RECORD OF DECISION

FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 AND 2
PHILADELPHIA, PENNSYLVANIA

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION III
PHILADELPHIA, PENNSYLVANIA
AUGUST 2020

FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 AND 2
PHILADELPHIA, PENNSYLVANIA
RECORD OF DECISION

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FIGURES, TABLES, AND APPENDICES

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
AMS	Air Management Services
AR	Administrative Record
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	United States Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
BTAG	Biological Technical Assistance Group
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FSRC	Franklin Smelting & Refining Company
FYR	Five-Year Review
GWCS	Groundwater Cleanup Standard
HDPE	High Density Polyethylene
HHRA	Human Health Risk Assessment
HI	Hazard Index
HMAU	Philadelphia Fire Department Hazardous Materials Administrative Unit
HQ	Hazard Quotient
ICs	Institutional Controls
MCL	Maximum Contaminant Level
MDC	MDC Industries
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MW	Monitoring Well
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEWPCP	Northeast Water Pollution Control Plant
NPL	National Priorities List
OU	Operable Unit
OU-1	Operable Unit 1
OU-2	Operable Unit 2
O&M	Operation and Maintenance
PADEP	Pennsylvania Department of Environmental Protection
PADOH	Pennsylvania Department of Health
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
PGW	Philadelphia Gas Works
PHA	Public Health Assessment
PRAP	Proposed Remedial Action Plan
PRM	Potomac-Raritan-Magothy
PRP	Potentially Responsible Party
PWD	Philadelphia Water Department

RA	Remedial Action
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Levels
SLERA	Screening Level Ecological Risk Assessment
SVOC	Semi-Volatile Organic Compound
TBC	To Be Considered
TCLP	Toxicity Characteristic Leaching Procedure
UECA	Uniform Environmental Covenants Act
UU/UE	Unlimited Use/Unrestricted Exposure
µg/dL	Micrograms per Deciliter
µg/L	Micrograms per Liter
$\mu g/m^3$	Micrograms per Cubic Meter
VOC	Volatile Organic Compound

I. DECLARATION

FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 AND 2
PHILADELPHIA, PENNSYLVANIA

RECORD OF DECISION

RECORD OF DECISION
FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 AND 2

DECLARATION

Site Name and Location

Franklin Slag Pile Superfund Site
Operable Units 1 and 2
Philadelphia, Pennsylvania
CERCLIS ID Number PASFN0305549

Statement of Basis and Purpose

This decision document presents the selected remedy (Selected Remedy) for the Franklin Slag Pile Superfund Site (Site) located in Philadelphia, Pennsylvania (see Figure 1). The Selected Remedy was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended (CERCLA), 42 U.S.C. §§ 9601 et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. The Site is divided into two Operable Units (OUs). Operable Unit 1 (OU-1) consists of slag and soil, Operable Unit 2 (OU-2) consists of groundwater. This decision document explains the factual and legal basis for choosing the selected remedy for OU-1 (OU-1 Remedy) and OU-2 (OU-2 Remedy) .

This decision document is based on the Administrative Record (AR) file for the Site, which was developed in accordance with Section 113 (k) of CERCLA (42 U.S.C. § 9613(k)). This Administrative Record file is available for review online at https://semspub.epa.gov/src/collections/03/AR/PASFN0305549 , at the U.S. Environmental Protection Agency Region (EPA) III Records Center in Philadelphia, Pennsylvania, and at the Richmond Branch Library. The AR file index (Appendix A) identifies each document contained in the AR file upon which the selection of the remedy is based.

The Pennsylvania Department of Environment Protection (PADEP) concurred with the Selected Remedy in a letter dated August 12, 2020.

Assessment of the Site

The Selected Remedy in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Description of the Selected Remedy

The Selected Remedy in this ROD will address the slag pile and contaminated soil (OU-1) and groundwater (OU-2) at the Site. The goal of the OU-1 Remedy is to prevent future potential human exposure to inorganics (metals) in the slag and soil, prevent future potential release of inorganics (metals) to the environment from the slag pile or underlying soil, and prevent future migration of contaminants in slag and soil that would result in groundwater contamination in excess of the applicable standards.

For groundwater, EPA has selected "No Action" as the OU-2 Remedy. No further remedial action is necessary for groundwater at the Site because the slag pile did not contribute to Site groundwater contamination above regional background sources. However, as part of the OU-1 Remedy, EPA will continue to monitor groundwater for at least two years after completion of the OU-1 Remedy to verify that there has not been an increase in Site related groundwater contamination. Groundwater monitoring is not being performed to evaluate groundwater restoration.

EPA completed a Remedial Investigation (RI) for OU-1 in 2007 and a RI for OU-2 in 2018. A combined OU-1 and OU-2 Feasibility Study (FS) was completed in November 2019. The RI/FS identified unacceptable risk associate with exposure to slag and impacted soil.

The OU-1 Remedy in this ROD addresses the threat from contaminated slag and soil at the Site. The Remedial Action Objectives (RAOs) for OU-1 are as follows:

Prevent future potential human exposure to inorganics (metals) in the slag material;

Prevent future potential release of inorganics (metals) to the environment from the slag pile; and

Prevent future migration of contaminants in slag and soil that would result in groundwater contamination in excess of the applicable standards.

The major components of the OU-1 Remedy are:

Excavation of slag and soils contaminated above the clean-up levels;

On-Site treatment with a stabilization agent to decrease the leachability of lead such that the material is no longer classified as a characteristic hazardous waste;

Transport of slag and soil for disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle D facility as non-hazardous solid waste;

Institutional Controls to limit contact with contaminated media by restricting disturbance of soil via grading, excavation, or installation of wells and preventing use of the Site property for purposes other than commercial/industrial, unless approved by EPA and PADEP; and

As part of the construction phase, at least two years of groundwater sampling following slag and soil removal to ensure that such action did not impact area groundwater.

The estimated present worth cost of the Selected Remedial Action is $21,638,100.

Statutory Determinations

The OU-1 Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action (ARARs), is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The OU-1 Remedy will meet the statutory preference for treatment as a principal element. This remedy utilizes permanent solutions to the maximum extent practicable by treating and removing slag and soil that exceed established cleanup levels which allow for commercial/industrial use of the Site.

For OU-2, EPA has determined that no remedial action is necessary for Site groundwater. Once the OU-1 Remedy is implemented, the slag pile and contaminated soil will no longer be a potential source of groundwater contamination. In addition, the slag pile was not found to have been a significant contributor to area-wide groundwater contamination above and beyond other sources in the area.

Because the Selected Remedy will result in hazardous substances remaining at the Site above levels that allow for residential use of the Site and unlimited use and unrestricted exposure (UU/UE), a statutory review will be conducted every five years after initiation of the remedial action to ensure that the Selected Remedy is protective of human health and the environment pursuant to CERCLA Section 121(c) and 40 C.F.R. § 300.430(f)(4)(ii).

Data Certification Checklist

The following information is included in the Decision Summary of this ROD. Additional information can be found in the AR file for this remedial action.

ROD CERTIFICATION CHECKLIST	
Information	Location/Page Number
Chemicals of Concern	Section 5, page 8; Section 7, page 11
Baseline risk	Section 7, page 12; Table 1, page 13
Clean-up levels established for Chemicals of Concern	Section 8, page 14; Table 2, page 15
Current and reasonably anticipated future land use assumptions	Section 6, page 10
Potential future land and groundwater use that will be available at the Site as a result of the implementation of the selected remedy	Section 11, page 25
Estimated remedy cost	Section 9, page 17; Table 4, page 23; Section 11, page 26
Key factors that led to selecting the remedy	Section 11, page 24

PAUL LEONARD Digitally signed by PAUL LEONARD Date: 2020.09.03 16:00:45 -04'00'

Paul Leonard, Director Date
Superfund and Emergency Management Division
EPA Region III

DECISION SUMMARY

FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 AND 2
PHILADELPHIA, PENNSYLVANIA

RECORD OF DECISION

1.0 SITE NAME, LOCATION AND DESCRIPTION

The Franklin Slag Pile (Site) is located in the Port Richmond section of northeast Philadelphia, Pennsylvania, at the intersection of Castor and Delaware Avenues. The Site is bordered by a Conrail rail line to the north; by the closed lagoons belonging to the Philadelphia Water Department (PWD) Northeast Water Pollution Control Plant (NEWPCP) to the north and east; by Delaware Avenue and Tioga Marine Terminal to the southeast; by Castor Avenue, portions of the former Franklin Smelting & Refining Company (FSRC) facility, and the Philadelphia Gas Works (PGW) to the southwest. The Delaware River is less than ¼ mile southeast of the Site. The closest residents are at the intersection of Castor Avenue and Richmond Street which is approximately 1/2 mile from the Site. (Figures 1 and 2)

The Site consists of a large pile of slag situated on an approximately four-acre lot. The volume of the slag pile is estimated to be about 68,000 cubic yards. The slag pile is approximately 250 feet wide by 350 feet long and varies in height from 10 to 40 feet. The slag pile is covered with a 60-millimeter high density polyethylene (HDPE) cover, the grounds surrounding the slag pile are covered with stone, and an 8-foot high barbed-wire fence surrounds the Site property.

The slag was generated as a by-product from a secondary copper smelter operated by FSRC which was located at 3100 Castor Avenue (FSRC Property), adjacent to the northwestern border of the slag pile. FSRC, which operated at the FSRC Property from the 1930's until 1997, made products including blister and black copper, mineral grit, converter slag, zinc oxides, and ammonium sulfate. FSRC started depositing a mineral grit or by-product of the smelting process in a pile at the present Site, beginning as early as the 1930's. An aerial photograph from 1959 shows a visible pile.

MDC Industries (MDC) sold the slag on a consignment basis for FSRC. MDC processed and sold the slag from the 1950's to 1999 at the Site. MDC dried, crushed, and sorted the slag and then sold the slag as sand-blasting grit by the truckload and in 50-pound bags, under the name of Polygrit.

While MDC operated, material from the slag pile was observed to have migrated off the Site on all four sides. The sidewalk between the Site and Delaware Avenue was covered in black slag material. The storm drains along Castor and Delaware Avenues which empty directly into the Delaware River transported slag material. MDC was cited by EPA Region III Water Protection Division in 1999 for releasing lead in storm water run-off that discharged into the Delaware River. Slag was also observed on the neighboring PWD property.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

On October 15 and 16, 1997, EPA conducted an inspection of both the FSRC and MDC properties. Three samples were collected at the Site: one sample was collected directly from the slag pile; the second sample was collected from the access road along the northern property boundary where the slag material had spilled beyond a fence; and the third sample was collected from the sediments in a storm drain on Delaware Avenue where a trail of slag had migrated from the pile. All three of these samples exceeded the Toxicity Characteristic Leaching Procedure (TCLP) level of 5 milligrams per liter (mg/L) for lead. Exceedance of the TCLP level of 5 mg/L indicates the slag is a hazardous waste by characteristic (toxicity).

PADEP and the City of Philadelphia also inspected the MDC facility on several occasions. In February 1988, PADEP sampled the PWD property adjacent to the Site and found lead levels above the 5 mg/L standard for a leaching procedure that was a predecessor test to the TCLP. In April 1995, PADEP collected five samples from the slag pile at the Site. All samples exceeded the TCLP level for lead with results ranging from 5.7 mg/L to 86.6 mg/L. Using an analytical method to quantify the amount of metals in the slag, total lead values ranged from 5,010 to 27,500 milligrams per kilogram (mg/kg). From January through March of 1998, the Philadelphia Fire Department Hazardous Materials Administrative Unit (HMAU) investigated both the FSRC and MDC facilities. A March 16, 1998 HMAU memorandum states that a black substance was passing through MDC's fence. In August 1999, PADEP again took samples from the slag pile. All five samples exceeded the TCLP level for lead, with lead results ranging from 17.5 mg/L to 44.7 mg/L. Using an analytical method to quantify the amount of metals in the slag, total lead values ranged from 4,861 mg/kg to 8,150 mg/kg.

EPA sampled the slag pile and collected samples of Polygrit during a second inspection on June 10 and 11, 1998. Ten composite samples were collected from the pile. All ten samples contained levels of lead that exceeded the TCLP level of 5 mg/L for lead with values ranging from 15.6 mg/L to 36.9 mg/L. In addition, four grab samples of the Polygrit were collected from bags. All four Polygrit samples contained lead levels that exceeded the TCLP level of 5 mg/L, with values ranging from 5.4 mg/L to 8.9 mg/L.

In August 1998, EPA returned to the MDC facility to evaluate the potential for the storm water run-off to transport the slag off that property. This inspection revealed pathways for the slag to migrate from the pile into the surrounding areas. Slag from the pile was found in storm drains that flowed directly into the Delaware River which is less than 1/4 mile from the Site.

As a result, on September 13, 1999, EPA issued MDC a Finding of Violation and Order (Administrative Order Docket No. III-99-025-DN) for Compliance under the Clean Water Act. The Order required MDC to control discharges to the storm drains and place covers over the slag pile. EPA also issued an Administrative Complaint to MDC on September 13, 1999, assessing penalties for past discharges. In January 2000, MDC indicated that it did not intend to act to control or stabilize the slag pile or address the potential threat posed by lead in the pile. Additionally, MDC submitted information stating that it closed the plant on December 30, 1999 and was unable to pay for any clean-up. To prevent further off-Site migration of slag EPA initiated an emergency removal action to stabilize the pile from January 2000 to October 2000. During that timeframe, EPA conducted the following activities:

Demolition and recycling/removal of the office trailer, all process buildings, two baghouses, and four storage silos; Consolidation of the loose slag material into one large pile; Removal of approximately 12,000 tons of slag material for disposal at an off-Site facility; Reconfiguration of the slag pile to facilitate temporary cap installation; Installation of a 60-millimeter HDPE geomembrane cover over the pile; Removal of slag material and soil that had migrated onto the PWD property, the adjacent railroad tracks and the narrow area between the Site fence and Delaware Avenue; Backfilling of excavated areas with clean soil and gravel; Removal of slag material that had migrated into area storm drains; Installation of an 8-foot high chain link fence around the perimeter of the Site to prevent humans and animals from accessing the pile and/or its cover; and Personnel and vehicle gates were installed in the fence along Delaware Avenue and Castor Avenue.

As one of the first emergency response actions at the Site, EPA, on January 5, 2000, collected 10 samples of the slag at the Site. The samples were collected in order to determine the potential hazards of the slag and its associated impact on the environment (Figure 3).

All samples collected were analyzed using the TCLP and were found to contain lead concentrations greater than 5 mg/L. The lead TCLP results ranged from 6.01 mg/L to 21.3 mg/L. There was also one value of cadmium of 3.24 mg/L that was above the cadmium TCLP level of 1.0 mg/L. Using an analytical method to quantify the amount of metals in the slag, EPA detected total lead values in the range from 4,200 mg/kg to 22,100 mg/kg. All samples contained copper, iron, and zinc in concentrations above their respective Risk-Based Concentration (RBC) levels. One slag sample was analyzed for contaminants other than metals including: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs). None of these substances exceeded TCLP levels and none exceeded EPA's RBCs.

Air monitoring stations were located near the Site and surrounding industrial and residential areas. These stations were placed by the City of Philadelphia Air Management Services (AMS). The nearest monitors were located at Castor and Delaware Avenues, which monitored emissions from the slag pile, and on the Philadelphia Gas Works property at Castor Avenue and Carbon Street, which monitored the former smelter on the FSRC Property. Other monitors were located near the residential area at Wheatsheaf Lane and Richmond Avenue and at Wheatsheaf Lane and Carbon Street. A monitor was also placed at the PWD property (Figure 2).

The data collected from the air monitoring stations showed that the airborne lead results declined significantly with the closure of the FSRC smelter in 1997. During smelter operation, lead levels were above the National Ambient Air Quality Standards (NAAQS) for lead. After the smelter closed, the lead levels were reduced below the applicable NAAQS. Additionally, the air monitors in the residential area reported lead levels below the applicable NAAQS during the smelter's operation, and when the smelter closed, the lead levels showed a further reduction. The monitor at Castor and Delaware Avenues continued to show periodic levels of lead above the NAAQS from 1998 through 2000. This result is attributable to emissions from the slag pile since the smelter was no longer in operation. After placement of the HDPE cover by EPA in 2000, levels have been significantly under the NAAQS. A chart showing the monitoring results from 1994 to 2004 in comparison to the NAAQS is included as Figure 6.

When both FSRC and MDC were in operation, the AMS Laboratory recorded the highest concentrations of airborne lead and particulates in Philadelphia County in the samples collected around these facilities. The National Ambient Air Quality Standard (NAAQS) for lead is a quarterly average of 1.5 microgram per cubic meter ($\mu g/m^3$) of air. The quarterly average lead concentrations in air near the facilities from 1994 through 1997 ranged from approximately 5 $\mu g/m^3$ to 10 $\mu g/m^3$, with a high of 22 $\mu g/m^3$ in the fourth quarter of 1994. While the closure of the FSRC facility reduced the amount of airborne particulates and lead in the area dramatically, attainment of the lead NAAQS was not reached until the slag pile was covered with a HDPE cover by EPA in 2000. Once the FSRC facility was closed, the area was able to attain the annual average PM10 NAAQS of 50 $\mu g/m^3$. PM10 are airborne particulate matter less than 10 micrometers in diameter. They pose a health concern because they can be inhaled and accumulate in the respiratory system. The ambient air concentration of PM10 fell well below the standard after the slag pile was covered in 2000. An air monitor was located at Richmond Street and Wheatsheaf Lane to measure ambient air concentrations of lead at the nearest Port Richmond residential area to both the FSRC Property and the Site. While this monitor always showed attainment of the lead NAAQS in the residential area, when the FSRC facility closed, the monitor recorded a significant reduction of ambient lead concentrations. This monitor was decommissioned in the second quarter of 1999.

The Agency for Toxic Substances and Disease Registry (ATSDR), in conjunction with the Pennsylvania Department of Health (PADOH), prepared a Public Health Assessment (PHA) for the Site. ATSDR and PADOH held a public availability meeting on November 19, 2003 in the Port Richmond section of the City of Philadelphia to provide the community with an opportunity to review and comment on an earlier version of the PHA. The final PHA was issued by ATSDR on May 24, 2005 and stated that current on-Site exposure did not pose a public health hazard since the slag pile was covered and was securely fenced. However, the community could have been exposed, prior to placement of the HPDE cover, to contaminants in soil/slag, storm water runoff and air. Furthermore, the public health assessment found that the community would not be exposed to contaminants via groundwater because all residents and businesses in the area receive public water.

