Sodium			µg/L	0.0E+00	NA		NO	NUT
Thallium			µg/L	0.0E+00	NSV		YES	NTX
Vanadium			µg/L	0.0E+00	2.6E-01	N	NO	BSL
Zinc			µg/L	0.0E+00	1.1E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] November 2010 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on metallic form

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	0.00E+00		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0230 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0230 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0230 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0230 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0230 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.0
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0230 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child											
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient							
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total			
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Exposure Medium Total			Chemical Total	0.00	--	0.00	0.00	
			Exposure Medium Total								
			Soil	Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--	0.00
						Antimony	0	--	NV	--	0.00
Arsenic	Development, vascular, nervous system	--				0.00	--	0.00			
Barium	Phototoxicity	--				0.00	--	0.00			
Beryllium	Beryllium sensitization (respiratory system)	--				0.00	--	0.00			
Cadmium	Kidneys	--				0.00	--	0.00			
Chromium	Lungs	--				0.00	--	0.00			
Cobalt	Respiratory System	--				0.00	--	0.00			
Copper	NA	--				NV	--	0.00			
Iron	NA	--				NV	--	0.00			
Manganese	Neurological	--				0.00	--	0.00			
Nickel	Respiratory System	--				0.00	--	0.00			
Selenium	Alimentary system, cardiovascular system, nervous system	--				0.00	--	0.00			
Silver	NA	--				NV	--	0.00			
Thallium	NA	--				NV	--	0.00			
Vanadium	NA	--				NV	--	0.00			
Zinc	NA	--				NV	--	0.00			
Exposure Medium Total						Chemical Total	--	0.00	--	0.00	
Exposure Medium Total											
Soil Total											
0.00											
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00			
			Antimony	Blood	0.00	--	0.00	0.00			
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00			
			Barium	Kidneys	0.00	--	0.00	0.00			
			Beryllium	Small intestine	0.00	--	0.00	0.00			
			Cadmium	Kidneys	0.00	--	0.00	0.00			
			Chromium	None Reported	0.00	--	0.00	0.00			
			Cobalt	Blood	0.00	--	0.00	0.00			
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00			
			Manganese	Neurological	0.00	--	0.00	0.00			
			Nickel	Body and Organ weights	0.00	--	0.00	0.00			
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00			
			Silver	Skin	0.00	--	0.00	0.00			
			Thallium	0	NV	--	NV	0.00			
			Vanadium	Kidneys	0.00	--	0.00	0.00			
			Zinc	Erythrocyte Cu/ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00			
			Exposure Medium Total			Chemical Total	0.00	--	0.00	0.00	
			Exposure Medium Total								
			Groundwater Total								
			0.00								
Total Hazard Across All Media											
0.00											
Total Neurological/Nervous System HI											
0.00											
Total Skin HI											
0.00											
Total Vascular HI											
0.00											
Total Kidneys HI											
0.00											
Total Development HI											
0.00											
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI											
0.00											
Total Blood HI											
0.00											
Total Lungs and Respiratory System HI											
0.00											
Total Beryllium Sensitization HI											
0.00											
Total Hair, Nails, and Teeth HI											
0.00											
Total Body and Organ Weights HI											
0.00											
Total ESOD HI											
0.00											
Total Phototoxicity											
0.00											

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk	
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk			
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks				0.0E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
<b>Ingestion Route Total</b>								<b>0.0E+00</b>	
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0E+00	
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks				0.0E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
<b>Dermal Absorption Route Total</b>								<b>0.0E+00</b>	
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00	
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00	
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00	
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks				0.0E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00	
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00	
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV	
<b>Inhalation Route Total</b>								<b>0.0E+00</b>	
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0E+00</b>	

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations					
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk	
				Value	Units	Value	Units		
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0E+00	
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Chromium	0.0E+00	mg/L			See Table for Mutagenic Risks		0.0E+00	
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
	Ingestion Route Total								0.0E+00
	Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Antimony		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Arsenic		0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0E+00	
Barium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Beryllium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Cadmium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Chromium		0.0E+00	mg/L			See Table for Mutagenic Risks		0.0E+00	
Cobalt		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Copper		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Iron		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Manganese		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Nickel		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Selenium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Silver		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Thallium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Vanadium		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Zinc		0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV	
Dermal Absorption Route Total								0.0E+00	
Total of Receptor Hazards Across All Media								0.0E+00	

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.0.E+00
			Antimony	NV	NV	NV	0.0.E+00
			Arsenic	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
			Barium	NV	NV	NV	0.0.E+00
			Beryllium	NV	0.0.E+00	NV	0.0.E+00
			Cadmium	NV	0.0.E+00	NV	0.0.E+00
			Chromium	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
			Cobalt	NV	0.0.E+00	NV	0.0.E+00
			Copper	NV	NV	NV	0.0.E+00
			Iron	NV	NV	NV	0.0.E+00
			Manganese	NV	NV	NV	0.0.E+00
			Nickel	NV	0.0.E+00	NV	0.0.E+00
			Selenium	NV	NV	NV	0.0.E+00
			Silver	NV	NV	NV	0.0.E+00
			Thallium	NV	NV	NV	0.0.E+00
			Vanadium	NV	NV	NV	0.0.E+00
			Zinc	NV	NV	NV	0.0.E+00
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
Exposure Medium Total							0.0.E+00
Soil Total							0.0.E+00
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.0.E+00
			Antimony	NV	--	NV	0.0.E+00
			Arsenic	0.0.E+00	--	0.0.E+00	0.0.E+00
			Barium	NV	--	NV	0.0.E+00
			Beryllium	NV	--	NV	0.0.E+00
			Cadmium	NV	--	NV	0.0.E+00
			Chromium	0.0.E+00	--	0.0.E+00	0.0.E+00
			Cobalt	NV	--	NV	0.0.E+00
			Copper	NV	--	NV	0.0.E+00
			Iron	NV	--	NV	0.0.E+00
			Manganese	NV	--	NV	0.0.E+00
			Nickel	NV	--	NV	0.0.E+00
			Selenium	NV	--	NV	0.0.E+00
			Silver	NV	--	NV	0.0.E+00
			Thallium	NV	--	NV	0.0.E+00
			Vanadium	NV	--	NV	0.0.E+00
			Zinc	NV	--	NV	0.0.E+00
			Chemical Total	0.0.E+00	--	0.0.E+00	0.0.E+00
Groundwater Total							0.0.E+00

Total risks across all exposure routes and media: 0.0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Ingestion Route Total								0.0
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
Dermal Absorption Route Total								0.0
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-03	mg/m <sup>3</sup>	0.00
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-04	mg/m <sup>3</sup>	0.00
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-05	mg/m <sup>3</sup>	0.00
	Chromium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.0E-04	mg/m <sup>3</sup>	0.00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	6.0E-06	mg/m <sup>3</sup>	0.00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	5.0E-05	mg/m <sup>3</sup>	0.00
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E-05	mg/m <sup>3</sup>	0.00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.0E-02	mg/m <sup>3</sup>	0.00
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV
Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	mg/m <sup>3</sup>	NV	
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-04	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-03	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E-03	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-03	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.3E-02	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-02	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-05	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Ingestion Route Total</b>								<b>0.0</b>
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.0E+00	mg/kg-day	0.00
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	6.0E-05	mg/kg-day	0.00
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-05	mg/kg-day	0.00
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.5E-05	mg/kg-day	0.00
	Chromium	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.5E-05	mg/kg-day	0.00
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	4.0E-02	mg/kg-day	0.00
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	7.0E-01	mg/kg-day	0.00
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	9.3E-04	mg/kg-day	0.00
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	8.0E-04	mg/kg-day	0.00
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-03	mg/kg-day	0.00
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-04	mg/kg-day	0.00
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	mg/kg-day	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.8E-06	mg/kg-day	0.00
Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	3.0E-01	mg/kg-day	0.00	
<b>Dermal Absorption Route Total</b>								<b>0.0</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0</b>

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0230 - Jefferson County Mining Site

Scenario Fimeline: Current/Future Receptor Population: Resident Receptor Age: Child										
Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient						
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total		
Soil	Soil	Site Soil	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu,ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Exposure Medium Total							
				Air	Visible and Fugitive Dust Emissions	Aluminum	Neurological	--	0.00	--
			Antimony	0	--	NV	--	0.00		
			Arsenic	Development, vascular, nervous system	--	0.00	--	0.00		
			Barium	Phototoxicity	--	0.00	--	0.00		
			Beryllium	Beryllium sensitization (respiratory system)	--	0.00	--	0.00		
			Cadmium	Kidneys	--	0.00	--	0.00		
			Chromium	Lungs	--	0.00	--	0.00		
			Cobalt	Respiratory System	--	0.00	--	0.00		
			Copper	NA	--	NV	--	0.00		
			Iron	NA	--	NV	--	0.00		
			Manganese	Neurological	--	0.00	--	0.00		
			Nickel	Respiratory System	--	0.00	--	0.00		
			Selenium	Alimentary system, cardiovascular system, nervous system	--	0.00	--	0.00		
			Silver	NA	--	NV	--	0.00		
			Thallium	NA	--	NV	--	0.00		
			Vanadium	NA	--	NV	--	0.00		
			Zinc	NA	--	NV	--	0.00		
Chemical Total					--	0.00	--	0.00		
Exposure Medium Total										
Soil Total										
0.00										
Groundwater	Groundwater	Potable Well	Aluminum	Neurological	0.00	--	0.00	0.00		
			Antimony	Blood	0.00	--	0.00	0.00		
			Arsenic	Skin/Vascular	0.00	--	0.00	0.00		
			Barium	Kidneys	0.00	--	0.00	0.00		
			Beryllium	Small intestine	0.00	--	0.00	0.00		
			Cadmium	Kidneys	0.00	--	0.00	0.00		
			Chromium	None Reported	0.00	--	0.00	0.00		
			Cobalt	Blood	0.00	--	0.00	0.00		
			Copper	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Iron	Gastrointestinal Tract	0.00	--	0.00	0.00		
			Manganese	Neurological	0.00	--	0.00	0.00		
			Nickel	Body and Organ weights	0.00	--	0.00	0.00		
			Selenium	Hair, nails, blood, teeth, skin, central nervous system	0.00	--	0.00	0.00		
			Silver	0	0.00	--	0.00	0.00		
			Thallium	0	NV	--	NV	0.00		
			Vanadium	Kidneys	0.00	--	0.00	0.00		
			Zinc	Erythrocyte Cu,ZnSuperoxide Dismutase (ESOD)	0.00	--	0.00	0.00		
			Chemical Total				0.00	--	0.00	0.00
			Groundwater Total							
			0.00							
Total Hazard Across All Media										
0.00										
Total Neurological/Nervous System HI										
0.00										
Total Skin HI										
0.00										
Total Vascular HI										
0.00										
Total Kidneys HI										
0.00										
Total Development HI										
0.00										
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI										
0.00										
Total Blood HI										
0.00										
Total Lungs and Respiratory System HI										
0.00										
Total Beryllium Sensitization HI										
0.00										
Total Hair, Nails, and Teeth HI										
0.00										
Total Body and Organ Weights HI										
0.00										
Total ESOD HI										
0.00										
Total Phototoxicity										
0.00										

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.0E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
<b>Ingestion Route Total</b>								<b>0.0E+00</b>
Dermal Absorption	Aluminum	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0E+00
	Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/kg		See Table for Mutagenic Risks			0.0E+00
	Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/kg	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
<b>Dermal Absorption Route Total</b>								<b>0.0E+00</b>
Inhalation	Aluminum	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00
	Barium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00
	Cadmium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.9E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00
	Chromium	0.0E+00	mg/m <sup>3</sup>		See Table for Mutagenic Risks			0.0E+00
	Cobalt	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	9.0E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00
	Copper	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	2.4E-01	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0E+00
	Selenium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	NV	(mg/m <sup>3</sup> ) <sup>-1</sup>	NV
<b>Inhalation Route Total</b>								<b>0.0E+00</b>
<b>Total of Receptor Hazards Across All Media</b>								<b>0.0E+00</b>

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Ingestion Route Total							
Dermal Absorption	Aluminum	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Antimony	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Arsenic	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0E+00
	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Beryllium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Cadmium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Chromium	0.0E+00	mg/L					
	Cobalt	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Copper	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Iron	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Manganese	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Nickel	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Selenium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Silver	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Thallium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Vanadium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Zinc	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
	Dermal Absorption Route Total							
Total of Receptor Hazards Across All Media								0.0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0230 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Age-adjustec

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Aluminum	NV	NV	NV	0.0.E+00
			Antimony	NV	NV	NV	0.0.E+00
			Arsenic	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
			Barium	NV	NV	NV	0.0.E+00
			Beryllium	NV	0.0.E+00	NV	0.0.E+00
			Cadmium	NV	0.0.E+00	NV	0.0.E+00
			Chromium	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
			Cobalt	NV	0.0.E+00	NV	0.0.E+00
			Copper	NV	NV	NV	0.0.E+00
			Iron	NV	NV	NV	0.0.E+00
			Manganese	NV	NV	NV	0.0.E+00
			Nickel	NV	0.0.E+00	NV	0.0.E+00
			Selenium	NV	NV	NV	0.0.E+00
			Silver	NV	NV	NV	0.0.E+00
			Thallium	NV	NV	NV	0.0.E+00
			Vanadium	NV	NV	NV	0.0.E+00
			Zinc	NV	NV	NV	0.0.E+00
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
Exposure Medium Total							0.0.E+00
Soil Total							0.0.E+00
Groundwater	Groundwater	Potable Well	Aluminum	NV	--	NV	0.0.E+00
			Antimony	NV	--	NV	0.0.E+00
			Arsenic	0.0.E+00	--	0.0.E+00	0.0.E+00
			Barium	NV	--	NV	0.0.E+00
			Beryllium	NV	--	NV	0.0.E+00
			Cadmium	NV	--	NV	0.0.E+00
			Chromium	0.0.E+00	--	0.0.E+00	0.0.E+00
			Cobalt	NV	--	NV	0.0.E+00
			Copper	NV	--	NV	0.0.E+00
			Iron	NV	--	NV	0.0.E+00
			Manganese	NV	--	NV	0.0.E+00
			Nickel	NV	--	NV	0.0.E+00
			Selenium	NV	--	NV	0.0.E+00
			Silver	NV	--	NV	0.0.E+00
			Thallium	NV	--	NV	0.0.E+00
			Vanadium	NV	--	NV	0.0.E+00
			Zinc	NV	--	NV	0.0.E+00
			Chemical Total	0.0.E+00	--	0.0.E+00	0.0.E+00
Groundwater Total							0.0.E+00

Total risks across all exposure routes and media: 0.0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]		COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	6.00E+00		mg/kg	6.0E+00	3.9E-01	C	YES	ASL
Barium	6.22E+02		mg/kg	6.2E+02	1.5E+03	N	NO	BSL
Cadmium	2.00E+00		mg/kg	2.0E+00	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	6.00E+00		6.00E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	6.27E+01		µg/L	6.3E+01	7.3E+02	N	NO