The emergency removal action was completed in October 2000. EPA proposed the Site to the National Priorities List (NPL) on September 13, 2001 and added the Site to the NPL on September 25, 2002.

Following the July 2003 OU-1 RI, EPA issued a Proposed Remedial Action Plan (PRAP) in July 2007 that identified its preferred alternative for the permanent remedy for the slag pile. The preferred alternative was to cover the slag pile with a multi-layer cap system under the requirements of the RCRA that included a vegetative cover. The preferred alternative also included partial excavation and off-Site disposal of a relatively small amount of slag material, regrading of the remaining slag pile, installation of security fencing, long-term maintenance and monitoring, and five-year reviews to assess the protectiveness of the remedy. However, after considering public comments on the 2007 Proposed Plan, which indicated concerns about the long-term maintenance of the slag pile, EPA did not issue a ROD at that time. Instead, EPA began to further study the Site, including the slag pile's impact on groundwater, and to develop additional remedial alternatives.

Since that time, EPA has evaluated remedial alternatives for the Site that are protective of human health and the environment, comply with regulations, and address all stakeholder concerns. In 2019, the FS, which addressed both OU-1 and OU-2, was prepared by EPA's contractor. A combined OU-1/OU-2 PRAP was issued January 2020, identifying EPA's preferred alternatives for the permanent remedy at the Site.

3.0 COMMUNITY PARTICIPATION

The RIs, FS, and other AR file documents relating to the Site, were made available to the public. They are located in the AR file, which can be viewed at http://www.epa.gov/arweb. In addition, the detailed AR file can be examined at the following locations:

U.S. EPA Administrative Records Room
Administrative Records Coordinator
1650 Arch Street
Philadelphia, PA 19103-2029
Phone: (215)814-3157
Flours: Monday-Friday 8:30a.m. to 4:30p.m.
By appointment

Port Richmond Branch of the Philadelphia
Free Public Library
2987 Almond Street
Philadelphia, Pennsylvania 19134
Phone: 215-685-9992

General information on the Franklin Slag Pile Site can be found at EPA's website:
https://semspub.epa.gov/src/collections/03/AR/PASFN03Q5549

The notice of availability of these documents was published in The Port Richmond Star on January 8, 2020. In addition, on January 8, 2020, EPA mailed approximately 850 fact sheets summarizing EPA's preferred remedial alternative for the Site to residences and businesses within an approximately 1/2-mile radius of the Site.

From January 8, 2020 to February 7, 2020, EPA held a 30-day public comment period to accept public comments on the remedial alternatives presented in the PRAP and the other documents contained within the AR file for the Site. On January 22, 2020, EPA held a public meeting at the Richmond Public Library at 2987 Almond Street, Philadelphia, Pennsylvania 19134, to discuss the PRAP and accept comments. A transcript of this meeting is included in the AR file. The summary of significant comments received during the public comment period and EPA's responses are included in the Responsiveness Summary, which is a part of this ROD.

4.0 SCOPE AND ROLE OF OPERABLE UNIT

EPA has organized the remedial response at this Site into two OUs. This ROD identifies the OU-1 Remedy as the on-Site treatment to stabilize inorganics within the slag and soil, removal of treated slag and soil, off-Site disposal at a RCRA subtitle D permitted facility, Site regrading, Institutional Controls, and at least two years of groundwater monitoring. The RAOs for OU-1 are as follows:

Prevent future potential human exposure to inorganics (metals) in the slag material;

Prevent future potential release of inorganics (metals) to the environment from the slag pile; and

Prevent future migration of contaminants in slag and soil that would result in groundwater contamination in excess of the applicable standards.

OU-2 addresses risk to groundwater beneath the slag pile. No separate RAOs were developed for groundwater (OU-2) at the Site because the slag pile was not found to have been a significant contributor to area-wide contamination. Historical activities at adjacent properties have contributed to the groundwater contamination. Therefore, it is not possible to define an area or volume of groundwater that is contaminated primarily by the Site and that can be targeted for remediation.

The OU-1 RAOs are described in additional detail in Section 8 of this ROD.

SITE CHARACTERISTICS

Surface Features

The topography on and around the Site is generally flat, urban/industrial land with paved/concrete commercial properties such as the Tioga Marine Terminal, a concrete materials business, and PGW. The exception is the adjacent PWD property which contains the closed sludge lagoons that are impoundments containing *Phragmites* and other vegetation.

Surface Hydrology

The Site is located within the Delaware Direct watershed. Frankford Creek is approximately 3,000 feet northeast of the Site. There are no natural drainages on or in the immediate vicinity of the Site. Runoff from the Site is collected in municipal storm drains located on Delaware Avenue to the southeast, and on Castor Avenue to the southwest, which discharge directly to the Delaware River. The Site is located at the edge of the 100-year flood zone of the Delaware River. As part of the installation process, the HDPE cover was anchored at a depth of 3 feet below ground surface (bgs) around the perimeter of the slag pile to prevent surface water from coming into contact with slag material. In addition, when the Delaware River is high (above flood stage), water backs-up into the storm drains and first floods the area from the subsurface as opposed to the Delaware River overflowing its banks onto the roadways. A suspected open-grate stormwater sump exists at the main gate into the Site property.

Regional Hydrogeology

This section of Philadelphia County is underlain by unconsolidated sediments of the Coastal Plain and by the older crystalline rocks of the Piedmont. Most of the gravels and sands in the unconsolidated sediments yield large supplies of water that are mainly used for industrial and other nondomestic purposes. These sediments form the principal aquifers in Philadelphia. In crystalline rocks, water is present in fractures and openings along planes of bedding, which yield small amounts of water that are used mainly for domestic purposes.

The Potomac-Raritan-Magothy (PRM) aquifer system forms the major unconsolidated part of the confined aquifer system. The lower sand unit is confined by the overlaying lower clay unit, the middle clay, and is the most important confined aquifer in the area. The upper sand unit is confined by the overlaying upper clay unit.

The unconfined (water table) aquifer system consists of the gravel and sands of the Trenton Gravel (unconsolidated sediments). The major sources of recharge to the unconfined aquifer system are precipitation, water from surface sources, and leakage from sewers and water pipes. The lower and upper sand units are unconfined where the overlaying clay units are absent and the sand units are in direct hydraulic contact with the overlying unconsolidated deposits (i.e., the Trenton Gravel).

Site Hydrogeology

The thickness of the unconsolidated deposits beneath the Site is unknown, as none of the borings reached bedrock. The deepest boring terminated at 91 feet below ground surface (ft bgs) due to refusal. The observations made during the subsurface soil characterization indicate that underlying material (beginning at approximately 90 ft bgs) is part of the Trenton Gravel and could potentially represent the Middle Clay unit of the PRM.

The Delaware River enters the Coastal Plain at Trenton, New Jersey, where it becomes a tidal stream, and flows in a general southwesterly direction. The flow of the River is affected by tides, which increase in amplitude in an upstream direction as far as the Fall Line. A tongue of salty or brackish water moves upstream as far as Marcus Hook, Pennsylvania. Marcus Hook is located over 20 miles south of the Site and is just south of Route 322. The Site is located approximately ¼ mile inland from the Delaware River.

The depth to water in the on-Site wells ranges from 6.34 ft bgs to 12.57 ft bgs. Groundwater is neither mounded nor depressed below the Site. While net groundwater flow is toward the Delaware River, groundwater flows to and from the River in concert with the River's tides. The periodic and repetitive changes in groundwater flow are an important aspect of the Site conceptual model, as, over time, they result in a homogenization and averaging of off-Site and on-Site groundwater contamination.

Nature and Extent of Contamination

The nature and extent of contamination from the slag pile was evaluated during the OU-1 and OU-2 RIs. The RI Reports (June 2007 and April 2018) are contained in the AR file, and their findings are summarized in this section of the ROD. The sampling of the slag occurred during EPA's removal action in 2000. The sampling of the soils surrounding the slag pile occurred in 2003 as part of the OU-1 RI, and groundwater was sampled as part of the OU-2 RI. The analytical data from these sampling events are included in the RI Report and summarized below.

As part of the OU-1 RI, EPA collected six soil samples outside of the fenced Site property. Two samples were collected on a strip of land between the fence and the curb on Delaware Avenue (SS-1, SS-4); one sample and a duplicate sample were collected on the PWD property (SS-2, SS-3); and two samples were collected along the railroad tracks (SS-5, SS-6). All the samples were analyzed for metals, VOCs, SVOCs, pesticides, and PCBs. The soil samples, SS-2 and SS-3, showed the lowest concentrations of metals: aluminum at 3630 mg/kg, lead at 117 mg/kg, and manganese at 604 mg/kg. The soil samples, SS-1 and SS-4, showed elevated levels of metals: aluminum from 15,200 mg/kg to 18,100 mg/kg, lead from 699 mg/kg to1,690 mg/kg, and manganese from 698 mg/kg to 737mg/kg. The soil samples collected furthest from the Site by the railroad tracks (SS-5, SS-6) showed the highest concentration of metals: aluminum from 12,800 mg/kg to 28,800 mg/kg, lead from 773 mg/kg to 2,090 mg/kg, and manganese from 651 mg/kg to 1,580 mg/kg (Figure 4).

In 2012, an OU-2 RI was initiated to assess potential impacts to groundwater from the slag pile. The RI field investigation activities included the following: installation of four on-Site monitoring wells (MW-1 through MW-4) (Figure 5), collection of subsurface soil samples from the water table interface during the monitoring well installations, and collection of three rounds of slag material. Three groundwater sampling events were conducted in December 2012, April 2013 and December 2013, respectively. Groundwater samples were collected from each of the four monitoring wells during each event. The December 2013 event also included the collection of groundwater samples from five monitoring wells located on the adjacent PWD property, northeast of the Site. The off-Site wells were sampled to provide information on area-wide concentrations of the contaminants of potential concern (COPCs). All groundwater samples were analyzed for Site related VOCs, SVOCs, mercury (total and dissolved fractions), cyanide, pesticides, and PCBs.

Metals, cyanide, pesticides, SVOCs, and VOCs were all detected in the groundwater samples. PCBs were not detected in any samples. No specific VOCs were consistently detected at concentrations greater than screening values, and neither an organic compound contamination plume nor a source of VOC to groundwater was identified at the Site. Arsenic, iron, manganese, and cyanide were consistently detected at concentrations greater than screening values in Site groundwater monitoring wells. Although these inorganic constituents are present in the slag material, they were also reported at elevated concentrations in off-Site groundwater and are associated with historical activities conducted at properties adjacent to the Site. For example, cyanide is a by-product associated with the production processes of manufactured gas; publicly owned wastewater treatment facilities are also a common source of cyanide releases.

In November 2019, the FS for OU-1 and OU-2 was completed and identified alternatives for a remedial action based on the data collected during the previous investigations. The FS summarizes these investigations and identifies alternatives for addressing the risk presented by Site slag, soil, and groundwater.

Conceptual Site Model

A Conceptual Site Model (CSM) diagrams contaminant sources, contaminant release mechanisms and migration routes, exposure pathways, and potential human and ecological receptors. It documents what is known about human and environmental exposure under current and potential future Site conditions.

The CSM was developed to identify which exposure pathways for humans were complete or could potentially be complete in the future. The following discussion identifies complete pathways for potential on-Site and off-Site receptors. Figures 7 and 8 illustrate the CSM for the Site.

The source of contamination at the Site is the slag pile. Based on analytical results, inorganics or metals are the primary Site-related contaminants. The release mechanisms for the slag include: 1) release of slag through storm water runoff into the storm drains where it would discharge to the Delaware River, 2) release of slag through leaching and migrating to subsurface soil and then to the water table where the metals could migrate to the Delaware River, and 3) release of slag into the air, dispersing slag onto neighboring properties.

During MDC's operations at the Site, slag was observed in the storm drains which discharged to the Delaware River. During the EPA removal action in 2000, EPA removed the slag from the storm drains. Prior to the placement of the HDPE cover, metals from the slag may have leached to the soils as a result of infiltrating precipitation. These metals would be available to transfer to the groundwater. Due to the proximity of the Delaware River and the groundwater modeling from the PWD closure plan, it is anticipated that groundwater impacted by the Site discharged to the Delaware River. Also, when the Site was in operation, slag was observed in the air being carried by the wind, and the AMS recorded the highest airborne lead particulates in the county in monitoring locations around the Site.

The migration of contaminants from the slag pile has been significantly reduced due to the HDPE cover over the slag pile. Should a breach of the cover occur in the future, there is the potential for the slag to migrate via wind and storm-water runoff, and for the infiltration of slag to soils and groundwater.

6.0 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

Land use within the vicinity of the Site includes a mix of industrial, commercial, and residential. The Site is zoned for industrial use. The properties immediately adjacent to the Site are industrial, i.e., Tioga Marine Terminal, Philadelphia Gas Works facility, and the NEWPCP facility. The Delaware River is located ¼ mile to the southeast of the Site. The majority of the residential neighborhood is to the west of Interstate-95 which is ½ mile from the Site. There is no use of the groundwater aquifer in the area. The City of Philadelphia is supplied by public water service. Use of groundwater as a water supply is not anticipated in the future.

7.0 SUMMARY OF SITE RISKS

Summary of Human Health Risk Assessment

A human health risk assessment (HHRA) was prepared as part of the OU-1 RI (OU-1 HHRA) to evaluate the potential human health impacts that could result from exposure to the slag and soil. An HHRA was also prepared for the Site groundwater as part of the OU-2 RI (OU-2 HHRA). An HHRA involves assessing the toxicity, or degree of hazard, posed by hazardous substances related to the particular site, and describes the routes by which humans could come into contact with these substances.

The HHRAs identified an unacceptable human health risk associated with the contamination in the slag, soils, and groundwater at the Site under an industrial exposure scenario. EPA has determined that the OU-1 Remedy identified in this ROD is necessary to protect public health and welfare and the environment from actual or threatened releases of hazardous substances, pollutants, and contaminants into the environment.

Exposure Assessment

In accordance with EPA Region III guidance, risk-based screening was performed to identify COPCs in the slag and soil that required further evaluation during the OU-1 HHRA and to determine if they are contaminants of concern (COCs). Potential receptors and exposure pathways were identified based on current and future land use. Exposure routes (i.e., ingestion, dermal contact and inhalation) were evaluated, as appropriate, for the populations potentially affected by the slag and soil. Human receptors evaluated during the risk assessment were: 1) construction worker, 2) adolescent trespasser, and 3) child and adult recreational user. Calculations were performed for substances that cause cancer and for substances that cause an adverse non-cancer health effect.

Likewise, potential receptors and exposure pathways were also identified for groundwater based on current and future groundwater use. Exposure routes were evaluated for the populations potentially affected by the groundwater. Human receptors evaluated during the OU-2 HHRA were: 1) construction worker; 2) off-Site resident adult; and 3) off-Site resident child.

Due to the industrial zoning and land use designation of the Site and the surrounding areas, it is highly unlikely that the area will be developed for residential use in the future. Therefore, the receptors reasonably anticipated to use the Site and potentially be exposed to groundwater under current and future conditions are workers.

Identification of Contaminants of Concern

The NCP establishes a range of acceptable cancer risk for Superfund sites from one in ten thousand to one in one million additional cancer cases, expressed in scientific notation as 1×10^{-4} to 1×10^{-6}, over a lifetime exposure to site-related contaminants. A 1×10^{-4} carcinogenic risk means that one person in ten thousand would have an increased risk for cancer while a 1×10^{-6} carcinogenic risk means that one person in one million would have an increased risk for cancer over a lifetime exposure to site-related COCs.

Additionally, chemicals that are ingested, inhaled, or absorbed through the skin may present non-cancer risks to different organs of the human body. The non-carcinogenic risks, or toxic effects, are expressed as a Hazard Quotient (HQ) calculated for the effect of each COPC on each target human organ; the cumulative risk is expressed as a hazard index (HI). If an HI is less than one (1.0), then exposure to site conditions is not expected to result in adverse effects during a lifetime or part of a lifetime. The NCP establishes an HI exceeding one (1.0) as an unacceptable non-carcinogenic risk.

The COCs are determined by performing a site-specific risk analysis for each COPC and each pathway to indicate areas of current or potential future risk that exceed EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} for carcinogens or exceed an HI of 1 for non- carcinogens.

The OU-1 HHRA identified aluminum, beryllium, cobalt, copper, hexavalent chromium, iron, lead, and manganese as COCs in slag and soil. The OU-2 HHRA identified arsenic, iron, manganese, cyanide, naphthalene, and polycyclic aromatic hydrocarbons (PAHs) as COPCs in groundwater.

Risk Characterization

Carcinogenic Risk:

The cancer risks from potential exposure to slag and soil were within EPA's acceptable range, except for one location with elevated PAHs. That location was within a narrow strip of land between the Site fence and the north side of Delaware Avenue. If a local child playing near the Site were regularly exposed to soil at that one location outside the fence on Delaware Avenue, the increased cancer risk of approximately 3×10^{-4} (or three in ten thousand) could exceed EPA's acceptable range. Slag samples have not shown the consistent presence of PAHs, and the location with elevated PAHs is near the intersection of Delaware and Castor Avenues, indicating a potential association with these roadways. Therefore, EPA has determined that PAHs, which are found in combustion products, are not Site-related and may be the result of contributions from traffic along Delaware Avenue.

The cancer risks from potential exposure to groundwater were above the EPA acceptable risk range of from 1×10^{-4} to 1×10^{-6} for the off-Site resident and construction workers via ingestion, dermal contact with, and inhalation.

Noncarcinogenic risk:

EPA also evaluates the risks of effects other than cancer (noncarcinogenic effects) from chemical exposure. These noncarcinogenic risks are assessed using the HQ.

The HQ is calculated for each chemical, and the HQs are added for a total HI. Ultimately, only chemicals that affect the same target organs are added together and the goal is for the target organ HI to be 1.0 or less. The NCP establishes an HI exceeding 1.0 as an unacceptable non-carcinogenic risk.

HIs for construction workers exposed to slag and off-Site surface soil exceeded 1.0. Inhalation of fugitive dust was the predominant exposure pathway. Manganese, cobalt, aluminum, beryllium, chromium, copper, and iron were the major contributors to the HI for exposure to slag. Aluminum and manganese were the major contributors to the HI for exposures to off-Site surface soil, with cobalt, chromium, copper, and iron also contributing to the hazard at one location. With respect to lead, for construction workers exposed to slag, blood-lead modeling indicated that a lead concentration of 5,890 mg/kg would result in 78 percent of workers having a blood lead level greater than 10 micrograms per deciliter (µg/dL). For construction workers exposed to off-Site surface soil, exposure to the average concentration of lead (1,070 mg/kg) would result in 12.8 percent of workers having a blood lead level great than 10.0 µg/dL. Based on this, more than 5 percent of the fetuses born to construction workers would be predicted to have blood lead levels greater than 10 µg/dL.

Based on the findings of the OU-1 HHRA, the following metals were identified as COCs in slag and surrounding impacted soil: aluminum, beryllium, chromium, cobalt, copper, iron, lead, and manganese (see Table 6-19 in the OU-1 RI, dated 2007).

Table 1. Summary of Human Health Risk Assessment

COC in Slag	Impact on Human Receptor	Exposure Pathway
Aluminum	Construction worker HQ = 3	inhalation of fugitive dust
Beryllium	Construction worker HQ = 3	inhalation of fugitive dust
Chromium	Construction worker HQ = 0.6	inhalation of fugitive dust
Cobalt	Construction worker HQ = 3	inhalation of fugitive dust
Copper	Construction worker HQ = 1	ingestion
Iron	Construction worker HQ = 2	ingestion
Manganese	Construction worker HQ = 18	inhalation of fugitive dust
Lead	More than 5% of the fetuses born to construction workers predicted to have blood lead levels greater than 10 µg/dl	Risk to construction worker based on average concentration in slag samples

The OU-1 HHRA also showed that soils located outside the fenced Site contained concentrations of metals (primarily aluminum, lead, and manganese) that would pose an unacceptable risk to construction workers due to inhaling metals adhered to dust particles. Two samples were collected on a strip of land between the fence and the curb on Delaware Avenue; one sample and a duplicate sample were collected on the PWD property; and two samples were collected along the railroad tracks. All the samples were analyzed for metals, VOCs, SVOCs, pesticides, and PCBs. The sample that was taken furthest from the Site along the railroad tracks was the most contaminated soil sample, with concentrations of aluminum, chromium, cobalt, copper, iron, manganese, and lead. In these off-Site soil sample locations, such as along Delaware Avenue or along the railroad tracks, it is unlikely that the soils could be excavated in sufficient quantities to pose a significant exposure threat to a construction worker. At these off-Site soil sample locations, the land is covered with stone that was placed by EPA during the emergency removal action in 2000. It is also possible that the metals in these off-Site soil samples are the result of a background condition. Specifically, manganese is a commonly occurring metal. It is also possible that the metals in these off-Site soil samples are the result of urban sources in this area such as the railroad, street traffic and industrial businesses.

The OU-2 RI identified similar COPCs which were found to be associated with groundwater from an adjacent property, located cross-gradient of the Site. This finding indicates that there are area-wide risk concerns for exposure to COPCs in groundwater in the vicinity of the Site. Furthermore, the OU-2 HHRA and 2018 supplemental HHRA, concluded that the slag pile is not considered a significant contributor of COPCs to groundwater, above and beyond other area sources.

Summary of Ecological Risk Assessment

An ecological risk assessment evaluates the potential for risks to ecological receptors (such as small mammals, birds, and plants) from exposure to Site contaminants. Screening level ecological risk assessments (SLERAs) for the two Site operable units were performed to assess potential risks to ecological receptors.

The lead concentrations measured in the slag greatly exceed the soil-based ecological screening levels established by EPA Region III, indicating potential risk to both floral and faunal ecological receptors. However, the SLERA for OU-1 concluded that any ecological risks posed by slag and soils at the Site in its present condition were negligible. This conclusion was based on the fact that the slag pile is covered with a geomembrane as well as the lack of natural habitat on the Site or in the vicinity of the Site, which is densely developed. The SLERA for OU-2 evaluated potential discharge of groundwater-containing

COPCs to the Delaware River, and identified cyanide, iron, and PAHs as potentially posing risks to aquatic organisms in the Delaware River, although receptors in the River would not likely be exposed to groundwater level concentrations due to mixing.

Overall, because the existing geomembrane cover is temporary and environmental deterioration or physical destruction of the cover could result in future exposure of ecological receptors to harmful concentrations of metals or future input of contaminants from the slag pile to groundwater, implementation of a permanent remedy is necessary to ensure long-term protection of the environment.

8.0 REMEDIAL ACTION OBJECTIVES

The RAOs for OU-1 at the Site have been developed to address the COCs and exposure pathways listed in the previous section. These RAOs will be the basis for evaluation of remedial alternatives for OU-1.

The RAOs describe both the exposure pathway to be addressed as well as the acceptable risk criteria that serve as the basis for the cleanup level. The RAOs developed for slag and soil at the Site are as follows:

Prevent future potential human exposure to inorganics (metals) in the slag material;

Prevent future potential release of inorganics (metals) to the environment from the slag pile; and

Prevent future migration of contaminants in slag and soil that would result in groundwater contamination in excess of the applicable standards.

No separate RAOs were developed for groundwater (OU-2) at the Site because the slag pile was not found to have been a significant contributor to area-wide contamination above and beyond other area sources.

Cleanup levels are established to meet RAOs, to comply with Federal and State ARARs, be protective of human receptors from adverse health effects, and be protective of the environment from detrimental impacts from Site related compounds. Cleanup levels for the slag material were not developed because, based on testing results, the material is a hazardous waste by characteristic (i.e., toxicity). Table 2, below, summarizes the final soil cleanup levels for each COC. Final soil cleanup levels were developed based on non-residential exposure to a construction worker as described in Section 7 of this ROD.

Table 2. Final Soil Cleanup Levels

COC	Cleanup Level (mg/kg)
Aluminum	**78,000**
Beryllium	**227**
Chromium	**24.9**
Cobalt	**469**
Copper	**1,119**
Iron	**78,540**
Lead	**800**
Manganese	**1,065**

9.0 DESCRIPTION OF REMEDIAL ALTERNATIVES

The alternatives below were evaluated against the OU-1 RAOs listed in the previous section. Superfund law and regulations require that the alternative chosen to clean up a contaminated site meet several criteria. The alternative must protect human health and the environment and meet ARARs. Permanent solutions to contamination, which reduce the volume, toxicity, or mobility of the contaminants, should be developed wherever possible. Emphasis is also placed on treating the wastes at a site whenever possible, and on applying innovative technologies to clean up the contaminants.

The remedial alternatives evaluated for the OU-1 remedial action at the Site are presented below in Table 3. The selected alternative (OU-1 Remedy) is Alternative S4: Complete Removal, On-Site Treatment and Off-Site Disposal.

For groundwater (OU-2), Alternative G1, No Action, was the only alternative considered. As stated above, no separate RAOs were developed for OU-2 because the slag pile was not found to have been a significant contributor to area-wide groundwater contamination.

Table 3. Remedial Alternatives Evaluated for OU-1

Alternative	Description
S1	No Action
S2	Complete Removal and Off-Site Disposal
S3	RCRA Cap, Regrading, and Partial Off-Site Disposal
S4	Complete Removal, On-Site Treatment, and Off-Site Disposal
S5	Complete Removal, Off-Site Treatment and Disposal

Common Elements

Other than the No Action alternative, all alternatives include an institutional controls component. Where slag and/or soil containing metals at concentrations exceeding cleanup levels remain on-Site following remediation, institutional controls would also be implemented to limit contact with these media by restricting the disturbance of contaminated soil via grading, excavation, and preventing the use of the Site property for purposes other than commercial/industrial use, unless approved by EPA and PADEP. The institutional controls would be implemented through an enforceable mechanism such as, but not limited to, an Environmental Covenant pursuant to the Pennsylvania Uniform Environmental Covenants Act, Act No. 68 of 2007, 27 Pa. C.S. §§ 6501-6517 (UECA). Alternatives S2 through S5 also include groundwater sampling for at least 2 years after the OU-1 Remedy has been completed, to monitor COC concentrations and confirm there are no increasing COC concentrations associated with OU-1 remedial activities.

The slag and soil removal alternatives (Alternatives S2, S4, and S5) share many similar features. These alternatives would include removal of the slag pile from the Site, along with soil contaminated with slag-associated metals at concentrations exceeding the soil cleanup levels. Following removal of the slag pile and prior to commencement of soil excavation, surface and subsurface soil sampling would be conducted under and around the footprint of the slag pile to confirm the feasibility of removing the volume of soil determined to contain metals at concentrations exceeding the soil cleanup levels. Soil samples would also be collected following soil excavation to determine as-left conditions. The removed material would be transported for off-Site disposal via either truck or rail, and Site restoration, including backfilling and grading activities, would be conducted. Excavation, transportation and disposal activities would be conducted in accordance with ARARs, including the substantive provisions of RCRA and more stringent substantive requirements under Pennsylvania regulations for air emission and erosion and sediment control. Material stockpiled on-Site would be covered at the conclusion of daily operations to minimize dust and erosion, and silt fencing would be placed around the Site perimeter prior to work start. Air monitoring equipment would be placed at appropriate intervals around the Site throughout the construction period. Excavation activities would be scheduled during normal business hours (to the greatest extent practicable) to minimize disruption to surrounding areas. The Site would remain fenced during excavation, with locked gates and appropriate warning signs to prevent access outside of work hours. The technology and materials required for removal, treatment and disposal are readily available and reliable.

Further details regarding all the alternatives can be found in the FS (November 2019), which is located in the Administrative Record file for the Site.

In accordance with CERCLA Section 121(c), 42 U.S.C. § 9621(c), a performance evaluation must be conducted at least every five (5) years when a remedial action results in any hazardous substances, pollutants, or contaminants remaining on-site. Therefore, Five-Year Reviews (FYR) will be required for OU-1. The first FYR for the Site will be conducted five years after the start of on-Site construction for OU-1 and will be conducted every five years thereafter.

In addition to the common elements of the remedial alternatives discussed above, the following sections describe the additional components of each remedial alternative that EPA considered.

The total present worth cost for each alternative was calculated using a 7% discount rate and an operation and maintenance (O&M) period of 30 years (unless otherwise noted).

ALTERNATIVE S1: NO ACTION

Estimated Capital Cost:	$0
Estimated Present Worth O&M Cost:	$82,574
Estimated Total Present Worth Cost:	$82,574
Estimated Construction Timeframe:	None

Consideration of a No Action alternative is required by the NCP and CERCLA. Alternative 1 would require no additional remedial action to be taken at the Site. The No Action alternative serves as a basis against which the effectiveness of all the other proposed alternatives can be compared. Under this alternative, the Site would remain in its present condition. This option includes neither institutional controls, access restrictions, monitoring, repairing the existing HDPE cover (which would remain in place), nor efforts to contain, remove, treat, or dispose of slag or associated soil at the Site. Implementation of a No Action alternative would require FYRs to ensure protection of human health and the environment.

ALTERNATIVE S2: COMPLETE REMOVAL AND OFFSITE DISPOSAL

Estimated Capital Cost:	$33,776,447
Estimated Present Worth O&M Cost:	$112,262
Estimated Total Present Worth Cost:	$33,888,709
Estimated Construction Timeframe:	1 year
Estimated Time to Achieve RAOs:	< 2 years (not including groundwater monitoring)

Alternative S2 includes: removal of the slag pile, followed by removal of on-Site soils exceeding cleanup levels. The slag and underlying soil would be mechanically removed by an excavator or front-end loader using conventional construction methods. Excavated slag and soil would either be direct loaded for off-Site disposal or be properly stockpiled on-Site pending transport and disposal off-Site. Based on previous sampling results, all the slag material is assumed to be a characteristic hazardous waste under RCRA due to toxicity. An indeterminate volume of soil underlying the pile may also be characterized as hazardous. Hazardous material would be transported in accordance with applicable U.S. Department of Transportation regulations and disposed of in accordance with applicable RCRA regulations at a RCRA Subtitle C facility. Any soil characterized as non-hazardous waste could be disposed of at a RCRA Subtitle D facility. The Site property would be restored to an acceptable appearance by backfilling the excavation area to surrounding grade and placement of a minimum of four inches of stone. Annual groundwater monitoring will take place for at least two years after the slag and soil are removed from the Site. It is expected that implementation of this alternative would take less than two years, not including groundwater monitoring. Institutional controls (ICs) will be put into place and FYRs will be conducted.

ALTERNATIVE S3: RCRA CAP, REGRADING, AND PARTIAL OFFSITE DISPOSAL

Estimated Capital Cost:	$6,473,976
Estimated Present Worth O&M Cost:	$449,260
Estimated Total Present Worth Cost:	$6.923,236
Estimated Construction Timeframe:	8 months
Estimated Time to Achieve RAOs:	< 2 years (not including post closure monitoring)

Alternative S3 includes: partial removal and regrading of the slag pile, followed by installation of a RCRA multi-layer cap over the regraded pile. The removed slag would be handled, transported, and disposed as characteristic hazardous waste, as described for Alternative S2. Slag removal and regrading would be conducted such that the side slopes of the slag pile meet PADEP requirements for landfill capping. The cap would consist of a geosynthetic clay liner, a linear low-density polyethylene membrane, a drainage layer, and vegetation-bearing soil. Maintenance of the Site would include erosion and sedimentation controls, control of tree and plant growth on and around the cap area, fence maintenance, etc. Post-closure monitoring would be conducted in accordance with RCRA regulations. It is expected that this alternative would take less than two years to implement, not including groundwater monitoring. ICs will be put into place and FYRs will be conducted.

ALTERNATIVE S4: COMPLETE REMOVAL, ONSITE TREATMENT, AND OFFSITE DISPOSAL

Estimated Capital Cost:	$21,525,842
Estimated Present Worth O&M Cost:	$112,262
Estimated Total Present Worth Cost:	$21,638,104
Estimated Construction Timeframe:	18 months
Estimated Time to Achieve RAOs:	< 2 years (not including groundwater monitoring)

Alternative S4 includes: removal of the slag pile, followed by removal of on-Site soils exceeding the cleanup levels. Slag and soil would be mechanically removed by an excavator or front-end loader using conventional construction methods. Following excavation from the pile, slag would undergo size segregation, crushing and any other processes necessary to prepare it for treatment. It would then be treated with a stabilization agent to decrease the leachability of lead such that the material is no longer classified as a characteristic hazardous waste. Underlying soils would be sampled to determine whether they meet the cleanup levels or if they require removal from the Site. Excavated soils would be analyzed to determine whether they are characteristic hazardous waste, and then treated as needed to make them nonhazardous. Following confirmation of successful treatment, the non-hazardous slag and soil would be transported for disposal at a RCRA Subtitle D facility as non-hazardous solid waste. The Site property would be restored to an acceptable appearance by backfilling the excavation area to surrounding grade and placement of a minimum of four inches of stone. Annual groundwater monitoring will take place for at least two years after the slag and soil are removed from the Site. It is expected that implementation of this alternative would take less than two years, not including groundwater monitoring. ICs will be put into place and FYRs will be conducted.

ALTERNATIVE S5: COMPLETE REMOVAL, OFFSITE TREATMENT AND DISPOSAL

Estimated Capital Cost:	\$28,357,802
Estimated Present Worth O&M Cost:	\$112,262
Estimated Total Present Worth Cost:	\$28,470,064
Estimated Construction Timeframe:	1 year
Estimated Time to Achieve RAOs:	< 2 years (not including groundwater monitoring)

Alternative S5 includes: removal of the slag pile, followed by removal of on-Site soils exceeding cleanup levels. Slag and soil would be mechanically removed by an excavator or front-end loader using conventional construction methods. Following excavation, slag and soil would be transported off-Site as hazardous waste, in accordance with applicable U.S. Department of Transportation regulations, to a treatment facility. The slag and soil would then be treated with a stabilization agent at the off-Site treatment facility to decrease the leachability of lead such that the material is no longer classified as a characteristic hazardous waste. Following confirmation of successful treatment, the non-hazardous slag and soil would be disposed of. The Site property would be restored to an acceptable appearance by backfilling the excavation area to surrounding grade and placement of a minimum of four inches of stone. Annual groundwater monitoring will take place for at least two years after the slag and soil are removed from the Site. It is expected that implementation of this alternative would take less than two years, not including groundwater monitoring. ICs will be put into place and FYRs will be conducted.

10.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, the remedial alternatives summarized above are compared to each other using the criteria set forth in the NCP at 40 C.F.R. § 300.430(e)(9)(iii). In the remedial decision-making process, EPA profiles the relative performance of each alternative against the evaluation criteria, noting how each compares to the other options under consideration. A detailed analysis of alternatives can be found in the FS which is in the AR file supporting selection of the Selected Remedial Action.

These evaluation criteria relate directly to requirements of Section 121 of CERCLA, 42 U.S.C. § 9621, for determining the overall feasibility and acceptability of a remedial action. The nine criteria fall into three groups described as follows:

Threshold criteria must be satisfied in order for a remedial action to be eligible for selection. The first two criteria are threshold criteria: (1) overall protection of human health and the environment, and (2) compliance with ARARs. The selected remedial action must meet the first and the second criteria

(unless an ARARs waiver is invoked).
Primary balancing criteria are used to weigh major tradeoffs between remedies. The next five criteria are the primary balancing criteria: (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short-term effectiveness; (6) implementability; and (7) cost.

Modifying criteria are formally taken into account after public comment is received on the PRAP. The modifying criteria are the remaining two criteria: (8) State acceptance and (9) community acceptance.

The following discussion summarizes the evaluation of the remedial alternatives developed for the remedial action at the Site against the nine evaluation criteria.

Overall Protectiveness of Human Health and the Environment

Alternative S1 (No Action) does not include measures to prevent future receptors from exposure to hazardous slag or contaminated soil. The baseline OU-1 HHRA indicates that contaminants would present unacceptable risk if human receptors were exposed to slag and on-Site soil. If action is not taken, contaminated slag and soil could expose the public to unacceptable levels of Site-related contaminants. For the short term, Alternative S1 would likely be protective as the HDPE cover and fence would remain in place; however, this alternative would not be protective in the future due to the lack of maintenance of the HDPE cover and fence, and because it does not include institutional controls to prevent contact with contaminated Site media. Because the No Action alternative for OU-1 would not be protective of human health and the environment and fails the threshold criteria, it is eliminated from further consideration under the remaining eight criteria.