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	6.27E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup>/event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0232 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0232 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0232 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0232 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0232 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	6.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.4E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.0E+00	mg/kg	7.67E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	6.0E+00	mg/kg	6.44E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.4E-09	mg/m <sup>3</sup>	4.23E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	2E-02	3E-01
			Chemical Total		3E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.0E+00	mg/kg	9.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	6.0E+00	mg/kg	8.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.4E-09	mg/m <sup>3</sup>	1.8E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1E-05	8E-09	1E-06	2E-05
			Chemical Total	1E-05	8E-09	1E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	6.0E+00	mg/kg	2.7E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	6.0E+00	mg/kg	4.5E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.4E-09	mg/m <sup>3</sup>	3.0E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	2E-02	1E-01
			Chemical Total		9E-02	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
	Soil Total							1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	6.0E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	6.0E+00	mg/kg	2.0E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.4E-09	mg/m <sup>3</sup>	3.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0232 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	2.48E+02		mg/kg	2.5E+02	1.5E+03	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	6.33E+01	J	µg/L	6.3E+01	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00	J	0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	6.33E-02		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0234 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0234 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0234 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0234 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0234 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	0.0E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	0.0E+00
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.00E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.00E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0.00	--	0.00	0.0
			Chemical Total		0.00	--	0.00	0.00
			Exposure Medium Total					0.0
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0.00	--	0.0
			Chemical Total		--	0.00	--	0.00
			Exposure Medium Total					0.00
Soil Total							0.0	

Total Hazard Across All Media = 0.0

Total Neurological/Nervous System HI = 0.0  
Total Skin HI = 0.0  
Total Vascular HI = 0.0  
Total Kidneys HI = 0.0  
Total Development HI = 0.0  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0.0  
Total Blood HI = 0.0  
Total Lungs and Respiratory System HI = 0.0  
Total Beryllium Sensitization HI = 0.0  
Total Hair, Nails, and Teeth HI = 0.0  
Total Body and Organ Weights HI = 0.0  
Total ESOD HI = 0.0  
Total Fetotoxicity = 0.0

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0.E+00
Ingestion Route Total								0.0.E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0.E+00
Dermal Absorption Route Total								0.0.E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0.E+00
Inhalation Route Total								0.0.E+00
Total of Receptor Hazards Across All Media								0.0.E+00

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
			Exposure Medium Total				0.0.E+00
Soil Total						0.0.E+00	

Total risks across all exposure routes and media = 0.0.E+00

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	3.0E-04	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	0.00
Inhalation Route Total								0.00
Total of Receptor Hazards Across All Media								0.0

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	0.00	--	0.00	0.0
			Chemical Total		0.00	--	0.00	0.00
			Exposure Medium Total					0.0
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	0.00	--	0.0
			Chemical Total		--	0.00	--	0.00
			Exposure Medium Total					0.0
			Soil Total					0.0

Total Hazard Across All Media = 0.0

Total Neurological/Nervous System HI = 0.0  
Total Skin HI = 0.0  
Total Vascular HI = 0.0  
Total Kidneys HI = 0.0  
Total Development HI = 0.0  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0.0  
Total Blood HI = 0.0  
Total Lungs and Respiratory System HI = 0.0  
Total Beryllium Sensitization HI = 0.0  
Total Hair, Nails, and Teeth HI = 0.0  
Total Body and Organ Weights HI = 0.0  
Total ESOD HI = 0.0  
Total Fetotoxicity = 0.0

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0.E+00
Ingestion Route Total								0.0.E+00
Dermal Absorption	Arsenic	0.0E+00	mg/kg	0.0E+00	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	0.0.E+00
Dermal Absorption Route Total								0.0.E+00
Inhalation	Arsenic	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	0.0.E+00
Inhalation Route Total								0.0.E+00
Total of Receptor Hazards Across All Media								0.0.E+00

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0234 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
			Chemical Total	0.0.E+00	0.0.E+00	0.0.E+00	0.0.E+00
			Exposure Medium Total				
Soil Total						0.0.E+00	

Total risks across all exposure routes and media = 0.0.E+00

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.80E+00		mg/kg	5.8E+00	3.9E-01	C	ASL
Barium	1.95E+02		mg/kg	2.0E+02	1.5E+03	N	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.80E+00		5.80E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	1.10E+00		µg/L	1.1E+00	4.5E-02	C	YES
Barium	1.01E+02		µg/L	1.0E+02	7.3E+02	N	NO

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/L	1.10E-03		1.10E-03	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

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Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0237 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0237 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0237 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0237 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0237 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.8E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	4.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.8E+00	mg/kg	7.42E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	5.8E+00	mg/kg	6.23E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	4.3E-09	mg/m <sup>3</sup>	4.09E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.1E-03	mg/L	7.0E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	1.1E-03	mg/L	4.6E-07	mg/kg-day	3.0E-04	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								2E-01

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	3E-01
			Chemical Total		2E-01	--	2E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	
Groundwater	Groundwater	Potable Well	Arsenic	Skin/Vascular	2E-01	--	2E-03	2E-01
			Chemical Total		2E-01	--	2E-03	2E-01
			Groundwater Total					2E-01

Total Hazard Across All Media = 5E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	5E-01
Total Vascular HI =	5E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.8E+00	mg/kg	9.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.8E+00	mg/kg	8.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	4.3E-09	mg/m <sup>3</sup>	1.8E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	8E-09
Inhalation Route Total								8E-09
Total of Receptor Hazards Across All Media								1E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 - 2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	1.1E-03	mg/L	1.6E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	1.1E-03	mg/L	9.4E-08	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-07
Dermal Absorption Route Total								1E-07
Total of Receptor Hazards Across All Media								2E-05

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	1.4E-05	7.5E-09	1.3E-06	1.5E-05
			Chemical Total	1.4E-05	7.5E-09	1.3E-06	1.5E-05
			Exposure Medium Total				1.5E-05
			Soil Total				1.5E-05
Groundwater	Groundwater	Potable Well	Arsenic	2.5E-05	--	1.4E-07	2.5E-05
			Chemical Total	2.5E-05	--	1.4E-07	2.5E-05
			Groundwater Total				2.5E-05

Total risks across all exposure routes and media = 4.0E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.8E+00	mg/kg	2.6E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
Ingestion Route Total								9E-02
Dermal Absorption	Arsenic	5.8E+00	mg/kg	4.4E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	4.3E-09	mg/m <sup>3</sup>	2.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	1.1E-03	mg/L	6.6E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Ingestion Route Total								2E-02
Dermal Absorption	Arsenic	1.1E-03	mg/L	3.6E-08	mg/kg-day	3.0E-04	mg/kg-day	1E-04
Dermal Absorption Route Total								1E-04
Total of Receptor Hazards Across All Media								2E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	9E-02	--	1E-02	1E-01
			Chemical Total		9E-02	--	1E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total						1E-01		
Groundwater	Groundwater	Potable Well	Arsenic	Skin/Vascular	2E-02	--	1E-04	2E-02
			Chemical Total		2E-02	--	1E-04	2E-02
			Groundwater Total					2E-02

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Soil Exposure Media: Soil and Air Exposure Point: Residential Property Receptor Population: Resident Receptor Age: Child/Adult, age-adjusted
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.8E+00	mg/kg	1.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	5.8E+00	mg/kg	1.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	4.3E-09	mg/m <sup>3</sup>	3.7E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium	Ingestion									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Inhalation									
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00	
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Arsenic	1.1E-03	mg/L	2.0E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-06
Ingestion Route Total								3E-06
Dermal Absorption	Arsenic	1.1E-03	mg/L	7.8E-09	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-08
Dermal Absorption Route Total								1E-08
Total of Receptor Hazards Across All Media								3E-06

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0237 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	3E-07	2E-06
			Chemical Total	2E-06	2E-09	3E-07	2E-06
			Exposure Medium Total				2E-06
			Soil Total				2E-06
Groundwater	Groundwater	Potable Well	Arsenic	3E-06	--	1E-08	3E-06
			Chemical Total	3E-06	--	1E-08	3E-06
			Groundwater Total				3E-06

Total risks across all exposure routes and media = 5E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	7.20E+00		mg/kg	7.2E+00	3.9E-01	C	YES	ASL
Barium	1.53E+02		mg/kg	1.5E+02	1.5E+03	N	NO	BSL
Cadmium	1.10E+00		mg/kg	1.1E+00	7.0E+00	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.20E+00		7.20E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.96E+02		µg/L	5.0E+02	7.3E+02	N	NO