Alternatives S2, S4 and S5 would provide protection of human health and the environment. Site COCs would be removed and disposed of in a manner that is protective. These actions would address risks associated with direct contact with the slag and on-Site soil under a non-residential land use scenario. Materials would be disposed of in appropriately permitted landfills, thus preventing future exposure to, or transport of, the contaminants. The institutional controls included in these alternatives would be used to prevent human contact with remaining soils that present an unacceptable risk to human health, such as restrictions on land use, excavation or well installation activities, without approval by EPA and PADEP.

Alternative S3 would also provide adequate protection of human health and the environment by containing the material in the slag pile. The installation of a cap would create a physical barrier between the slag pile and human receptors. The cap would prevent potential direct contact with contaminated slag material and prevent potential migration of material from the slag pile to nearby environmental media. Materials removed from the Site would be disposed of in appropriately permitted landfills, thus preventing future exposure to or transport of the contaminants. Institutional controls would prevent activities that would interfere with the integrity of the cap thereby ensuring that it is not disturbed and remains protective.

Compliance with ARARs

This criterion addresses whether a remedial action will meet ARARs and/or whether there are grounds for invoking a waiver of such ARARs.

Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and the NCP at 40 C.F.R. § 300.430(f)(1)(ii)(B), require that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law, which are collectively referred to as ARARs, unless such ARARs are waived under Section 121(d)(4) of CERCLA, 42 U.S.C. § 9621(d)(4), and the NCP at 40 C.F.R. § 300.430(f)(1)(ii)(C).

"Applicable" requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility-siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Only those State standards that are identified by a State in a timely manner and that are more stringent than Federal requirements may be applicable.

"Relevant and appropriate" requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility-siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified by a State in a timely manner and that are more stringent than Federal requirements may be relevant and appropriate.

EPA also considers to-be-considered material (TBCs) along with ARARs. TBCs are non-promulgated advisories or guidance issued by Federal or State governments that are not legally binding and do not have the status of potential ARARs. EPA may use TBCs in determining the necessary level of cleanup for protection of human health or the environment when ARARs do not exist for particular contaminants.

Alternative S1 (No Action) takes no action and as a result there are no ARARs associated with the alternative.

Alternatives S2, S4 and S5 would comply with the substantive requirements of Federal and State ARARs, as required under Section 121(d) of CERCLA, 42 U.S.C. § 9621(d). Major ARARs include the substantive requirements for identification of hazardous waste under RCRA and standards for generators of hazardous waste under RCRA that govern how excavated soil is handled and disposed. The RCRA regulations governing the identification of hazardous waste apply to construction activities when soils are excavated and sent to an off-Site disposal facility. If the excavated soils to be sent for off-Site disposal are determined to be hazardous waste, then the RCRA regulations applicable to generators of hazardous wastes are applicable. These regulations include standards applicable to initiating shipments of hazardous waste and requirements applicable to temporary on-Site storage of hazardous waste. Other major ARARs include standards for erosion and sediment control and fugitive air emissions. The more stringent requirements of the Pennsylvania erosion and sediment control regulations apply to construction activities that will disturb the ground surface, including clearing, excavation, and grading. More stringent requirements under the Pennsylvania fugitive dust regulation for particulate matter applies to construction activities involving ground disturbance, including clearing, grubbing, and excavation.

Alternative S3 would also comply with the substantive requirements of Federal and State ARARs, as required under Section 121(d) of CERCLA, 42 U.S.C. § 9621(d). Major ARARs include RCRA landfill cap standards and ARARs for erosion and sediment control and fugitive air emissions. The standards for landfill caps under 25 Pa Code §264a.301 and 40 C.F.R. §§ 264.300-317 are relevant and appropriate to construction of a cap to prevent exposure to contaminants. The requirements for landfill closure and post-closure requirements under 25 Pa Code § 264a.115 and 40 CFR §§ 264.110-120 are relevant and appropriate. The Pennsylvania erosion and sediment control regulations apply to construction activities that will disturb the ground surface, including clearing, grading, and cap installation. The Pennsylvania fugitive dust regulation for particulate matter applies to construction activities involving ground disturbance, including clearing, grubbing, and cap installation.

A description of the ARARs is provided in Table 5.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence addresses expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. Alternatives S2, S4 and S5 are preferable to the other alternatives for this balancing criterion.

Alternatives S2, S4 and S5 include total removal of the slag pile as well as removal of soil with contaminant levels above the soil cleanup levels, thus providing a high degree of long-term effectiveness and permanence. The institutional controls included in these alternatives would provide additional long-term effectiveness and permanence by creating administrative controls to prevent future potential risks. Such controls include a restriction on land use, and any activity that would disturb the surface of the restored Site area without prior written EPA and PADEP approval.

Alternative S3 would also effectively reduce the potential for future human exposure to slag material and potential future release of metals to the environment. However, long-term monitoring and maintenance of the cap would be required to ensure the adequacy and reliability of this alternative over time. The institutional controls included in this alternative would provide long-term effectiveness and permanence by preventing disturbance of the cap and addressing other potential future risks.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Reduction of toxicity, mobility, or volume through treatment addresses the anticipated performance of the treatment technologies evaluated. Alternatives S4 and S5 are preferable to other alternatives for this balancing criterion, because these alternatives reduce the mobility and volume of contaminants at the Site and include treatment to decrease the toxicity of the excavated material.

Excavation and off-Site disposal of the contaminated soils as part of Alternatives S2, S4 and S5 would significantly and permanently reduce the toxicity, mobility, and volume of contamination at the Site. Alternative S4 would reduce toxicity and mobility of constituents in the slag via stabilization prior to its removal from the Site, whereas Alternative S5 would reduce the toxicity and mobility of constituents in slag via stabilization after transport to an off-Site treatment and disposal facility. Alternatives S1, S2, and S3 do not include treatment technologies. Under Alternative S3, only a relatively small amount of hazardous materials would be removed, and no reduction in the toxicity or volume of the remaining contaminants is expected. However, this alternative would reduce the mobility of the contaminants by containing the slag through the installation of a low permeability cap.

Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup levels are achieved.
Alternatives S2, S4 and S5 require disturbance of the slag and on-Site soil, staging and handling of

excavated materials on-Site, and then transportation of the excavated materials to an off-Site disposal facility (although it may be possible that slag/soil for alternatives S2 and S5 could be directly loaded prior to any treatment and/or disposal). Alternative S3 requires disturbance of portions of the slag pile, as well as construction activities to build the cap. The impacts to the community and workers potentially resulting from Alternatives S2, S4 and S5 would be somewhat greater than the impacts potentially resulting from Alternative S3, due to the disturbance of larger volumes of contaminated material. Engineering controls and best management practices would minimize the area of uncovered slag and the duration that the slag is uncovered during Alternatives S2, S4 and S5 and thus mitigate potential short-term risks. Under Alternatives S2, S3, S4 and S5, the community and workers would be protected through adherence to a Site-specific health and safety plan. The health and safety plan would include requirements for engineering controls, the use of personal protective equipment (PPE), environmental monitoring, and Site access controls during the implementation of these alternatives to ensure that workers and the public are not exposed to potentially unacceptable levels of contamination. The alternatives would not generate additional on-Site or off-Site adverse environmental impacts. Remedial activities under Alternatives S2, S3, S4, and S5 are expected to meet the RAOs within 2 years after the remedial action start, with at least an additional 2 years of groundwater monitoring.

Implementability

Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option. Alternatives S2, S3, S4, and S5 all involve conventional construction methods and use technology and materials that are readily available and reliable. The common elements of these alternatives, including construction technique, treatment, disposal, and groundwater monitoring are expected to be implementable at the Site.

Alternatives S2, S4 and S5 would be implementable, as soil excavation and off-Site disposal is a commonly employed technique that utilizes readily available equipment, and no long-term maintenance would be required (although some form of institutional controls may be necessary). Of these three, Alternatives S2 and S5 are the most implementable, as these alternatives would not involve on-Site treatment of excavated material, which could present logistical challenges as does Alternative S4 due to space constraints at the Site. Alternative S3 is also implementable and utilizes well established technologies but would require long-term maintenance and post-closure monitoring and maintenance activities, as well as institutional controls to prevent interference with the cap and development of the Site.

Cost

Cost information for Alternatives S2, S3, S4, and S5, with adjustment for present worth as appropriate, is presented below. Detailed cost estimates and associated assumptions are included in Table 4. Additional cost information is also contained in Appendix B

Table 4. Cost Estimates for Remedial Alternatives

Alternative	Description	Capital	Annual O&M	Total
S2	Complete Removal and Off-Site Disposal	$33,776,400	$4,100	$33,888,700
S3	RCRA Cap, Regrading, Partial Off-Site Disposal	$6,474,000	$16,400	$6,923,200

S4	Complete Removal, Onsite Treatment, Off-Site Disposal	$21,525,800	$4,100	$21,638,100
S5	Complete Removal, Off-Site Treatment and Disposal	$28,357,800	$4,100	$28,470,100

State/Support Agency Acceptance

PADEP concurred with the selection of Alternative S4 in a letter dated August 12, 2020.

Community Acceptance

EPA held a 30-day public comment period from January 8, 2020 through February 7, 2020, to accept public comments on the remedial alternatives presented in the PRAP and on the other documents contained in the AR file compiled in support of the Selected Remedy. On January 22, 2022, EPA held a public meeting to discuss the PRAP and accept comments. A transcript of this meeting is included in the AR file. No other verbal or written comments, via postal mail or email, were received during the public comment period. A discussion of the public comment process and a summary of the comments and questions raised during the public meeting, along with EPA's responses thereto, are included in the Responsiveness Summary, which is a part of this ROD.

Principal Threat Wastes

EPA characterizes waste on-site as either principal threat waste or low-level threat waste. The concept of principal threat waste and low-level threat waste, as developed by EPA in the NCP, is applied on a site-specific basis when characterizing source material. "Source material" is defined as material that includes or contains hazardous substances, pollutants, or contaminants, and acts as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile, which would present a significant risk to human health or the environment should exposure occur. The slag and on-Site soils at the Site may be characterized as source material because the soils contain hazardous substances, act as a reservoir for migration of contamination to groundwater and air, and act as a source for direct contact exposure. The slag and on-Site soils at the Site may be considered principal threat wastes because they would present a significant threat to human health or the environment should exposure occur. The following section discusses in greater detail the risks to human health and the environment from exposure to contamination in the slag and on-Site soils. The OU-1 Remedy at the Site is intended to permanently reduce the toxicity, mobility, and volume of those source materials that constitute the principal threat wastes.

11.0 SELECTED REMEDY

Following review and consideration of the information in the AR file supporting selection of this remedial action, the requirements of CERCLA and the NCP, public comments, and State acceptance, EPA has selected Alternative S4, Complete Removal, On-Site Treatment, Off-Site Disposal, and Institutional Controls, as the OU-1 Remedy at the Site. EPA has selected Alternative G1 (No Action) as the OU-2 Remedy for groundwater at the Site.

Summary of the Rationale for the Selected Remedy

The OU-1 Remedy at the Site is: **Alternative S4, Complete Removal, On-Site Treatment, Off-Site**

Disposal, Site restoration, annual groundwater monitoring for at least two years and institutional controls. EPA has selected Alternative S4 because it is protective, meets ARARs, is considered more effective in the long-term, is more permanent, and provides greater reduction of toxicity, mobility, and volume of contamination.

Alternative S4 is considered more effective in the long-term and more permanent because it removes the contamination from the Site property by excavating the slag and impacted soil, treating it on-Site, and disposing of it off-Site. By removing the contamination from the Site property, Alternative S4 prevents the contamination from migrating to groundwater at levels that would present an unacceptable risk to the public and eliminates the probability of an accidental release in the future. Alternative S3 leaves slag and soil contamination in place and requires maintenance of the cap in order to ensure long-term protectiveness. Future land uses at the Site property would be hindered by requirements to maintain the cap in this alternative. Alternatives S2 and S5 require transportation of hazardous wastes and the associated risks and costs involved. Alternative S4 is not the most expensive alternative, and it ensures permanent protectiveness after the approximate two-year time frame to implement.

Alternative S4 was selected because it will protect human health and the environment by treating and removing the slag pile and impacted soil and by complying with ARARs.

For OU-2, EPA has selected **Alternative G1, No Action, for Groundwater as the OU-2 Remedy.** The OU-2 RI determined that the extent of groundwater contaminated with COPCs extends beyond the boundaries of the Site. The slag pile has not been a source of PAHs or a primary source of arsenic, iron, manganese and cyanide to the groundwater. In addition, historical activities at adjacent properties have contributed to the groundwater contamination. As a result, it is not possible to define an area or volume of groundwater that is contaminated primarily by the Site and that can be targeted for remediation. Therefore, EPA has determined that no further remedial action for groundwater at the Site is necessary.

Description of the OU-1 Remedy and Performance Standards

Based on the comparative analysis of the alternatives under the nine criteria, EPA's OU-1 Remedy at the Site is Alternative S4 (Complete removal, on-Site treatment, off-Site Disposal, Site restoration, annual groundwater monitoring for at least two years and ICs. The total present worth cost of the OU-1 Remedy is $21,638,100. The major components of the OU-1 Remedy are:

Excavation of slag followed by size segregation, crushing as needed, and treatment with a stabilization agent to decrease the leachability of constituents such that the material does not exceed TCLP criteria for hazardous waste;

Excavation of on-Site soil contaminated with slag-associated metals at concentrations exceeding the soil cleanup levels (Table 2). Excavation will be followed by sampling from the limits of excavated area and then TCLP analysis of the excavated soil and treatment with a stabilization agent if necessary to decrease metals leachability such that the soil is rendered non-hazardous;

Post-treatment analysis of slag and soil where applicable, to verify that the material does not exceed TCLP criteria for hazardous waste;

Transport and disposal of the slag and soil to a RCRA Subtitle D landfill. (Note: if a beneficial reuse option is identified for the slag, the OU-1 Remedy may be modified, as appropriate and consistent with public participation requirements, to incorporate potential off-Site beneficial reuse rather than off-Site disposal at a landfill);

Site restoration, including backfilling and grading, after excavation is complete;

Collection of groundwater samples annually from existing groundwater monitoring wells for at least 2 years after completion of slag and soil removal to monitor COC concentrations and confirm no increasing COC concentrations associated with OU-1 remedial activities at the Site;

Implementation of institutional controls, through an enforceable mechanism, including but not limited to an environmental covenant pursuant to Pennsylvania UECA, or a governmental control, such as a zoning ordinance, to prevent human contact with remaining soils that present an unacceptable risk to human health. Contact would be prevented by restricting the disturbance of contaminated soil via grading, excavation, and preventing the use of the Site property for purposes other than commercial/industrial without prior written approval by EPA and PADEP; and

Five-Year Reviews, which would be required to assess the continued protectiveness of the remedy because COCs would remain on-Site at concentrations that exceed levels appropriate for Site uses other than commercial/industrial.

Summary of the Estimated Remedy Costs

The estimated present worth cost of the Selected Remedy is $21,638,100. The information in the cost summary table (Table 4) is based on the best available information regarding the anticipated scope of the Selected Remedy. This amount is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. Changes in the cost elements may occur as a result of new information and data collected during the engineering design of the Selected Remedial Action.

12.0 STATUTORY DETERMINATIONS

Under CERCLA, a selected remedy must protect human health and the environment, comply with ARARs that are not waived, be cost-effective and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Additionally, CERCLA includes a preference for remedial actions that use treatment to significantly and permanently reduce the volume, toxicity, or mobility of hazardous substances, pollutants, and contaminants as their principal element. The following sections discuss how the OU-1 Remedy at the Site meets these statutory requirements.

Protection of Human Health and the Environment

The OU-1 Remedy is protective of human health and the environment. Excavation and off-Site disposal of soils exceeding the soil cleanup levels will eliminate risks associated with direct contact with contaminated soils and prevent further migration of COCs to groundwater. Confirmation sampling will be used to verify that the OU-1 Remedy is effective in attaining the RAOs. ICs will prevent future potential exposure to contaminants via administrative controls on future land use and development.

Compliance with Applicable or Relevant and Appropriate Requirements

The OU-1 Remedy will comply, as required under Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), with Federal and State ARARs. The ARARs include identification of hazardous waste under RCRA, and standards for generators of hazardous waste under RCRA that govern how excavated slag and soil is handled and disposed. Other ARARs include standards for erosion and sediment control and fugitive air emissions. The OU-1 Remedy will attain all ARARs that are identified in Section 10.0 and specified in Table 5 of this ROD.

Cost Effectiveness

Section 300.430(f)(1)(ii)(D) of the NCP, 40 C.F.R. § 300.430(f)(1)(ii)(D), requires EPA to evaluate cost-effectiveness by comparing all the alternatives meeting the threshold criteria - protection of human health and the environment and compliance with ARARs - against long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness (collectively referred to as "overall effectiveness"). The NCP further states that overall effectiveness is then compared to cost to ensure that the remedial action is cost effective, and that a remedial action is cost effective if its costs are proportional to its overall effectiveness.

EPA concludes, following an evaluation of these criteria, that the OU-1 Remedy is cost-effective in providing overall protection in proportion to cost and meets all other requirements of CERCLA. The estimated present worth cost for the OU-1 Remedy is $21.638,100.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The OU-1 Remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. Excavation, on-Site treatment, and off-Site disposal of contaminated slag and soil will permanently eliminate the threats to human health and the environment from those media. Alternative treatment technologies were considered for this remedial action during the OU-1/OU-2 FS, but were not carried forward due to cost and implementation issues. For the OU-1 Remedy, risk reduction and protectiveness are achieved in a cost-effective manner, using proven technologies that do not include alternative treatment technologies.

Preference for Treatment as a Principal Element

The OU-1 Remedy employs treatment as a principal element because it is cost effective, and there is reduction in toxicity, mobility, and volume of contamination by removing the contamination permanently from the Site and disposing of it off-Site at an appropriate permitted facility.

Five-Year Review Requirements

Because the Selected Remedy will result in hazardous substances remaining on-Site above levels that allow for UU/UE (i.e., non-commercial/industrial use), a statutory review will be conducted every five years after initiation of the remedial action to ensure that the Selected Remedy is protective of human health and the environment pursuant to CERCLA Section 121(c), 42 U.S.C. § 9621(c), and the NCP, 40 C.F.R. §300.430(f)(5)(iii)(C).