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.96E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Future  
Medium: Soil  
Exposure Medium: Air  
Exposure Point: Soil  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0240 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0240 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0240 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0240 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0240 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.2E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.3E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.2E+00	mg/kg	9.21E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.2E+00	mg/kg	7.73E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	5.08E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								3E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	3E-01
			Chemical Total		3E-01	--	3E-02	3E-01
			Exposure Medium Total					3E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							3E-01	

Total Hazard Across All Media = 3E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	3E-01
Total Vascular HI =	3E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.2E+00	mg/kg	1.1E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.2E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	2.2E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	9E-09
Inhalation Route Total								9E-09
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	9E-09	2E-06	2E-05
			Chemical Total	2E-05	9E-09	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.2E+00	mg/kg	3.2E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.2E+00	mg/kg	5.4E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	3.6E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
			Soil Total					1E-01

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI = 2E-04  
Total Skin HI = 1E-01  
Total Vascular HI = 1E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 2E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.2E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.2E+00	mg/kg	2.4E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.3E-09	mg/m <sup>3</sup>	4.6E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										0.0E+00
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0240 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	5.30E+00		mg/kg	5.3E+00	3.9E-01	C	YES
Barium	5.63E+02		mg/kg	5.6E+02	1.5E+03	N	NO

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
Surface Soil  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	5.30E+00		5.30E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	1.03E+03		µg/L	1.0E+03	7.3E+02	N	YES

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	1.03E+00		1.03E+00	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor 1.36 x 10<sup>-9</sup> m<sup>3</sup>/kg.

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0241 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0241 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0241 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0241 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0241 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	5.3E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	3.9E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.3E+00	mg/kg	6.78E-05	mg/kg-day	3.0E-04	mg/kg-day	2E-01
Ingestion Route Total								2E-01
Dermal Absorption	Arsenic	5.3E+00	mg/kg	5.69E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	3.9E-09	mg/m <sup>3</sup>	3.74E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								2E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	6.6E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	1.0E+00	mg/L	4.3E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								4E-01

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	2E-01	--	2E-02	2E-01
			Chemical Total		2E-01	--	2E-02	2E-01
			Exposure Medium Total					2E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							2E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Groundwater Total					4E-01

Total Hazard Across All Media = 6E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	2E-01
Total Vascular HI =	2E-01
Total Kidneys HI =	4E-01
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.3E+00	mg/kg	8.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-05
Ingestion Route Total								1E-05
Dermal Absorption	Arsenic	5.3E+00	mg/kg	7.9E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Dermal Absorption Route Total								1E-06
Inhalation	Arsenic	3.9E-09	mg/m <sup>3</sup>	1.6E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	7E-09
Inhalation Route Total								7E-09
Total of Receptor Hazards Across All Media								1E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00		
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	1.5E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.0E+00	mg/L	8.8E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	1E-05	7E-09	1E-06	1E-05	
			Chemical Total	1E-05	7E-09	1E-06	1E-05	
			Exposure Medium Total					1E-05
			Soil Total					1E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 1E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	5.3E+00	mg/kg	2.4E-05	mg/kg-day	3.0E-04	mg/kg-day	8E-02
Ingestion Route Total								8E-02
Dermal Absorption	Arsenic	5.3E+00	mg/kg	4.0E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
Dermal Absorption Route Total								1E-02
Inhalation	Arsenic	3.9E-09	mg/m <sup>3</sup>	2.6E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	2E-04
Inhalation Route Total								2E-04
Total of Receptor Hazards Across All Media								9E-02

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	6.1E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	1.0E+00	mg/L	3.3E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	8E-02	--	1E-02	9E-02
			Chemical Total		8E-02	--	1E-02	9E-02
			Exposure Medium Total					9E-02
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	2E-04	--	2E-04
			Chemical Total		--	2E-04	--	2E-04
			Exposure Medium Total					2E-04
Soil Total							9E-02	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03	3E-02
			Chemical Total		3E-02	--	2E-03	3E-02
			Groundwater Total					3E-02

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	2E-04
Total Skin HI =	9E-02
Total Vascular HI =	9E-02
Total Kidneys HI =	3E-02
Total Development HI =	2E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	5.3E+00	mg/kg	9.3E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	1E-06
Ingestion Route Total								1E-06
Dermal Absorption	Arsenic	5.3E+00	mg/kg	1.7E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	3E-07
Dermal Absorption Route Total								3E-07
Inhalation	Arsenic	3.9E-09	mg/m <sup>3</sup>	3.4E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-09
Inhalation Route Total								1E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	1.0E+00	mg/L	1.9E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	1.0E+00	mg/L	7.3E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0241 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	1E-06	1E-09	3E-07	2E-06	
			Chemical Total	1E-06	1E-09	3E-07	2E-06	
			Exposure Medium Total					2E-06
			Soil Total					2E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Arsenic	7.90E+00		mg/kg	7.9E+00	3.9E-01	C	YES ASL
Barium	3.55E+02		mg/kg	3.6E+02	1.5E+03	N	NO BSL
Cadmium	4.00E+00		mg/kg	4.0E+00	7.0E+00	N	NO BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.90E+00		7.90E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Residential Property

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	8.83E+02		µg/L	8.8E+02	7.3E+02	N	YES ASL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Barium	mg/L	8.83E-01		8.83E-01	Maximum Detection

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times IR \times EF \times ED \times CF \times 1/BW \times 1/AT$
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times SA \times SSAF \times DABS \times CF \times EF \times ED \times 1/BW \times 1/AT$
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.



Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
		AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air
Exposure Point: Soil
Receptor Population: Resident
Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR \times EF \times ED / (BW \times AT-N)$
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	tevent	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IRc	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IRa	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWA \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times tevent$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SAc	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SAa	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	EDc	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	EDa	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BWc	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BWa	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0245 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0245 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m3				
Arsenic	Chronic	1.5E-05	mg/m3	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m3	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m3	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m3	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m3	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m3	Respiratory System		RSL	Nov-10
Copper		NV	mg/m3	NA			
Iron		NV	mg/m3	NA			
Manganese	Chronic	5.0E-05	mg/m3	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m3	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m3	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m3	NA			
Thallium		NV	mg/m3	NA			
Vanadium		NV	mg/m3	NA			
Zinc		NV	mg/m3	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0245 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0245 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0245 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.9E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.8E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.9E+00	mg/kg	1.01E-04	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.9E+00	mg/kg	8.48E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.8E-09	mg/m <sup>3</sup>	5.57E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.8E-01	mg/L	5.6E-02	mg/kg-day	2.0E-01	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Barium	8.8E-01	mg/L	3.7E-04	mg/kg-day	1.4E-02	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Total of Receptor Hazards Across All Media								3E-01

TABLE 9.1  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
Soil Total							4E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-01	--	3E-02	3E-01
			Chemical Total		3E-01	--	3E-02	3E-01
			Groundwater Total					3E-01

Total Hazard Across All Media = 7E-01

Total Neurological/Nervous System HI =	4E-04
Total Skin HI =	4E-01
Total Vascular HI =	4E-01
Total Kidneys HI =	3E-01
Total Development HI =	4E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.9E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.9E+00	mg/kg	1.2E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.8E-09	mg/m <sup>3</sup>	2.4E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations								
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk		
				Value	Units	Value	Units					
Chromium	Ingestion										0.0E+00	
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Dermal Absorption											0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00			
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00			
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00			
	Inhalation											0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00				
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00				



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.8E-01	mg/L	1.3E-02	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.8E-01	mg/L	7.5E-05	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05	
			Chemical Total	2E-05	1E-08	2E-06	2E-05	
			Exposure Medium Total					2E-05
			Soil Total					2E-05
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.9E+00	mg/kg	3.5E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.9E+00	mg/kg	5.9E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.8E-09	mg/m <sup>3</sup>	3.9E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	8.8E-01	mg/L	5.3E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
Ingestion Route Total								3E-02
Dermal Absorption	Barium	8.8E-01	mg/L	2.9E-05	mg/kg-day	1.4E-02	mg/kg-day	2E-03
Dermal Absorption Route Total								2E-03
Total of Receptor Hazards Across All Media								3E-02