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The PRAP for OU-1 and OU-2 for the Site, along with the AR file, was released for public comment on January 8, 2020. The PRAP identified Alternative 4 (Complete Removal, On-Site Treatment, Off-Site Disposal and ICs) as the Preferred Alternative for OU-1 (slag pile and associated soil) at the Site. The

PRAP also identified Alternative G1 (No Action) as the Preferred Alternative for groundwater at the Site (OU-2). EPA reviewed all comments received during the public meeting for the Site--the only verbal or written comments received during the public comment period. EPA has determined that no significant charges to the remedy, as originally identified in the PRAP, are necessary or appropriate.

RESPONSIVENESS SUMMARY

FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 AND 2
PHILADELPHIA, PENNSYLVANIA

RECORD OF DECISION

FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 AND 2
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RESPONSIVENESS SUMMARY

The Responsiveness Summary, the third component of the ROD, summarizes information about the views of the public and support agency regarding both the remedial alternatives and general concerns about the site submitted during the public comment period. It also documents in the record how public comments were integrated into the decision-making process. EPA prepared this Responsiveness Summary to provide a summary of any significant public comments and concerns regarding the PRAP at the Site and EPA's responses to those comments. After receiving the public's questions and comments during the public meeting for the Site, the only public comments received, EPA determined that no significant changes to the proposed remedial action, as originally identified in the PRAP, were necessary or appropriate. EPA has selected Preferred Alternative 4 as the OU-1 Remedy, to address slag and soil contamination at the Site, and Alternative G-1, No Action, as the OU-2 Remedy for groundwater at the Site.

EPA issued a public notice in *The Star News*, a Philadelphia newspaper, on January 7, 2020, which contained a list of the components of EPA's preferred alternatives, information relevant to the duration of the public comment period, the date of the public meeting, and the availability of the PRAP and the AR file. On January 8, 2020, the PRAP and supporting documentation were made available to the public in the AR file compiled to support selection of this remedial action and accessible at https://semspub.epa.gov/src/collections/03/AR/PASFN0305549. EPA provided notice to the public that the AR file could also be viewed at the following locations:

EPA Administrative Records Room, Attention: Administrative Coordinator 1650 Arch Street Philadelphia, PA 19103-2029 (215) 814-3157 Hours: Monday through Friday, 8:30 am to 4:30 pm; by appointment only.	Richmond Branch Library 2987 Almond Street Philadelphia, PA 19134 Phone (215) 685-9992

The 30-day comment period began on January 8, 2020 and ran through February 7, 2020. In addition, on January 8, 2020, EPA sent a Fact Sheet summarizing EPA's preferred alternatives to residences and businesses near the Site.

EPA conducted a public meeting in Philadelphia, Pennsylvania to inform local officials, interested citizens, and other stakeholders in attendance about EPA's proposed cleanup plan and the Superfund process, to respond to questions, and to receive comments on the PRAP. The public meeting was held by EPA on January 22, 2020, at the Richmond Branch Library located at 2987 Almond Street, Lansdale, Philadelphia, Pennsylvania.

Questions raised during the public meeting included general information on the groundwater monitoring wells at the Site and in the surrounding neighborhood; the general timeline for Site remediation; the nature and extent of contamination at the Site; air monitoring during the remedial action; and Site ownership. Many of these questions were addressed during the presentation. A complete transcript of the public meeting has been included in the AR file.

The following section of this Responsiveness Summary will summarize the questions and concerns raised by the public and EPA's responses to those comments.

Comment 1: Is the current groundwater monitoring well network complete or will additional wells be installed?

EPA Response: There are currently four groundwater monitoring wells on-Site. Of these four wells, Well MW-1 is upgradient, Well MW-4 is downgradient, and Wells MW-2 and MW-3 are on the northeast and southwest sides of the Site. There are a number of wells off-Site that were sampled as part of the OU-2 RI. The locations of the wells are shown on Figure 5 in this ROD. No additional wells are proposed at this time, although it is possible that additional wells may be installed during the Remedial Design (RD) phase of the cleanup.

Comment 2: Is there an exact timeline for Site remediation?

EPA Response: EPA does not have an exact timeline for Site remediation. The next step in the Superfund process, after issuance of the ROD, is to begin the RD. The ROD estimates that the OU-1 Remedy will be completed within approximately two years from completion of the Remedial Action (RA) phase, with the exception of groundwater monitoring. This timeframe may also be impacted by the availability of funds for the cleanup.

Comment 3: There were **s**everal questions about EPA's involvement with other contaminated properties in the area of the Site.

EPA Response: There are currently no NPL Sites in the immediate area of the Site, and, therefore, EPA's remedial program is not able to speak to contamination at those properties at this time.

Comment 4: Where is the closest residence to the Site?

EPA Response: The closest residential properties are on the west side of I-95 and are approximately ½ mile away, on the 2800 block of Castor Avenue.

Comment 5: Why is the public's opinion important in the Superfund process?

EPA Response: Community involvement is a vital part of the Superfund process. The foundation of Superfund's community involvement program is the belief that members of the public have a right to know what the Agency is doing in their community and to have a say in the decision-making process. The Superfund law requires specific community involvement activities that must occur at certain points throughout the Superfund process. Throughout the entire remedial process, EPA engages with the community through informational mailers (Fact Sheets) to nearby residences and businesses, keeping the Site's website up to date and holding public meetings. The public has the opportunity to submit comments and questions during the public comment period on the PRAP. EPA takes the comments that are received into account when choosing the final remedy for the Site.

Comment 6: What are the COCs associated with the Site?

EPA Response: The COCs in slag and impacted soil are aluminum, beryllium, chromium, cobalt, copper, iron, lead, and manganese.

Comment 7: How will air quality in the area be affected by the RA?

EPA Response: The RA at the Site will comply with all applicable or "relevant and appropriate" requirements under Federal and State environmental laws, referred to as "ARARs", for fugitive air emissions and particulate levels associated with the RA . The ARARs for the Site were discussed in detail in the PRAP and in this ROD. The specific actions that will be taken to safeguard air quality during the RA phase will be further addressed in the RD for the OU-1 Remedy.

Comment 8: What is the range of lead contamination at the Site, and what are the ranges of the other contaminants found at the Site?

EPA Response: The range of lead levels in the slag is 4000- 22,000 ppm. The levels found for the other contaminants can be found in the OU-1 RI, Section 5.0. In addition, it should be noted that PAHs were found not to be Site-related as a result of the risk assessment process for the Site.

Comment 9: Has the Site contributed to elevated lead levels in soil which have closed some local parks?

EPA Response: EPA does not have any information that the Site contributed to the closing of local parks. While in operation, MDC contributed to area-wide air, soil, and water pollution. EPA's 2000 emergency removal action involved the removal of slag material from adjacent properties and area storm drains. The slag material was consolidated into one pile and a 60-millimeter HDPE geomembrane cover (cover) was placed over the pile. Since 2000, the cover has prevented the slag material at the Site from continuing to contribute to area-wide pollution.

Comment 10: Does MDC still own the Site property?

EPA Response: MDC is a former operator at the Site and was not an owner of the Site property. Based on the most recent information available to EPA, the current owner of the Site property is Francos Realty, Inc.

Comment 11: What routes will trucks take to remove treated material from the Site during RA?

EPA Response: The truck routes are unknown at this time. Specific details of the RA will be determined during the RD. EPA may conduct an RD public briefing and will also issue a Fact Sheet regarding the RD. The community will be informed about the work to be done, planned work hours, truck traffic and routes, health and safety precautions, and monitoring to confirm that there are no releases during construction of the OU-1 Remedy.

Comment 12: How will the clean-up of the Site take place?

EPA Response: The components and performance standards for the OU-1 Remedy are described in the ROD. Further details of the Site remediation will be determined in the RD. EPA is required to issue a Fact Sheet and may provide a public briefing about the final RD prior to the initiation of the clean-up.

Comment 13: Given the small footprint of the Site, what will be the process for removing the cover and mitigating the waste to make it non-hazardous?

EPA Response: The details for this process will be fleshed out in the RD. EPA did perform a pilot study to help inform the process for stabilizing the slag material, but the specific details will be determined in the RD and will be presented to the public.

Comment 14: Where were the soil samples taken during the RIs?

EPA Response: There were numerous soil samples taken during the RIs. Sampling locations are shown on Figure 4 of the ROD.

TABLES

FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 and 2
PHILADELPHIA, PENNSYLVANIA

RECORD OF DECISION

[Tables 1 to 4 are in the text of the ROD. See the Table of Contents, p. ii, for the location of Tables 5]

TABLE 5: LIST OF APPLICABLE OR RELEVANT AND APPROPRIATE REGULATIONS (ARARS)

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARS in the Context of the Remedy
Chemical Specific				
There are no chemical specific ARARs identified				
Location Specific				
Floodwater Management	Executive Order 11988 40 C.F.R. Part 6, Appendix A	Applicable	Executive Order to evaluate potential effects of actions in a floodplain lo avoid adversely impacting a floodplain.	Part of the Site is in a 100-year floodplain. As a result, during the remedial design EPA will consider the requirements in the Executive Order for floodplain management.
Floodwater Management	40 C.F.R. § 264.18(b)	Relevant and Appropriate	Requirements for landfills to be designed, constructed, operated, and maintained to avoid washout, if they are near or within a 100-year floodplain.	Part of the Site is in a 100-year floodplain. As a result, a remedial design of a landfill cap would incorporate requirements to protect the cap from a 100-year flood.
Action Specific				
Storm Water Management Act	32 P.S. § 680.13	Applicable	Requires implementation of storm water control measures to prevent injury to health, safety, or property.	Storm water shall be managed in accordance with these requirements during implementation of the remedy.
National Pollutant Discharge Elimination System Program	40 C.F.R. §§ I 22.26(a)(4) and I 22.26(b)(14)-(15) 25 Pa. Code § 92a-54	Applicable	Sets requirements and substantive general permit requirements to control and monitor storm water runoff from construction activities or during remedial.	The substantive requirements of these regulations apply during planning and general remediation activities.
Erosion and Sediment Control	25 Pa. Code §§ 102.4(b)(1), 102.11, 102.22	Applicable	Identifies erosion and sediment control requirements and criteria for activities involving land clearing, grading, and other earth disturbances and establishes erosion and sediment control criteria.	These regulations apply to construction activities at the Site which disturb the ground surface, including clearing, grading, and excavation.
Resource Conservation and	40 C.F.R § 262.34 and 25	Applicable	These provisions govern the	The remedy will require the storage of slag prior to transport and

Recovery Act (RCRA) Pennsylvania Hazardous Waste Management Regulations[i]	Pa. Code § 262a.34 40 C.F.R. §§ 264.171-175 and 25 Pa. Code § 264a.173(3)		accumulation time for hazardous wastes and management of containers and will be followed when slag is stored at the Site.	disposal. When slag will be staged in containers for less than 90 days prior to off-site disposal, its handling will comply with these regulations.
RCRA Pennsylvania Hazardous Waste Management Regulations	40 C.F.R. § 268.50 25 Pa. Code § 268a.1	Applicable	These regulations set out prohibitions and establish standards for the storage of hazardous wastes restricted from land disposal.	During remedial action, slag for off-site disposal would comply these regulations.
Identification of Hazardous Wastes	40 C.F.R. §§ 261.20-24 25 Pa. Code § 261a.1	Applicable	Defines and describes process for identifying hazardous wastes based on toxicity characteristic.	These regulations apply to construction activities where soils are excavated from the site and sent to an off-site disposal facility or landfill.
Standards Applicable to Generators of Hazardous Wastes	40 C.F.R. §§ 262.10(a), (h) and 262.11(c)(1) 25 Pa. Code §§ 262a.10 and 11	Applicable	These regulations establish standards for generators of hazardous wastes, including initiating shipments, determination of hazard characteristics, and identification numbers.	These regulations apply to construction activities when excavated soils that are sent for offsite disposal are determined to be hazardous waste.
Standards Applicable to Generators of Hazardous Wastes	40 C.F.R. § 262.34 25 Pa. Code § 262a.34	Applicable	Establishes requirements for generators of hazardous wastes, including temporary storage of hazardous wastes on-site.	This regulation applies to construction activities when excavated soils are determined to be hazardous wastes need to be temporarily stored on-site.
Pennsylvania Department of Environmental Protection (DEP) Management of Fill Policy, Effective January 1, 2020	Pennsylvania E-Library Document Number 258-2182-773	TBC	Provides DEP's procedures for determining whether material is clean fill or regulated fill.	Fill that is used for backfilling excavated areas will meet the standards for clean fill as defined in this document.
Fugitive Air Emissions	Relevant provisions of 40 C.F.R. Part 52, Subpart NN, §§ 52.2020(c)(1) & (c)(3) and 25 Pa. Code §§ 123.1 and 123.2	Applicable	Establishes the fugitive dust regulation for particulate matter.	Fugitive air emissions during the remedial action would comply with the requirements of the EPA approved Pennsylvania State Implementation Plan (SIP).
Particulate Levels	40 C.F.R. §§ 50.6 and 50.7	Applicable	Establishes the particulate levels during the remedial action.	Particulate levels generated during the remedial action would be monitored to ensure compliance with the National Ambient Air

	25 Pa. Code §§ 131.2, 131.3, and 131.4			Quality Standards in the EPA approved SIP.
Groundwater Wells	32 P.S. § 645.5	Relevant and Appropriate	This regulation requires well to be abandoned.	After the monitoring of the groundwater wells is completed the wells will be abandoned.
RCRA PA Hazardous Waste Management Regs	40 C.F.R. §§ 264.97-99 25 Pa. Code § 264a.97[1]	Relevant and Appropriate	Regulations establishing the procedures for monitoring groundwater at a hazardous waste landfill.	After installation of the landfill cap groundwater would be monitored in accordance with these regulations.
Standards for Landfill Caps	40 C.F.R. §§ 264.300 - 317 25 Pa. Code § 264a.301[1]	Relevant and Appropriate	Contain requirements for landfills including requirements for caps.	Portions of these regulations are relevant and appropriate to construction of a cap to prevent exposure to contaminants.
Landfill Closure and Post -Closure Requirements PA Hazardous Waste Management Regulations	40 C.F.R. §§ 264.110 – 264.120 25 Pa. Code § 264a.115[1]	Relevant and Appropriate	Contains requirements for landfill closure and post-closure maintenance.	Portions of this regulation are relevant and appropriate to the closure of the landfill and post landfill closure requirements, including operation and maintenance.

[1] With respect to each of these provisions, the Commonwealth provision is a Federal ARAR if the provision is part of the Commonwealth's authorized program. The Commonwealth provision is a State ARAR if the provision is not part of the authorized program but is more stringent than the Federal provision (within the meaning of CERCLA) or if the Commonwealth provision is beyond the scope of the Federal provision. Otherwise, the Federal provision is the Federal ARAR.