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS  
CENTRAL TENDENCY EXPOSURE  
JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	
Groundwater	Groundwater	Potable Well	Barium	Kidneys	3E-02	--	2E-03	3E-02
			Chemical Total		3E-02	--	2E-03	3E-02
			Groundwater Total					3E-02

Total Hazard Across All Media = 2E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	3E-02
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.9E+00	mg/kg	1.4E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.9E+00	mg/kg	2.6E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.8E-09	mg/m <sup>3</sup>	5.0E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Inhalation										0.0E+00
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00			
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	8.8E-01	mg/L	1.6E-03	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0E+00
Dermal Absorption	Barium	8.8E-01	mg/L	6.3E-06	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0E+00
Total of Receptor Hazards Across All Media								0E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0245 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Age-adjusted

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06	
			Chemical Total	2E-06	2E-09	4E-07	2E-06	
			Exposure Medium Total					2E-06
			Soil Total					2E-06
Groundwater	Groundwater	Potable Well	Barium	NV	--	NV	0E+00	
			Chemical Total	0E+00	--	0E+00	0E+00	
			Groundwater Total					0E+00

Total risks across all exposure routes and media = 2E-06

Table 2.1  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Surface Soil Exposure Medium: Surface Soil Exposure Point: Residential Property
-------------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]	
Arsenic	7.60E+00		mg/kg	7.6E+00	3.9E-01	C	YES	ASL
Barium	2.85E+02		mg/kg	2.9E+02	1.5E+03	N	NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for residential soil (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.1  
 Surface Soil  
 EXPOSURE POINT CONCENTRATION SUMMARY  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Surface Soil

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Arsenic	mg/kg	7.60E+00		7.60E+00	Maximum Detection

[1] Due to limited number of composite samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 2.2  
 OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN  
 Residential Property  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Medium: Groundwater Exposure Medium: Groundwater Exposure Point: Residential Property
-----------------------------------------------------------------------------------------------------------------------------------

Chemical	Maximum Concentration	Maximum Qualifier	Units	Concentration Used for Screening [1]	Screening Toxicity Value [2]	COPC Flag	Rationale for Selection or Deletion [3]
Barium	4.13E+02		µg/L	4.1E+02	7.3E+02	N NO	BSL

[1] Maximum detected concentration used for screening.

[2] June 2011 RSL for tap water (risk = 1E-06; HQ = 0.1).

[3] Rationale Codes: Above Screening Levels (ASL), Below Screening Level (BSL), Nutrient (NUT), NTX (no toxicity value)

Notes:

RSL for chromium based on hexavalent form

RSL for vanadium based on vanadium and compounds

Table 3.2  
Groundwater  
EXPOSURE POINT CONCENTRATION SUMMARY  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater

Chemical of Potential Concern	Units	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure and Central Tendency Exposure <sup>[1]</sup>	
				Medium EPC Value	Medium EPC Statistic
Aluminum	mg/L	0.00E+00		0.00E+00	Not a COPC
Antimony	mg/L	0.00E+00		0.00E+00	Not a COPC
Arsenic	mg/L	0.00E+00		0.00E+00	Not a COPC
Barium	mg/L	4.13E-01		0.00E+00	Not a COPC
Beryllium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cadmium	mg/L	0.00E+00		0.00E+00	Not a COPC
Chromium	mg/L	0.00E+00		0.00E+00	Not a COPC
Cobalt	mg/L	0.00E+00		0.00E+00	Not a COPC
Copper	mg/L	0.00E+00		0.00E+00	Not a COPC
Iron	mg/L	0.00E+00		0.00E+00	Not a COPC
Manganese	mg/L	0.00E+00		0.00E+00	Not a COPC
Nickel	mg/L	0.00E+00		0.00E+00	Not a COPC
Selenium	mg/L	0.00E+00		0.00E+00	Not a COPC
Silver	mg/L	0.00E+00		0.00E+00	Not a COPC
Thallium	mg/L	0.00E+00		0.00E+00	Maximum Detection
Vanadium	mg/L	0.00E+00		0.00E+00	Not a COPC
Zinc	mg/L	0.00E+00		0.00E+00	Not a COPC

[1] Due to limited number of samples collected at each property, the exposure point concentration is equal to the maximum detected concentration.

Table 4.1  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Surface Soil  
 Exposure Medium: Soil  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = CS x IR x EF x ED x CF x 1/BW x 1/AT
	IR	Ingestion Rate of Soil	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = CS x SA x SSAF x DABS x CF x EF x ED x 1/BW x 1/AT
	SA	Skin Surface Area Available for Contact	cm <sup>2</sup>	2,800	EPA, 2004	2800	EPA, 2004	
	SSAF	Soil to Skin Adherence Factor	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001		
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
AT	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	730	EPA, 1989		

Notes:

[1] Mean ingestion rate for children, Table 4-23, EPA, 1997.

Sources:

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Table 4.2  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Soil  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Ingestion	CS	Soil Concentration	mg/kg	see Table 3.1				Chronic Daily Intake (CDI) (mg/kg-day) = $CS \times CF \times EF \times [(IR-C \times ED-C/BW-C) + (IR-A \times ED-A/BW-A)] \times 1/AT$
	IR-C	Ingestion Rate of Soil, Child	mg/day	200	EPA, 1991	100	[1], EPA, 1997	
	IR-A	Ingestion Rate of Soil, Adult	mg/day	100	EPA, 1991	50	[1], EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	CS	Soil Concentration	mg/kg	see Table 3.1				CDI (mg/kg-day) = $CS \times CF \times DABS \times EF \times 1/AT \times [(SA-C \times SSAF-C \times ED-C/BW-C) + (SA-A \times SSAF-A \times ED-A/BW-A)]$
	SA-C	Skin Surface Area, child	cm <sup>2</sup>	2,800	EPA, 2004	2,800	EPA, 2004	
	SSAF-C	Soil to Skin Adherence Factor, child	mg/cm <sup>2</sup> -day	0.2	EPA, 2004	0.2	EPA, 2004	
	SA-A	Skin Surface Area, adult	cm <sup>2</sup>	5,700	EPA, 2004	5,700	EPA, 2004	
	SSAF-A	Soil to Skin Adherence Factor, adult	mg/cm <sup>2</sup> -day	0.07	EPA, 2004	0.07	EPA, 2004	
	DABS	Dermal Absorption Factor Solids	--	chem. specific	EPA, 2004	chem. specific	EPA, 2004	
	CF	Conversion Factor	kg/mg	0.000001	--	0.000001	--	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED-C	Exposure Duration -child	years	6	EPA, 1991	2	[2]	
	ED-A	Exposure Duration - adult	years	24	EPA, 1991	7	[2]	
	BW-C	Body weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW-A	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

Notes:

[1] Mean ingestion rates for children and adults, Table 4-23, EPA, 1997.

[2] 50th percentile of time spent at one residence is 9 years (EPA, 1997, Table 15-176). It is assumed that 6 years are as a child, and 3 years as an adult.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, August 1997.

EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.

Table 4.3  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Future  
 Medium: Soil  
 Exposure Medium: Air  
 Exposure Point: Soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	AT	Averaging Time	hours	52,560	EPA, 2009	17,520	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.4  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Surface Soil  
Exposure Medium: Air  
Exposure Point: Residential Property  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Routes	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference	CTE Value	CTE Rationale/Reference	Intake Equation/Model Name
Inhalation	CA	Air Concentration	mg/m <sup>3</sup>	[1]		[1]		Adjusted air concentration (mg/m <sup>3</sup> ) = CA x ET x EF x ED x 1/AT
	ET	Exposure time	hours/day	24	EPA, 1991	24	EPA, 1991	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	30	EPA, 1991	9	EPA, 2004	
	AT	Averaging Time	hours	613,200	EPA, 2009	613,200	EPA, 2009	

Notes:

[1] Air concentration estimated by dividing the soil exposure point concentration by the default particulate emissions factor  $1.36 \times 10^{-9} \text{ m}^3/\text{kg}$ .