V. FIGURES

FRANKLIN SLAG PILE SUPERFUND SITE
OPERABLE UNITS 1 and 2
PHILADELPHIA, PENNSYLVANIA

RECORD OF DECISION

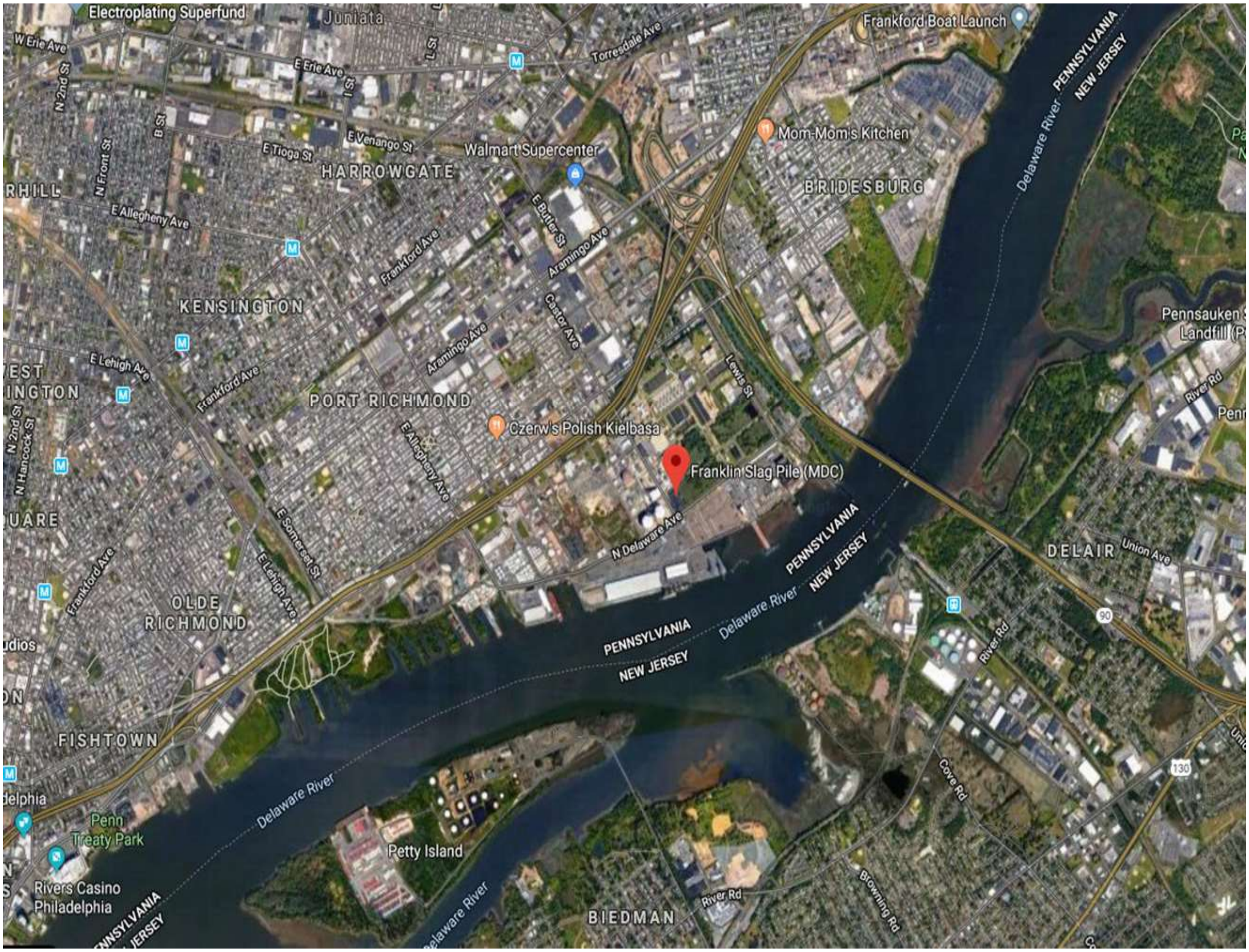
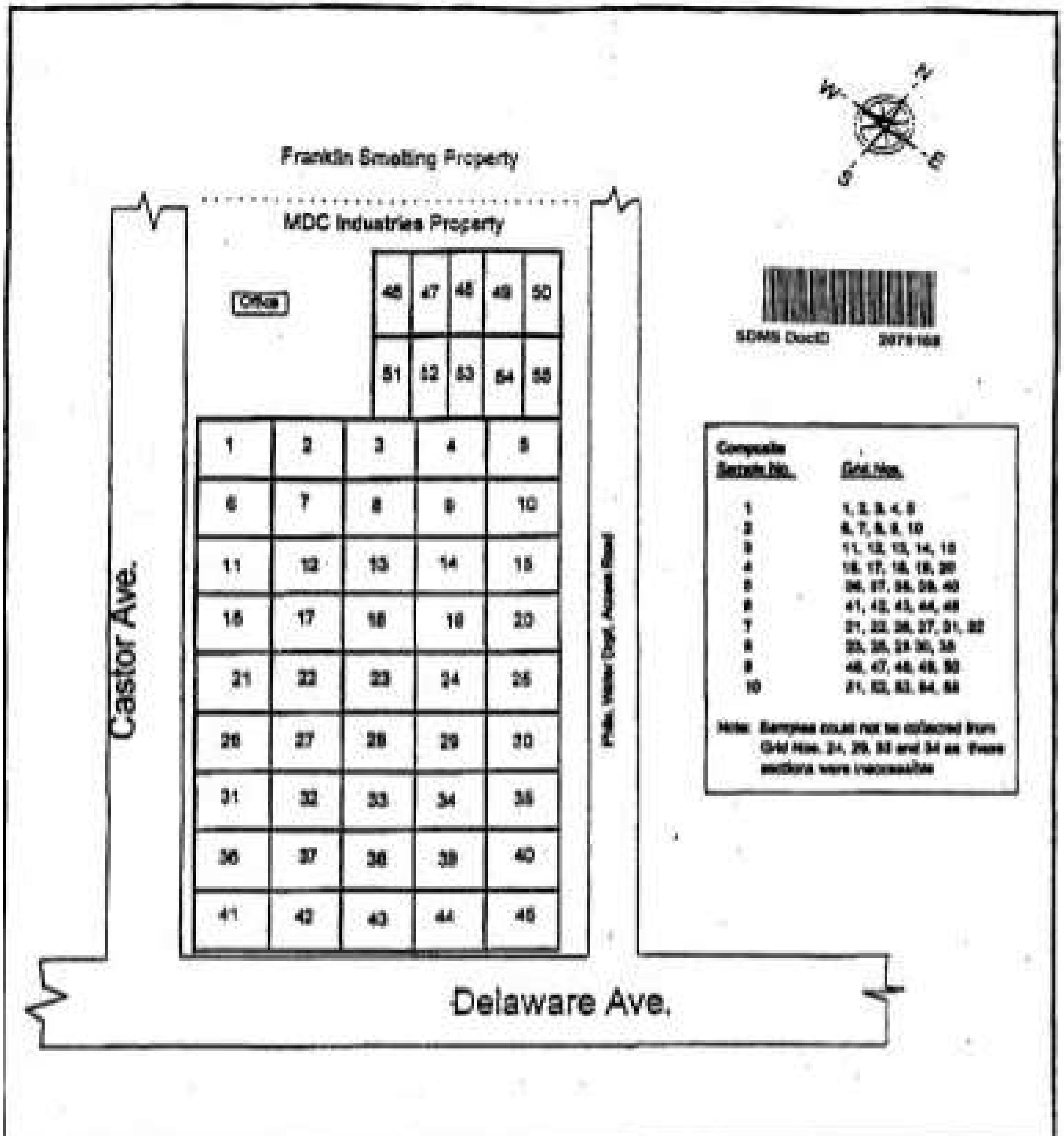


Figure 1. Site Location

Franklin Slag Pile Superfund Site
OU-2 Groundwater
Philadelphia, Pennsylvania

Figure 2
Site Location



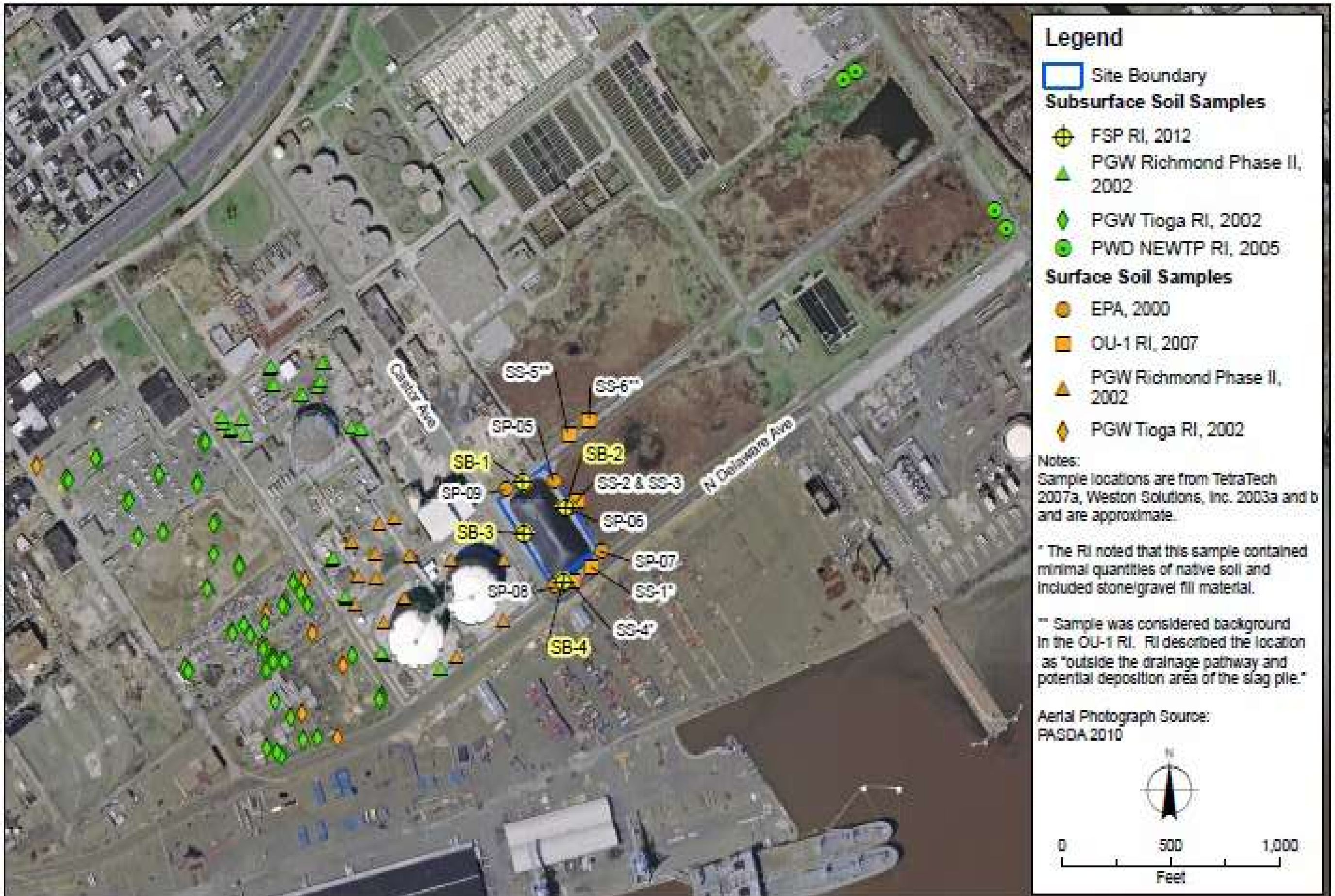
U.S. Environmental Protection Agency
Region III
Waste and Chemical Management Division
Compliance and Enforcement Branch

Figure 3

MDC Industries
Sample Location Map

Not to Scale

Date:
August 31, 1998



Franklin Slag Pile Superfund Site
OU-2 Groundwater
Philadelphia, Pennsylvania

Figure 4
Soil Sample Location Map

Franklin Slag Pile Superfund Site
OU-2 Groundwater
Philadelphia, Pennsylvania

Figure 5
Location of Monitoring Wells

AERIAL VIEW WITH AIR MONITORING LOCATIONS
FRANKLIN SLAG
PHILADELPHIA, PENNSYLVANIA

FIGURE 6

Figure 7
Human Health Conceptual Site Model
Franklin Slag Pile

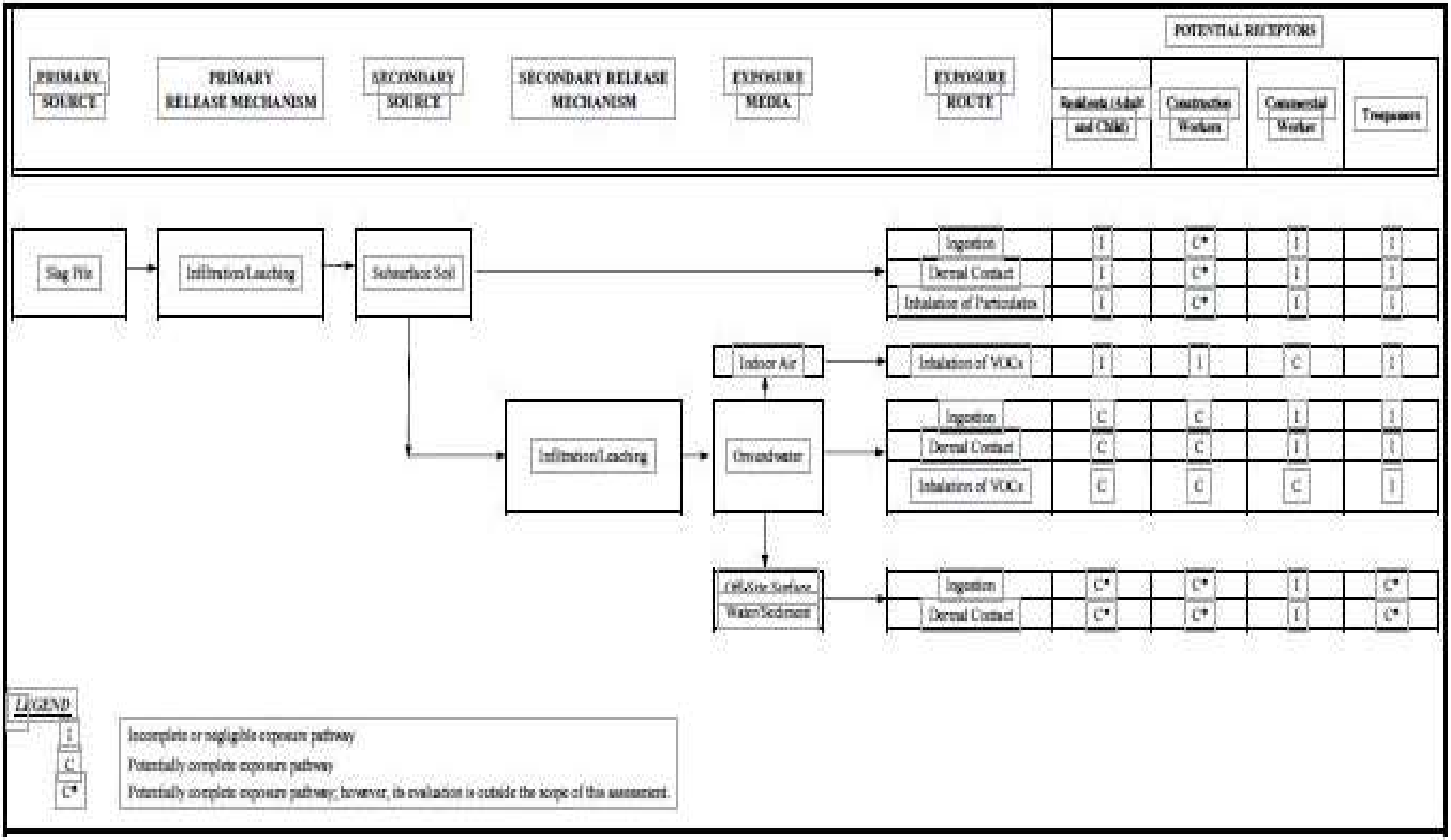
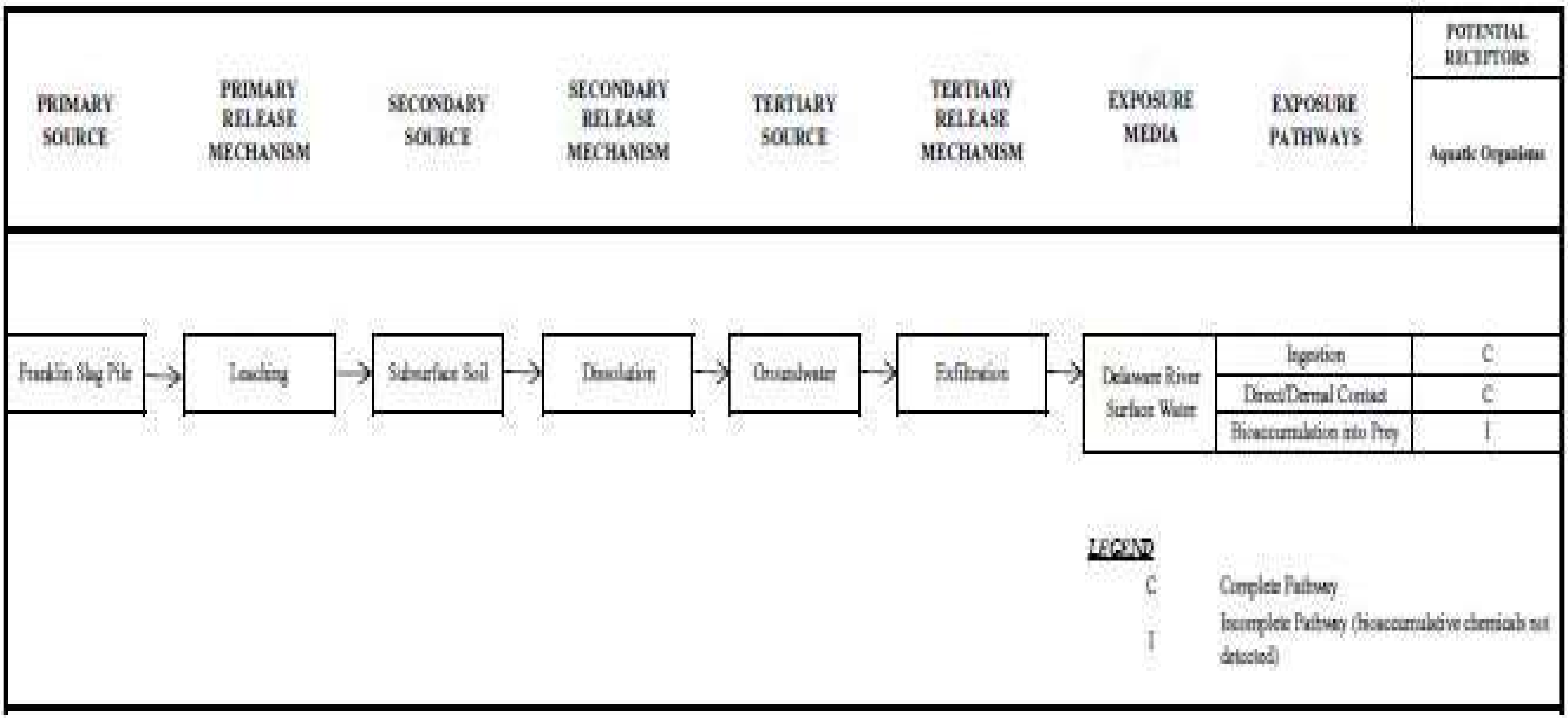


FIGURE 8
ECOLOGICAL CONCEPTUAL SITE MODEL
FRANKLIN SLAG PILE OU-2 GROUNDWATER



APPENDIX A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION III

1650 Arch Street

Philadelphia, Pennsylvania 19103

FRANKLIN SLAG PILE (MDC)

REMEDIAL ADMINISTRATIVE RECORD FILE

INDEX OF DOCUMENTS

AVAILABLE 7/13/07, UPDATED 1/8/20 , //20

https://semspub.epa.gov/src/collection/03/AR11824

Introduction

The “Administrative Record” is the collection of documents which form the basis for the U. S. Environmental Protection Agency’s (EPA) selection of a response action at a Superfund site. Superfund is the name given to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) which can be found in Title 42 of the U.S. Code (U.S.C.) at Sections 9601 through 9675. Response actions under Superfund can be either “removal actions” or “remedial actions.” As the EPA decides what to do at the site of a release of hazardous substances, the EPA compiles documents concerning the site and EPA’s decision into an “Administrative Record File.” Documents may be added to the “Administrative Record File” from time to time. Once the EPA Regional Administrator or the Regional Administrator’s delegate signs the decision document memorializing the selection of an action, the documents which form the basis for the selection of an action are known as the “Administrative Record.” An administrative record file is required by CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA).

The Administrative Record will be available for public review during normal business hours in an electronic computer imaged format at the selected near site repository and by appointment only at the Environmental Protection Agency (EPA), Region 3 office which is located at the address given on the cover page. The Administrative Record is treated as a non-circulating reference document. Individuals may review documents contained in the Administrative Record, according to the procedures at the local repository and at the EPA Region 3 office. The Administrative Record will be maintained at the near site repository until further notice. EPA may send additional documents to the repository as work progresses at the Site. The EPA may hold formal public comment periods at certain stages of the response process. The public is urged to use the formal public comment periods to submit written comments to the EPA regarding the actions at the Site.