Sources:

- EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
- EPA, 2004. Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. OSWER 9285.7-02EP.
- EPA, 2009. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. OSWER 9285.7-82, January 2009.

Table 4.5  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Child Resident  
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = Cw x IR x EF x ED / (BW x AT-N)
	IR	Ingestion Rate	L/day	1	EPA, 1997	0.4	[1]	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		CDI = Devent x SA x ED x EF/(BW x AT-N)  For inorganics: Devent = Cw x CF x Kp x tevent
	CF	Conversion Factor	L/cm <sup>3</sup>	0.001		0.001		
	SA	Skin Surface Area	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event</sub>	Exposure time	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED	Exposure Duration	years	6	EPA, 1991	2	EPA, 1991	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW	Body Weight	kg	15	EPA, 1991	15	EPA, 1991	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	EPA, 1989	2,190	EPA, 1989	

cm<sup>2</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

mg/L = milligrams per liter

mg/cm<sup>2</sup>-event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

Table 4.6  
VALUES USED FOR DAILY INTAKE CALCULATIONS  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Medium: Groundwater  
Exposure Medium: Groundwater  
Exposure Point: Potable Water Well  
Receptor Population: Resident  
Receptor Age: Age-adjusted

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		Chronic Daily Intake (CDI) (mg/kg-day) = $Cw \times IR_{age-adj} \times EF / AT-C$  $IR_{age-adj} = (EDc \times IRc/BWc) + (EDa \times IRa/BWa)$
	IR <sub>age-adj</sub>	Ingestion Rate, age-adjusted	L-year/kg-day	1.09	calculated			
	IR <sub>c</sub>	Ingestion Rate - child	L/day	1	EPA, 1997	0.4	[1]	
	IR <sub>a</sub>	Ingestion Rate - adult	L/day	2	EPA, 1991	1.4	EPA, 1997	
	EF	Exposure Frequency	days/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 1991	7	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	
Dermal Absorption	Cw	Chemical Concentration in Water	mg/L	Table 3.2		Table 3.2		$CDI = Deventc \times SAc \times EDc \times EF / (BWc \times AT-C) + Deventa \times SAa \times EDa \times EF / (BWa \times AT-C)$ For inorganics: $Devent = Cw \times CF \times Kp \times t_{event}$
	CF	Conversion Factor (CF)	L/cm <sup>3</sup>	0.001		0.001		
	SA <sub>c</sub>	Skin Surface Area - child	cm <sup>2</sup> /event	6,600	EPA, 2004	6,600	EPA, 2004	
	SA <sub>a</sub>	Skin Surface Area - adult	cm <sup>2</sup> /event	18,000	EPA, 2004	18,000	EPA, 2004	
	Devent	Dermally Absorbed Dose per Event	mg/cm <sup>2</sup> -event	calculated	EPA, 2004	calculated	EPA, 2004	
	t <sub>event - c</sub>	Exposure time - child	hours/event	1	EPA, 2004	0.33	EPA, 2004	
	t <sub>event - a</sub>	Exposure time - adult	hours/event	0.58	EPA, 2004	0.25	EPA, 2004	
	EF	Exposure Frequency	events/year	350	EPA, 1991	245	EPA, 1991	
	ED <sub>c</sub>	Exposure Duration - child	years	6	EPA, 1991	2	EPA, 1991	
	ED <sub>a</sub>	Exposure Duration - adult	years	24	EPA, 2004	7	EPA, 2004	
	Kp	Permeability Coefficient	cm/hr	chem specific	EPA, 2004	chem specific	EPA, 2004	
	BW <sub>c</sub>	Body Weight - child	kg	15	EPA, 1991	15	EPA, 1991	
	BW <sub>a</sub>	Body Weight - adult	kg	70	EPA, 1991	70	EPA, 1991	
	AT-C	Averaging Time (Cancer)	days	25,550	EPA, 1989	25,550	EPA, 1989	

cm<sup>3</sup> /event = square centimeter per event

cm/hr = centimeter per hour

hrs = hours

hr/event = hour per event

kg = kilogram

L/cm<sup>3</sup> = liters per cubic centimeter

L/day = liters per day

L-year/kg-day = liters per year per kilograms per day

mg/L = milligrams per liter

mg/cm<sup>2</sup> -event = milligram per square centimeter per event

Notes:

[1] Mean daily ingestion rate for children ages < 1 - < 6 years, EPA 2008

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/8-89/043.

EPA, 2004: Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, EPA/540/R/99/005, July 2004.

TABLE 5.1  
NON-CANCER TOXICITY DATA -- ORAL/DERMAL  
JC-0246 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [3]
Aluminum	Chronic	1.0E+00	mg/kg-day	1	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/21/04
Antimony	Chronic	4.0E-04	mg/kg-day	0.15	6.0E-05	mg/kg-day	Blood	1000/1	IRIS	Mar-11
Arsenic	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Skin/Vascular	3/1	IRIS	Mar-11
Barium	Chronic	2.0E-01	mg/kg-day	0.07	1.4E-02	mg/kg-day	Kidneys	300/1	IRIS	Mar-11
Beryllium	Chronic	2.0E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300/1	IRIS	Mar-11
Cadmium	Chronic	1.0E-03	mg/kg-day	0.025	2.5E-05	mg/kg-day	Kidneys	10/1	IRIS	Mar-11
Chromium	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	None Reported	300/3	IRIS	Mar-11
Cobalt	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	Blood		RSL	Nov-10
Copper	Chronic	4.0E-02	mg/kg-day	1	4.0E-02	mg/kg-day	Gastrointestinal Tract	N/A	RSL	Nov-10
Iron	Chronic	7.0E-01	mg/kg-day	1	7.0E-01	mg/kg-day	Gastrointestinal Tract	1.5	PPRTV	Sep-06
Manganese	Chronic	2.3E-02	mg/kg-day	0.04	9.3E-04	mg/kg-day	Neurological	3/2	IRIS	Mar-11
Nickel	Chronic	2.0E-02	mg/kg-day	0.04	8.0E-04	mg/kg-day	Body and Organ weights	300/1	IRIS	Mar-11
Selenium	Chronic	5.0E-03	mg/kg-day	1	5.0E-03	mg/kg-day	Hair, nails, blood, teeth, skin, central nervous system	3/1	IRIS	Mar-11
Silver	Chronic	5.0E-03	mg/kg-day	0.04	2.0E-04	mg/kg-day	Skin	3/1	IRIS	Mar-11
Thallium	Chronic	NV	mg/kg-day	1	NV	mg/kg-day				
Vanadium	Chronic	7.0E-05	mg/kg-day	0.026	1.8E-06	mg/kg-day	Kidneys		PPRTV	Sep-09
Zinc	Chronic	3.0E-01	mg/kg-day	1	3.0E-01	mg/kg-day	Erythrocyte Cu,Zn-Superoxide Dismutase (ESOD)	3/1	IRIS	Mar-11

IRIS = EPA Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

NV = no toxicity value

Target organs for cobalt and copper obtained from Agency for Toxic Substance and Disease Registry Minimal Risk Level list.