Except as explained below, this index and the record were compiled in accordance with the EPA’s Revised Guidance on Compiling Administrative Records for CERCLA Response Actions, EPA/OSRE/OEM/OSRTI (September 20, 2010), and/or in accordance with Superfund Removal Procedures Public Participation Guidance for On-Scene Coordinators: Community Relations and the Administrative Record, OSWER 9360.3-05 (July 1992), and/or the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. Consistent with 40 CFR Sections 300.805 (a) (2), and 300.810 (a) (2), Region 3 has listed, in the Administrative Record Index (or in bibliographies of documents listed in the Index), guidance documents which may form a basis for the selection of this response action (EPA Guidance Documents, Non-Site Specific). Unless the guidance documents indexed were generated specifically for the Site, the guidance documents may not be present in the Administrative Record. However, it should be noted that the EPA does maintain an extensive collection of Superfund response action guidance documents available in electronic format on the EPA website at:
https://www.epa.gov/superfund/superfund-policy-guidance-and-laws.

Additionally, the EPA guidance related to Superfund cleanup enforcement may be found on the website at the following address: http://cfpub.epa.gov/compliance/resources/policies/cleanup/superfund. This page is titled, “Superfund Cleanup Policies and Guidance.”

The Administrative Record is listed in chronological order with the earliest dated document at the top and followed by documents which may be “Undated.”

Documents added for the 1/8/20 update to the Administrative Record are marked on the index with *. Documents added for the //20 update to the Administrative Record are marked on the index with Δ.

Throughout the Administrative Record File, EPA has redacted certain documents to protect against the disclosure of potential confidential business information and/or information which may involve personal identifiable information or a protected privacy interest. The redactions are evident from the face of the particular document and the word “Redacted” appears in the title on the index.

Additional sampling and testing data, including supplementary quality assurance documentation; chain of custody; and raw laboratory data, in support of EPA-performed sampling results reflected herein, is incorporated by reference into this Administrative Record File. These documents are not physically included in the record file but are located at the U.S. EPA Region III office in Philadelphia, PA, or stored in the Federal Records Center in Philadelphia, PA. The documents are available, if not confidential, upon request.

Documents listed as bibliographic sources for other documents in the record might not be listed separately in the Site Index.

DOC ID	DOC DATE	TITLE	PAGE COUNT	ADDRESSEE NAME	AUTHOR NAME
2079131	04/01/1993	LAGOON A NORTHEAST WATER POLLUTION CONTROL PLANT MAP	1		
2079132	04/01/1993	LAGOON C NORTHEAST WATER POLLUTION CONTROL PLANT MAP	1		
2079133	11/01/1994	PACKET OF GEOLOGIC WELL LOGS	28		(BLACK & VEATCH)|(RETTEW ASSOCIATES INC)
2079134	08/02/1996	FLOOD INSURANCE RATE MAP	1		
2079135	09/06/1996	ARTICLE: SYNTHETIC PRECIPITATION LEACHING PROCEDURE	2		ALFORQUE,MARICIA (EPA)
2079136	01/01/1997	FIGURE 2: SITE LAYOUT MAP	1		(TETRA TECH EM INC)
2079138	05/01/1997	MINE GUIDE FOR HAZARDOUS WASTE MANAGEMENT	13		
2079156	10/01/1997	MULTI-MEDIA INSPECTION	19		(EPA)
2079158	08/31/1998	FIGURE 2: MDC INDUSTRIES SAMPLE LOCATION MAP (RELATED TABLES ATTACHED)	3		(EPA)
2079159	09/01/1998	SOLID WASTE DEFINITION & SOLID & HAZARDOUS WASTE EXCLUSIONS DOCUMENT	38		(COLORADO DEPT OF PUBLIC HEALTH & ENVIRONMENT)
2079140	01/01/2000	BOOKLET: AMERICAN MINERALS INC (RELATED CORRESPONDENCE ATTACHED)	19	DENNIS,EUGENE (EPA)	EICHLER,JOSEPH (AMERICAN MINERALS)
2079160	02/09/2000	WORK PLAN FOR IMPOUNDMENT CLOSURE	70		(RETTEW ASSOCIATES INC)
2079161	08/01/2000	ARTICLE: SPLP GAINING GROUND AS ACCEPTABLE, EVEN PREFERRED LEACHABILITY TEST	1		KINGHAM,NEVILLE (KEMRON ENVIRONMENTAL SERVICES INC)|SEMENAK,ROBERT,K (KIBER ENVIRONMENTAL SERVICES INC)
2079139	12/19/2000	FIELD TRIP REPORT	12	(EPA)	(TETRA TECH EM INC)
2079143	06/26/2001	RECORD OF TELEPHONE CONVERSATION WITH ROY ROMANO REGARDING STORMWATER DRAINAGE	1	ROMANO,ROY (PHILADELPHIA WATER DEPT)	WOOD,KEVIN,J (EPA)
2079146	08/09/2001	HAZARD RANKING SYSTEM DOCUMENTATION RECORD	84	(EPA)	(TETRA TECH EM INC)
2079803	09/01/2001	FACT SHEET: FRANKLIN SLAG PILE	1		(EPA)
2079804	09/01/2001	FACT SHEET: NATIONAL PRIORITIES LIST	4		(EPA)
2079805	09/13/2001	PUBLIC NOTICE: FRANKLIN SLAG PILE PROPOSED FOR SUPERFUND HAZARDOUS SITE LIST	2		(EPA)

DOC ID	DOC DATE	TITLE	PAGE COUNT	ADDRESSEE NAME	AUTHOR NAME
2079162	09/25/2001	FOLLOW UP TO 9/17/01 DISCUSSION (PROGRESS REPORT ATTACHED)	14	DENNIS,EUGENE (EPA)	BLAIR,DENNIS,D (CITY OF PHILADELPHIA)|ROMANO,ROY (PHILADELPHIA WATER DEPT)|WENTZEL,JAMES (PADEP)
2079163	04/01/2002	CITY OF PHILADELPHIA WATER DEPARTMENT NORTHEAST WATER POLLUTION CONTROL PLANT IMPOUNDMENT CLOSURE PLAN (FEDERAL EXPRESS AIRBILL ATTACHED)	110	(CITY OF PHILADELPHIA WATER DEPT)	(RETTEW ASSOCIATES INC)
2079164	04/01/2002	NORTHEAST WPCP LAGOON ESTIMATED SLUDGE VOLUME & REMEDIATION COSTS	1		(BLACK & VEATCH)
2079165	08/01/2002	APPLICABLE OR RELEVANT & APPROPRIATE REQUIREMENTS (ARARS) FOR CLEANUP RESPONSE & REMEDIAL ACTIONS (RELATED DOCUMENTS ATTACHED)	46	SEXTON,BARBARA (PA DEPT OF ENVIRONMENTAL PROTECTION)	HOGEMAN,DAVID,C (PA DEPT OF ENVIRONMENTAL PROTECTION)
2081132	09/01/2002	GROUND WATER SAMPLES SPREADSHEET	16		
2079147	03/01/2003	ARTICLE: REMEDIATION OF GROUNDWATER CONTAMINATED WITH ZN PB AND CD USING APATITE II (RELATED DOCUMENTS ATTACHED)	13		(EPA)
2079166	04/01/2003	DRAFT REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) (COVER LETTER ATTACHED)	145		(TETRA TECH NUS INC)
2079167	11/01/2003	SAMPLING & ANALYSIS REPORT	101	(EPA)|(NATIONAL RISK MANAGEMENT RESEARCH LABORATORY)	(ENVIRONMENTAL QUALITY MANAGEMENT INC)
2079813	11/01/2003	SLUDGE/SAMPLING LOCATIONS MAP (COVER MEMO ATTACHED)	5	FREBOWITZ,ANDREW (TETRA TECH NUS INC)	MATZKO,KRISTINE (EPA)
2079814	01/01/2004	PACKET OF AERIAL PHOTOS - LAGOONS A & C	5		
2079168	04/13/2004	GENERAL PERMIT FOR PROCESSING BENEFICIAL USE OF RESIDUAL WASTE	14		(PADEP)
2079169	04/24/2004	MANAGEMENT OF FILL POLICY - DOC # 258-2182-773	15		(PADEP)
2079170	05/20/2004	COMMENTS ON LIMITED ACTION ALTERNATIVE, TREATABILITY STUDY & FORTHCOMING 5/24 MEETING	1	MATZKO,KRISTINE (EPA)	MOREHEAD,GRANT (PA DEPT OF ENVIRONMENTAL PROTECTION)
2079171	05/21/2004	EUROENVIRON WASTE NETWORK WASTE CALL 2004 PROJECT PROPOSAL SHEET (ARTICLE ATTACHED)	12		(EUROENVIRON)
2079148	06/01/2004	TABLE 1: PHILADELPHIA SLUDGE LAGOONS TCLP RCRA METALS CHARACTERIZATION	1		(KEMRON ENVIRONMENTAL SERVICES INC)
2079172	06/24/2004	BASIC RESEARCH FILL IN THE BLANK QAPP	5		
2079173	06/28/2004	COMMENTS ON SPLP LEACHING RESULTS	5	BATES,EDWARD (EPA)|REISMAN,DAVID (EPA)	BATES,EDWARD (EPA)|REISMAN,DAVID (EPA)

DOC ID	DOC DATE	TITLE	PAGE COUNT	ADDRESSEE NAME	AUTHOR NAME
2079174	07/01/2004	PROPOSED WORK PLAN (RELATED DOCUMENTS ATTACHED)	8	(EPA)	(ENVIRONMENTAL QUALITY MANAGEMENT INC)
2079806	09/01/2004	FACT SHEET: FRANKLIN SLAG PILE SUPERFUND SITE FREQUENTLY ASKED QUESTIONS	4		(EPA)
2079175	09/08/2004	COMMENTS ON PRELIMINARY RESULTS OF LEACH TESTS (RELATED DOCUMENTS ATTACHED)	5	MATZKO,KRISTINE (EPA)	REISMAN,DAVID (EPA)
2079176	10/19/2004	COMMENTS ON TCLP METALS TESTING RESULTS (RELATED DOCUMENTS ATTACHED)	3	MATZKO,KRISTINE (EPA)|REISMAN,DAVID (EPA)	AMICK,ROBB (ENVIRONMENTAL QUALITY MANAGEMENT INC)
2079149	01/01/2005	ARTICLE: TRACE ELEMENT CHEMISTRY IN RESIDUAL TREATED SOIL - KEY CONCEPTS & METAL BIOAVAILIBILITY	15		BASTA,N.T. (OHIO STATE UNIVERSITY)|CHANEY,R.L. (USDA)|RYAN,J.A. (EPA)
2079150	01/01/2005	ARTICLE: ECOSYSTEM FUNCTION IN ALLUVIAL TAILINGS AFTER BIOSOLIDS & LIME ADDITION	21		BROWN,SALLY (UNIVERSITY OF WASHINGTON)|COMPTON,HARRY (EPA)|MAXEMCHUK,AMANDA (LOCKHEED MARTIN)|SPRENGER,MARK,D (EPA)
2079151	02/01/2005	ARTICLE: PLANTING OF NATIVE GRASS SPECIES ON LANDFILL CAPS & FORMERLY CONTAMINATED WASTE SITES IN THE MID ATLANTIC	6		(EPA)
2079177	02/01/2005	A STUDY ON THE FEASIBILITY OF REMEDIATION & REUSE & TREATABILITY STUDY REPORT (COVER MEMO ATTACHED)	22	(EPA REGION 3)	(ENVIRONMENTAL QUALITY MANAGEMENT INC)|(NATIONAL RISK MANAGEMENT RESEARCH LABORATORY)
2079178	02/01/2005	NORTHEAST WATER POLLUTION CONTROL PLANT INACTIVE SEWAGE SLUDGE IMPOUNDMENTS - ACT 2 REMEDIAL INVESTIGATION/BASELINE RISK ASSESSMENT REPORT - APPENDICES ONLY	666	(CITY OF PHILADELPHIA WATER DEPT)	(RETTEW ASSOCIATES INC)
2079179	02/14/2005	EPA COMMENTS ON 3/04 DRAFT FEASIBILITY STUDY (RELATED DOCUMENTS ATTACHED)	66	FREBOWITZ,ANDREW (TETRA TECH NUS INC)	MATZKO,KRISTINE (EPA)
2079180	03/02/2005	COMMENTS ON DRAFT TREATABILITY STUDY REPORT	3	REISMAN,DAVID (EPA)	MATZKO,KRISTINE (EPA)
2079181	05/01/2005	TECHNICAL MEMORANDUM - ALTERNATIVE 6	37		(TETRA TECH NUS INC)
2079182	05/24/2005	PUBLIC HEALTH ASSESSMENT	61		(ATSDR)
2079183	06/07/2005	HANDWRITTEN NOTES (6/7/05 MEETING AGENDA ATTACHED)	8		
2079184	06/08/2005	6/7/05 ATTENDEE MEETING LOG (COVER MEMO ATTACHED)	2	MATZKO,KRISTINE (EPA)	FREBOWITZ,ANDREW (TETRA TECH NUS INC)
2079185	06/29/2005	COMMENTS ON CLASS III RESIDUAL WASTE STANDARDS (SPREADSHEET OF STANDARDS ATTACHED)	2	MATZKO,KRISTINE (EPA)	FREBOWITZ,ANDREW (TETRA TECH NUS INC)

DOC ID	DOC DATE	TITLE	PAGE COUNT	ADDRESSEE NAME	AUTHOR NAME
2079186	07/07/2005	COMMENTS ON TECHNICAL MEMORANDUM ALTERNATIVE 6	3	MATZKO,KRISTINE (EPA)	SHEEHAN,THOMAS (PA DEPT OF ENVIRONMENTAL RESOURCES)
2079152	11/04/2005	POWERPOINT: MINERAL PROCESSING WASTES - THE BEVILL EXCLUSION	33		TEKRONY,LINDA (NATIONAL ENFORCEMENT INVESTIGATIONS CENTER)
2079808	01/01/2006	COMMUNITY INVOLVEMENT PLAN	52		(EPA)
2079807	01/04/2006	FRANKLIN SLAG PILE SITE SALIENT	1		MATZKO,KRISTINE (EPA)|TAYLOR,TRISH (EPA)
2079809	01/30/2006	TRANSMITTAL LETTERS FOR COMMUNITY INVOLVEMENT PLAN	3	EDELSTEIN,JON (CITY OF PHILADELPHIA - DEPT OF COMMERCE)|ROMANO,ROY (PHILADELPHIA WATER DEPT)|SHEEHAN,TIM (PA DEPT OF ENVIRONMENTAL RESOURCES)	MATZKO,KRISTINE (EPA)
2079153	02/22/2006	ARTICLE: LDR PHASE IV - TREATMENT STANDARDS FOR TOXICITY CHARACTERISTIC METAL AND MINERAL PROCESSING WASTES	2		(EPA)
2079810	03/01/2006	FACT SHEET: BENEFICIAL USES OF CHAT PROPOSED	1		(EPA)
2079187	03/29/2006	DRAFT PROPOSAL MEMORANDUM	2	FREDERICKS,SCOTT (EPA)|MATZKO,KRISTINE (EPA)|SPRENGER,MARK,D (EPA)	COMPTON,HARRY (EPA)
2079154	04/04/2006	ARTICLE: CRITERIA FOR THE SAFE & ENVIRONMENTALLY PROTECTIVE USE OF GRANULAR MINE TAILINGS KNOWN AS CHAT	41		(EPA)
2079155	04/04/2006	ARTICLE: CRITERIA FOR THE SAFE & ENVIRONMENTALLY PROTECTIVE USE OF GRANULAR MINE TAILINGS KNOWN AS CHAT	2		(EPA)
2079188	05/23/2006	COMMENTS ON APPLICABLE & RELEVANT & APPROPRIATE REQUIREMENTS (ARARS)	1	SHEEHAN,THOMAS (PA DEPT OF ENVIRONMENTAL RESOURCES)	MATZKO,KRISTINE (EPA)
2079189	06/14/2006	POWERPOINT PRESENTATION: POTENTIAL CLEANUP ALTERNATIVES (RELATED DOCUMENTS ATTACHED)	14		MATZKO,KRISTINE (EPA)
2079190	08/23/2006	COMMENTS ON CLEAN-UP ALTERNATIVES	3	FERDAS,ABRAHAM (EPA)	DONAGHY,JAMES,A (CITY OF PHILADELPHIA)
2079191	09/28/2006	COMMENTS ON HEAVY METAL STABILIZATION (RELATED DOCUMENTS ATTACHED)	4	HANSEN,KEVIN (TETRA TECH INC.)	HANSEN,KEVIN (TETRA TECH INC.)|VON HACHT,WILL (US ENVIRONMENTAL INC)
2079812	12/01/2006	FACT SHEET: FREQUENTLY ASKED QUESTIONS ABOUT ECOLOGICAL REVITALIZATION OF SUPERFUND SITES	12		(EPA)
2079840	06/01/2007	REMEDIAL INVESTIGATION REPORT (APPENDICES A - H ATTACHED)	578		(TETRA TECH NUS INC)