Oral-to-dermal adjustment factor for aluminum provided by J. Hubbard, EPA Region III

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) Oral RfD\*Oral to Dermal Adjustment Factor = Adjusted Dermal RfD

(3) For IRIS values, date that IRIS was searched

For RSL values, date of table

For PPRTV values, date of document

TABLE 5.2, Surface Soil  
NON-CANCER TOXICITY DATA -- INHALATION  
JC-0246 : Jefferson County Mining Site

Chemical of Potential Concern	Chronic/ Subchronic	RfC Value	RfC Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY) [1]
Aluminum	Chronic	5.0E-03	mg/m <sup>3</sup>	Neurological	300	PPRTV	10/21/04
Antimony	Chronic	NV	mg/m <sup>3</sup>				
Arsenic	Chronic	1.5E-05	mg/m <sup>3</sup>	Development, vascular, nervous system		CalEPA	Mar-11
Barium	Chronic	5.0E-04	mg/m <sup>3</sup>	Fetotoxicity	1000	HEAST	Jul-97
Beryllium	Chronic	2.0E-05	mg/m <sup>3</sup>	Beryllium sensitization (respiratory system)	10/1	IRIS	Mar-11
Cadmium	Chronic	2.0E-05	mg/m <sup>3</sup>	Kidneys	9	ATSDR	Mar-11
Chromium	Chronic	1.0E-04	mg/m <sup>3</sup>	Lungs	300/1	IRIS	Mar-11
Cobalt	Chronic	6.0E-06	mg/m <sup>3</sup>	Respiratory System		RSL	Nov-10
Copper		NV	mg/m <sup>3</sup>	NA			
Iron		NV	mg/m <sup>3</sup>	NA			
Manganese	Chronic	5.0E-05	mg/m <sup>3</sup>	Neurological	1000/1	IRIS	Mar-11
Nickel		9.0E-05	mg/m <sup>3</sup>	Respiratory System	30	ATSDR	Mar-11
Selenium		2.0E-02	mg/m <sup>3</sup>	Alimentary system, cardiovascular system, nervous system		CalEPA	Mar-11
Silver		NV	mg/m <sup>3</sup>	NA			
Thallium		NV	mg/m <sup>3</sup>	NA			
Vanadium		NV	mg/m <sup>3</sup>	NA			
Zinc		NV	mg/m <sup>3</sup>	NA			

IRIS = EPA Integrated Risk Information System

NV = no toxicity value

PPRTV = EPA's Provisional Peer-Reviewed Toxicity Value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA - California Environmental Protection Agency

ATSDR = Agency for Toxic Substance and Disease Registry

HEAST = Health Effects Assessment Summary Tables

Cobalt target organ obtained from ATSDR Minimal Risk Level list

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For PPRTV values, date the file was downloaded from the database

For CalEPA, date that database was searched

TABLE 6.1  
 CANCER TOXICITY DATA -- ORAL/DERMAL  
 JC-0246 : Jefferson County Mining Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [3]
Aluminum	NV	1	NV	(mg/kg-day) <sup>-1</sup>	NV		
Antimony	NV	0.15	NV	(mg/kg-day) <sup>-1</sup>	NV		
Arsenic	1.5E+00	1	1.5E+00	(mg/kg-day) <sup>-1</sup>	A	IRIS	Mar-11
Barium	NV	0.07	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Beryllium	NV	0.007	NV	(mg/kg-day) <sup>-1</sup>			
Cadmium	NV	0.025	NV	(mg/kg-day) <sup>-1</sup>			
Chromium	5.0E-01	0.025	2.0E+01	(mg/kg-day) <sup>-1</sup>		NJDEP	Apr-09
Cobalt	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Copper	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Iron	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Manganese	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Nickel	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>			
Selenium	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Silver	NV	0.04	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11
Thallium	NV	1	NV	(mg/kg-day) <sup>-1</sup>			
Vanadium	NV	0.026	NV	(mg/kg-day) <sup>-1</sup>			
Zinc	NV	1	NV	(mg/kg-day) <sup>-1</sup>	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

RSL = Oak Ridge National Laboratory Regional Screening Level Table

NV= No toxicity value available

(1) EPA 2004. RAGS Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

(2) ORAL CSF/ Oral to Dermal Adjustment Factor = Adjusted Dermal CSF

(3) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

CalEPA - California Environmental Protection Agency

[4] Weight of evidence from IRIS; slope factor from RSL Table

Weight of Evidence:

A - Human carcinogen

D - Not classifiable as a human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans



TABLE 6.2, Surface Soil  
 CANCER TOXICITY DATA -- INHALATION  
 JC-0246 : Jefferson County Mining Site

Chemical of Potential Concern	Inhalation Unit Risk (per ug/m <sup>3</sup> )	Inhalation Unit Risk per mg/m <sup>3</sup>	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YY) [1]
Aluminum	NV	NV			
Antimony	NV	NV			
Arsenic	4.3E-03	4.3E+00	A	IRIS	Mar-11
Barium	NV	NV	D	IRIS	Mar-11
Beryllium	2.4E-03	2.4E+00	B1	IRIS	Mar-11
Cadmium	1.8E-03	1.8E+00	B1	IRIS	Mar-11
Chromium	1.2E-02	1.2E+01	A	IRIS	Mar-11
Cobalt	9.0E-03	9.0E+00		RSL	Nov-10
Copper	NV	NV	D	IRIS	Mar-11
Iron	NV	NV			
Manganese	NV	NV	D	IRIS	Mar-11
Nickel	2.4E-04	2.4E-01	A	IRIS	Mar-11
Selenium	NV	NV	D	IRIS	Mar-11
Silver	NV	NV	D	IRIS	Mar-11
Thallium	NV	NV			
Vanadium	NV	NV			
Zinc	NV	NV	D	IRIS	Mar-11

IRIS = Integrated Risk Information System

NV = no toxicity value

RSL = Oak Ridge National Laboratory Regional Screening Level Table

CalEPA = California Environmental Protection Agency

(1) For IRIS values, date that IRIS was searched

For RSL values, date table was downloaded

For CalEPA, date database was searched.

For nickel, used toxicity value for nickel refinery dust

JC-0246 : Jefferson County Mining Site

Chemical	Conc (mg/kg)
Aluminum	0.0E+00
Antimony	0.0E+00
Arsenic	7.6E+00
Barium	0.0E+00
Beryllium	0.0E+00
Cadmium	0.0E+00
Chromium	0.0E+00
Cobalt	0.0E+00
Copper	0.0E+00
Iron	0.0E+00
Manganese	0.0E+00
Nickel	0.0E+00
Selenium	0.0E+00
Silver	0.0E+00
Thallium	0.0E+00
Vanadium	0.0E+00
Zinc	0.0E+00

PEF = 1.36E+09 m3/kg

PEF is default value from EPA, 2002, for non-excavation activities

Chemical	VOC?	Conc (mg/m3)
Aluminum	No	0.0E+00
Antimony	No	0.0E+00
Arsenic	No	5.6E-09
Barium	No	0.0E+00
Beryllium	No	0.0E+00
Cadmium	No	0.0E+00
Chromium	No	0.0E+00
Cobalt	No	0.0E+00
Copper	No	0.0E+00
Iron	No	0.0E+00
Manganese	No	0.0E+00
Nickel	No	0.0E+00
Selenium	No	0.0E+00
Silver	No	0.0E+00
Thallium	No	0.0E+00
Vanadium	No	0.0E+00
Zinc	No	0.0E+00

TABLE 7.1  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Site soil
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.6E+00	mg/kg	9.72E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
Ingestion Route Total								3E-01
Dermal Absorption	Arsenic	7.6E+00	mg/kg	8.16E-06	mg/kg-day	3.0E-04	mg/kg-day	3E-02
Dermal Absorption Route Total								3E-02
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	5.36E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	4E-04
Inhalation Route Total								4E-04
Total of Receptor Hazards Across All Media								4E-01

TABLE 7.3  
 CALCULATION OF NON-CANCER HAZARDS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Potable Well
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.1  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	3E-01	--	3E-02	4E-01
			Chemical Total		3E-01	--	3E-02	4E-01
			Exposure Medium Total					4E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	4E-04	--	4E-04
			Chemical Total		--	4E-04	--	4E-04
			Exposure Medium Total					4E-04
			Soil Total					4E-01

Total Hazard Across All Media = 4E-01

Total Neurological/Nervous System HI = 4E-04  
Total Skin HI = 4E-01  
Total Vascular HI = 4E-01  
Total Kidneys HI = 0E+00  
Total Development HI = 4E-04  
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI = 0E+00  
Total Blood HI = 0E+00  
Total Lungs and Respiratory System HI = 0E+00  
Total Beryllium Sensitization HI = 0E+00  
Total Hair, Nails, and Teeth HI = 0E+00  
Total Body and Organ Weights HI = 0E+00  
Total ESOD HI = 0E+00  
Total Fetotoxicity = 0E+00

Table 8.1  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Media: Soil and Air  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.6E+00	mg/kg	1.2E-05	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-05
Ingestion Route Total								2E-05
Dermal Absorption	Arsenic	7.6E+00	mg/kg	1.1E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Dermal Absorption Route Total								2E-06
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	2.3E-09	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	1E-08
Inhalation Route Total								1E-08
Total of Receptor Hazards Across All Media								2E-05

Table 8.1a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Dermal Absorption										0.0E+00
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00		
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 6 - 16 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
	Age 16 - 30 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		
	Inhalation										0.0E+00
	Age 0 -2 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 6 - 16 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00			
Age 16 - 30 years	0.0E+00	mg/m3	0.0E+00	mg/m3	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	1	0.0E+00			



Table 8.3  
 CALCULATION OF CANCER RISKS  
 REASONABLE MAXIMUM EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Media: Groundwater
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.3a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, REASONABLE MAXIMUM EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
Age 6 - 16 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 16 - 30 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	1	0.0E+00		

TABLE 9.2  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-05	1E-08	2E-06	2E-05
			Chemical Total	2E-05	1E-08	2E-06	2E-05
			Exposure Medium Total				2E-05
Soil Total						2E-05	

Total risks across all exposure routes and media = 2E-05

TABLE 7.2  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Soil  
 Exposure Medium: Soil  
 Exposure Point: Site soil  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Arsenic	7.6E+00	mg/kg	3.4E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
Ingestion Route Total								1E-01
Dermal Absorption	Arsenic	7.6E+00	mg/kg	5.7E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
Dermal Absorption Route Total								2E-02
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	3.8E-09	mg/m <sup>3</sup>	1.5E-05	mg/m <sup>3</sup>	3E-04
Inhalation Route Total								3E-04
Total of Receptor Hazards Across All Media								1E-01

TABLE 7.4  
 CALCULATION OF NON-CANCER HAZARDS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Medium: Groundwater  
 Exposure Point: Potable Well  
 Receptor Population: Resident  
 Receptor Age: Child

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Intake (Non-Cancer)		Reference Dose or Reference Concentration		Hazard Quotient
		Value	Units	Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E-01	mg/kg-day	0.00
Ingestion Route Total								0.0
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	1.4E-02	mg/kg-day	0.00
Dermal Absorption Route Total								0.0
Total of Receptor Hazards Across All Media								0.0

TABLE 9.3  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
CENTRAL TENDENCY EXPOSURE  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
Receptor Population: Resident  
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical	Non-Carcinogenic Hazard Quotient				
				Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil	Site Soil	Arsenic	Skin/Vascular	1E-01	--	2E-02	1E-01
			Chemical Total		1E-01	--	2E-02	1E-01
			Exposure Medium Total					1E-01
	Air	Volatile and Fugitive Dust Emissions	Arsenic	Development, vascular, nervous system	--	3E-04	--	3E-04
			Chemical Total		--	3E-04	--	3E-04
			Exposure Medium Total					3E-04
Soil Total							1E-01	

Total Hazard Across All Media = 1E-01

Total Neurological/Nervous System HI =	3E-04
Total Skin HI =	1E-01
Total Vascular HI =	1E-01
Total Kidneys HI =	0E+00
Total Development HI =	3E-04
Total Gastrointestinal Tract/Small Intestine/Alimentary System HI =	0E+00
Total Blood HI =	0E+00
Total Lungs and Respiratory System HI =	0E+00
Total Beryllium Sensitization HI =	0E+00
Total Hair, Nails, and Teeth HI =	0E+00
Total Body and Organ Weights HI =	0E+00
Total ESOD HI =	0E+00
Total Fetotoxicity =	0E+00

Table 8.2  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Media: Soil and Air
Exposure Point: Residential Property
Receptor Population: Resident
Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				Cancer Risk
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		
				Value	Units	Value	Units	
Ingestion	Arsenic	7.6E+00	mg/kg	1.3E-06	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	2E-06
Ingestion Route Total								2E-06
Dermal Absorption	Arsenic	7.6E+00	mg/kg	2.5E-07	mg/kg-day	1.5E+00	(mg/kg-day) <sup>-1</sup>	4E-07
Dermal Absorption Route Total								4E-07
Inhalation	Arsenic	5.6E-09	mg/m <sup>3</sup>	4.8E-10	mg/m <sup>3</sup>	4.3E+00	(mg/m <sup>3</sup> ) <sup>-1</sup>	2E-09
Inhalation Route Total								2E-09
Total of Receptor Hazards Across All Media								2E-06

Table 8.2a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations							
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk	
				Value	Units	Value	Units				
Chromium	Ingestion										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Dermal Absorption										
	Age 0 -2 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00	
	Age 2 - 6 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/kg	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	0.0E+00	
	Inhalation										
Age 0 -2 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	10	0.0E+00	0.0E+00		
Age 2 - 6 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/m <sup>3</sup>	0.0E+00	mg/m <sup>3</sup>	1.2E+01	(mg/m <sup>3</sup> ) <sup>-1</sup>	3	0.0E+00	0.0E+00		



Table 8.4  
 CALCULATION OF CANCER RISKS  
 CENTRAL TENDENCY EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Medium: Groundwater  
 Exposure Media: Groundwater  
 Exposure Point: Residential Property  
 Receptor Population: Resident  
 Receptor Age: Child/Adult, age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations				
		Value	Units	Intake (Cancer)		Cancer Slope Factor or Inhalation Unit Risk		Cancer Risk
				Value	Units	Value	Units	
Ingestion	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Ingestion Route Total								0.E+00
Dermal Absorption	Barium	0.0E+00	mg/L	0.0E+00	mg/kg-day	NV	(mg/kg-day) <sup>-1</sup>	NV
Dermal Absorption Route Total								0.E+00
Total of Receptor Hazards Across All Media								0.E+00

Table 8.4a  
 CALCULATION OF CANCER RISKS - AGE-DEPENDENT CALCULATIONS, CENTRAL TENDENCY EXPOSURE  
 JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future  
 Receptor Population: Resident  
 Receptor Age: Child/Adult Age-adjusted

Exposure Route	Chemical of Potential Concern	Exposure Point Concentration		Cancer Risk Calculations						
		Value	Units	Intake (Cancer)		Cancer Slope Factor		Age-Dependent Adjustment Factors (unitless)	Age-Dependent Cancer Risk	Cancer Risk
				Value	Units	Value	Units			
Chromium in Groundwater	Ingestion									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
	Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	5.0E-01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00	
	Dermal Absorption									
	Age 0 -2 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	10	0.0E+00	0.0E+00
Age 2 - 6 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		
Age 6 - 9 years	0.0E+00	mg/L	0.0E+00	mg/kg-day	2.0E+01	(mg/kg-day) <sup>-1</sup>	3	0.0E+00		

TABLE 9.4  
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs  
REASONABLE MAXIMUM EXPOSURE  
JC-0246 : Jefferson County Mining Site

Scenario Timeframe: Current/Future Receptor Population: Resident Receptor Age: Age-adjusted
---------------------------------------------------------------------------------------------------

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Soil and Air	Residential Property	Arsenic	2E-06	2E-09	4E-07	2E-06
			Chemical Total	2E-06	2E-09	4E-07	2E-06
			Exposure Medium Total				2E-06
Soil Total						2E-06	

Total risks across all exposure routes and media = 2E-06