DOC ID	DOC DATE	TITLE	PAGE COUNT	ADDRESSEE NAME	AUTHOR NAME	
2079842	06/01/2007	FEASIBILITY STUDY REPORT (APPENDICES A - F ATTACHED)	292		(TETRA TECH NUS INC)	
2081133	07/01/2007	PROPOSED PLAN	27		(EPA)	
2102812	11/15/2007	COMMENTS ON PROPOSED REMEDIAL ACTION PLAN - CITY OF PHILADELPHIA	11	MATZKO,KRISTINE (EPA)	ONEILL,PATRICK,K (PHILADELPHIA CITY OF)	*
2129114	01/28/2009	COMMENTS ON OFFICIAL REQUEST TO DELAY RELEASE OF RECORD OF DECISION (ROD) UNTIL ON OR AFTER 6/30/09	1	MATZKO,KRISTINE (EPA)	ONEILL,PATRICK,K (PHILADELPHIA CITY OF)	*
2129115	02/19/2009	COMMENTS ON AGREEMENT, IN CONSULTATION WITH PADEP, TO DELAY ISSUANCE OF RECORD OF DECISION (ROD) UNTIL 6/30/09	1	ONEILL,PATRICK,K (PHILADELPHIA CITY OF)	WEBB,JAMES,N (EPA)	*
2166666	02/16/2011	COMMENTS ON SLAG REUSE	1	GALLAGHER,TIMOTHY,M (EPA)	FRIEDMAN,DAVID,M (EPA)	*
2178143	02/01/2012	QUALITY ASSURANCE PROJECT PLAN (QAPP)	132	(EPA)	(EA ENGINEERING SCIENCE & TECHNOLOGY INC)	*
2293034	02/01/2012	REDACTED HEALTH & SAFETY PLAN - GROUNDWATER REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)	102	(EPA)	(EA ENGINEERING SCIENCE & TECHNOLOGY INC)	*
2293037	03/01/2012	REDACTED FIELD SAMPLING PLAN - GROUNDWATER REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)	197	(EPA)	(EA ENGINEERING SCIENCE & TECHNOLOGY INC)	*
2293025	09/13/2012	REDACTED INORGANIC DATA VALIDATION REPORT - CASE 42737 - SDG MC0AA9 (SAMPLE SUMMARY REPORT ATTACHED)	30	WALLING,COLLEEN (EPA)	(LOCKHEED MARTIN)	*
2293033	09/27/2012	REDACTED ORGANIC DATA SAMPLE SUMMARY REPORT- CASE 42737 - SDG C0AA0 (MEMO ATTACHED)	77	GALLAGHER,TIMOTHY,M (EPA)	WALLING,COLLEEN (EPA)	*
2293021	01/24/2013	REDACTED INORGANIC DATA VALIDATION REPORT - CASE 43072 - SDG MC0AC2 (SAMPLE SUMMARY REPORT ATTACHED)	31	WALLING,COLLEEN (EPA)	(LOCKHEED MARTIN)	*
2293015	01/28/2013	REDACTED DATA VALIDATION REPORT - CASE 43072 - SDG MC1KP0 (TRANSMITTAL MEMO & SAMPLE SUMMARY REPORT ATTACHED)	24	GALLAGHER,TIMOTHY,M (EPA)|WALLING,COLLEEN (EPA)	(LOCKHEED MARTIN)|WALLING,COLLEEN (EPA)	*
2293022	01/30/2013	REDACTED ORGANIC DATA VALIDATION REPORT - CASE 43072 - SDG C0AC2 (SAMPLE SUMMARY REPORT ATTACHED)	85	WALLING,COLLEEN (EPA)	(LOCKHEED MARTIN)	*
2293023	05/16/2013	REDACTED INORGANIC DATA VALIDATION REPORT - CASE 43443 - SDG MC00A1 (SAMPLE SUMMARY REPORT ATTACHED)	23	WALLING,COLLEEN (EPA)	(LOCKHEED MARTIN)	*
2293016	05/21/2013	REDACTED INORGANIC DATA VALIDATION REPORT - CASE 43443 - SDG MC0AC9 (TRANSMITTAL MEMO & SAMPLE SUMMARY REPORT ATTACHED)	34	GALLAGHER,TIMOTHY,M (EPA)|WALLING,COLLEEN (EPA)	(LOCKHEED MARTIN)|WALLING,COLLEEN (EPA)	*
2293017	05/21/2013	REDACTED ORGANIC DATA VALIDATION REPORT - CASE 43443 - SDG C0AC9 (TRANSMITTAL MEMO ATTACHED)	4	GALLAGHER,TIMOTHY,M (EPA)|WALLING,COLLEEN (EPA)	(LOCKHEED MARTIN)|WALLING,COLLEEN (EPA)	*

DOC ID	DOC DATE	TITLE	PAGE COUNT	ADDRESSEE NAME	AUTHOR NAME	
2293018	02/26/2014	REDACTED ORGANIC DATA VALIDATION REPORT - CASE 43443 - SDG C0AC9 (TRANSMITTAL MEMO & SAMPLE SUMMARY REPORT ATTACHED)	100	GALLAGHER,TIMOTHY,M (EPA)|WALLING,COLLEEN (EPA)	(ICF INTERNATIONAL)|WALLING,COLLEEN (EPA)	* *
2293019	02/26/2014	REDACTED INORGANIC DATA VALIDATION REPORT - CASE 44031 - SDG MC0AD6 (TRANSMITTAL MEMO & SAMPLE SUMMARY REPORT ATTACHED)	47	GALLAGHER,TIMOTHY,M (EPA)|WALLING,COLLEEN (EPA)	(ICF INTERNATIONAL)|WALLING,COLLEEN (EPA)	*
2293020	02/26/2014	REDACTED INORGANIC DATA VALIDATION REPORT - CASE 44031 - SDG MC1L20 (TRANSMITTAL MEMO & SAMPLE SUMMARY REPORT ATTACHED)	33	GALLAGHER,TIMOTHY,M (EPA)|WALLING,COLLEEN (EPA)	(ICF INTERNATIONAL)|WALLING,COLLEEN (EPA)	* *
2293001	03/01/2014	MAP: INORGANICS EXCEEDING SCREENING LEVELS IN GROUNDWATER (FILTERED)	1		(EPA)	*
2293002	03/01/2014	MAP: INORGANICS EXCEEDING SCREENING LEVELS IN GROUNDWATER (UNFILTERED)	1		(EPA)	*
2278605	09/01/2014	OU 2 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT	100	(EPA)	(EA ENGINEERING SCIENCE & TECHNOLOGY INC)	*
2278604	06/01/2016	OU 2 HUMAN HEALTH RISK ASSESSMENT	183	(EPA)	(EA ENGINEERING SCIENCE & TECHNOLOGY INC)	*
2290793	07/21/2016	EMAIL REGARDING VOLUME OF SLAG COVERED BY GEOMEMBRANE (SURVEY MAP & PHOTOGRAPH ATTACHED)	5	GALLAGHER,TIMOTHY,M (EPA)|JOHNSON,STERLING,H (US ARMY CORPS OF ENGINEERS)	GALLAGHER,TIMOTHY,M (EPA)|JOHNSON,STERLING,H (US ARMY CORPS OF ENGINEERS)	*
2293032	04/01/2018	REDACTED OU 2 FINAL REMEDIAL INVESTIGATION REPORT	606	(EPA)	(EA ENGINEERING SCIENCE & TECHNOLOGY INC)	* *
2293024	07/02/2019	REDACTED INORGANIC DATA VALIDATION REPORT - CASE 48263 - SDG MC0AF1 (TRANSMITTAL MEMO & SAMPLE SUMMARY REPORT ATTACHED)	16	GALLAGHER,TIMOTHY,M (EPA)|MCDONALD,BRANDON (EPA)	(ICF INTERNATIONAL)|MCDONALD,BRANDON (EPA)	Δ
2290750	11/01/2019	FINAL FEASIBILITY STUDY (FS) REPORT	118	(EPA)	(EA ENGINEERING SCIENCE & TECHNOLOGY INC)	Δ
2262685	12/01/2019	PROPOSED REMEDIAL ACTION PLAN (PRAP)	47		(EPA)	Δ
2303163	01/01/2020	FACT SHEET: EPA ANNOUNCES PROPOSED CLEANUP PLAN	2		(EPA)	
2303164	01/08/2020	PUBLIC NOTICE: PROPOSED CLEANUP PLAN AVAILABLE FOR PUBLIC COMMENT	1		(EPA)|(STAR NEWS PHILLY)	
		[REDACTED] 1/22/2020 PROPOSED REMEDIAL ACTION			(SARGENT'S COURT REPORTING	

DOC ID	DOC DATE	TITLE	PAGE COUNT	ADDRESSEE NAME	AUTHOR NAME
2079196	Undated	TABLE 4 - MIXTURE DEVELOPMENT & TCLP METALS CHARACTERIZATION	2		(ENVIRONMENTAL QUALITY MANAGEMENT INC)|(KEMRON ENVIRONMENTAL SERVICES INC)
2079197	Undated	SECTION 703 - AGGREGATE	16		
2079198	Undated	PACKET OF GROUNDWATER MONITORING DATA CHARTS	23		(RETTEW ASSOCIATES INC)
2079199	Undated	PACKET OF SPECIAL CONDITIONS GENERAL PERMITS	44		
2079800	Undated	COST ESTIMATES - EXCAVATION OF PHILADELPHIA NORTHEAST WATER POLLUTION CONTROL PLANT SLUDGE LAGOONS	3	FREBOWITZ,ANDREW (TETRA TECH NUS INC)	MATZKO,KRISTINE (EPA)
2079801	Undated	PACKET OF FEDERAL EXPRESS AIRBILLS	10	FREBOWITZ,ANDREW (TETRA TECH NUS INC)	MATZKO,KRISTINE (EPA)
2079802	Undated	HEAVY METAL STABILIZATION REPORT	101		(ADT ENVIRONMENTAL SOLUTIONS LLC)
2079811	Undated	FACT SHEET: REVEGETATING LANDFILLS & WASTE CONTAINMENT AREAS FACT SHEET	12		(EPA)
2293011	Undated	SITE PHOTOS: CONTAINER & INGOT	4		

*

APPENDIX B

Estimated Cost of Alternative S1—No Action

Item No.	Cost Categories and Items	Units	Unit Cost	Quantity (#)	Total Cost
A. CAPITAL COSTS					
1	**No Action**				
	Not applicable	Not applicable			$0
	Line Item Total				$0
				Total	$0
B. O&M COSTS					
2	**Administrative Requirements**				
2.1	Five-Year Reviews	Each	$15,522	6	$93,130
				Total O&M Costs:	**$93,130**

C. 30-YEAR PRESENT VALUE [1]

O&M Costs $82,574

D. COST SUMMARY

Notes:

1. Present Value = Future Value / (1+i)^n, where i is the Real Discount Rate (0.7%) and n is time in years.

Estimated Cost of Alternative S2—Complete Removal and Offsite Disposal

Item No.	Cost Categories and Items	Units	Unit Cost	Quantity (#)	Total Cost
A. CAPITAL COSTS					
1	**Project Planning**				
1.1	Remedial Action Plan	LS	$10,000	1	$10,000
2	**Slag Pile Excavation**				
2.1	Decontamination Facilities for Project Duration	LS	$194,965.84	1	$194,966
2.2	Slag Pile Excavation and Metals Analysis	LS	$566,543.29	1	$566,543
3	**Soil Excavation (Assume Top 1 ft soil removed)**				
3.1	Soil Excavation, Backfilling and Metals Analysis	LS	$202,141.31	1	$202,141
4	**Slag/Soil Transportation and Disposal**				
4.1	Material Loading, including dump truck	LS	$247,140.74	1	$247,141
4.2	32-ft Dump Truck liners	EA	$30.34	3,562.00	$108,076
4.3	Transport Bulk Solid Hazardous Waste	MI	$2.71	1068600	$2,894,196
4.4	Disposal Bulk Haz Waste at RCRA Landfil	TON	$200.00	113151.6	$22,630,320
5	**Site Restoration**				
5.1	Grading and Gravel Placement	LS	$26,142	1	$26,142
6	**Institutional Controls**				
6.1	Administrative Land Use Controls	LS	$277,868.73	1	$277,869
7	**Reporting**				
7.1	Post Construction Documents	LS	$20,000	1	$20,000
				Subtotal:	$27,177,394
				Field Oversight (20%)	$247,387
				Project Management (10%)	$154,480
				Capital Costs Subtotal:	$27,579,261
				Indirects (35%)	$681,334
				Profit (10%)	$2,757,926
				Contingency (10%)	$2,757,926
				Total Capital Costs:	**$33,776,447**
B. O&M COSTS					
8	**Administrative Requirements**				
8.1	Five-Year Reviews	Each	$15,522	6	$93,130
9	**Monitoring**				
9.1	Annual Groundwater Monitoring	Per year	$15,000	2	$30,000
				Total O&M Costs:	**$123,130**

C. 30-YEAR PRESENT VALUE [1]

O&M Costs $112,262

D. COST SUMMARY

Notes:

1. Present Value = Future Value / (1+i)^n, where i is the Real Discount Rate (0.7%) and n is time in years.

Estimated Cost of Alternative S3—RCRA Cap, Regrading, and Partial Offsite Disposal

Item No.	Cost Categories and Items	Units	Unit Cost	Quantity (#)	Total Cost
A. CAPITAL COSTS					
1	**Project Planning**				
1.1	Remedial Action Plan	LS	$20,000	1	$20,000
2	**Limited Slag Removal**				
2.1	Decontamination Facilities for Project Duration	LS	$153,817.25	1	$153,817
2.2	Limited Slag Pile Excavation and Metals Analysis	LS	$62,051.32	1	$62,051
3	**Slag Transportation and Disposal**				
3.1	Material Loading, including dump truck	LS	$29,759.42	1	$29,759
3.2	32-ft Dump Truck liners	EA	$30.34	429	$13,016
3.3	Transport Bulk Solid Hazardous Waste	MI	$2.71	128700	$348,571
3.4	Disposal Bulk Haz Waste at RCRA landfill	TON	$200.00	13618.35	$2,723,670
4	**RCRA Capping**				
4.1	Regrading	LS	$54,438.63	1	$54,439
4.2	Capping	LS	$762,369.77	1	$762,370
4.3	Fencing Around Site	LS	$39,884.32	1	$39,884
5	**Institutional Controls**				
5.1	Administrative Land Use Controls	LS	$277,868.73	1	$277,869
6	**Reporting**				
6.1	Post Construction/O&M Documents	LS	$25,000	1	$25,000
				Subtotal:	$4,510,447
				Field Oversight (20%)	$220,464
				Project Management (10%)	$142,519
				Capital Costs Subtotal:	$4,873,430
				Indirects (35%)	$625,860
				Profit (10%)	$487,343
				Contingency (10%)	$487,343
				Total Capital Costs:	**$6,473,976**
B. O&M COSTS					
7	**Administrative Requirements**				
7.1	Five-Year Reviews	Each	$15,521.66	6	$93,129.99
8	**Monitoring and Maintenance**				
8.1	Cap Inspections and Maintenance	Per Year	$10,000	30	$300,000.00
8.2	Periodic Soil and/or Air Monitoring	Each Event	$17,108.08	4	$68,432.32
8.3	Annual Groundwater Monitoring	Per year	$15,000	2	$30,000.00
				Total O&M Costs:	**$491,562**

C. 30-YEAR PRESENT VALUE [1]

O&M Costs $449,260

D. COST SUMMARY

Notes:

1. Present Value = Future Value / (1+i)^n, where i is the Real Discount Rate (0.7%) and n is time in years.

Estimated Cost of Alternative S4—Complete Removal, Onsite Treatment, and Offsite Disposal

Item No.	Cost Categories and Items	Units	Unit Cost	Quantity (#)	Total Cost
A. CAPITAL COSTS					
1	**Project Planning**				
1.1	Remedial Action Plan	LS	$20,000	1	$20,000
2	**Slag Pile Excavation**				
2.1	Decontamination Facilities for Project Duration	LS	$226,413.83	1	$226,414
2.2	Slag Pile Excavation and Metals Analysis	LS	$642,082.39	1	$642,082
3	**Soil Excavation (Assume Top 1 ft soil removed)**				
3.1	Soil Excavation, Backfilling, and Metals Analysis	LS	$202,141.31	1	$202,141
4	**Slag/Soil Treatment**				
4.1	Blastox for Lead Stabilization (delivered, per ton of slag/soil	TON	$15.00	113145	$1,697,175
4.2	Slag Crushing, Slag/Soil Treatment via Mixing	LS	$3,307,666.09	1	$3,307,666
5	**Slag/Soil Transportation and Disposal**				
5.1	Material Loading, including dump truck	LS	$258,929.96	1	$258,930
5.2	32-ft Dump Truck liners	EA	$31.40	3732	$117,195
5.3	Transport Bulk Solid Non-Hazardous Waste	MI	$3.17	279900	$887,283
5.4	Disposal Bulk Non-Haz Waste at Landfill	TON	$70.00	118677.6	$8,307,432
6	**Site Restoration**				
6.1	Grading and Gravel Placement	LS	$26,141.72	1	$26,142
7	**Institutional Controls**				
7.1	Administrative Land Use Controls	LS	$277,868.73	1	$277,869
8	**Reporting**				
8.1	Post Construction Documents	LS	$20,000	1	$20,000
				Subtotal:	$15,990,329
				Field Oversight (20%)	$892,247
				Project Management (10%)	$667,842
				Capital Costs Subtotal:	$15,990,329
				Indirects (35%)	$2,337,447
				Profit (10%)	$1,599,033
				Contingency (10%)	$1,599,033
				Total Capital Costs:	**$21,525,842**
B. O&M COSTS					
9	**Administrative Requirements**				
9.1	Five-Year Reviews	Each	$15,522	6	$93,130
10	**Monitoring**				
10.1	Annual Groundwater Monitoring	Per year	$15,000	2	$30,000
				Total O&M Costs:	**$123,130**

C. 30-YEAR PRESENT VALUE [1]

O&M Costs $112,262

D. COST SUMMARY

Notes:

1. Present Value = Future Value / (1+i)^n, where i is the Real Discount Rate (0.7%) and n is time in years.

Estimated Cost of Alternative S5—Complete Removal, Offsite Treatment and Disposal

Item No.	Cost Categories and Items	Units	Unit Cost	Quantity (#)	Total Cost
A. CAPITAL COSTS					
1	**Project Planning**				
1.1	Remedial Action Plan	LS	$10,000	1	$10,000
2	**Slag Pile Excavation**				
2.1	Decontamination Facilities for Project Duration	LS	$194,965.84	1	$194,966
2.2	Slag Pile Excavation and Metals Analysis	LS	$566,543.29	1	$566,543
3	**Soil Excavation (Assume Top 1 ft soil removed)**				
3.1	Soil Excavation, Backfilling, and Metals Analysis	LS	$202,141.31	1	$202,141
4	**Slag/Soil Transportation and Disposal**				
4.1	Transportation, Stabilization, and Disposal Bulk Non-Haz Waste at Landfill	TON	$185.00	113151.6	$21,955,356
5	**Site Restoration**				
5.1	Grading and Gravel Placement	LS	$26,142	1	$26,142
6	**Institutional Controls**				
6.1	Administrative Land Use Controls	LS	$277,868.73	1	$277,869
7	**Reporting**				
7.1	Post Construction Documents	LS	$20,000	1	$20,000
				Subtotal:	$23,253,017
				Field Oversight (20%)	$157,530
				Project Management (10%)	$129,766
				Capital Costs Subtotal:	$23,253,017
				Indirects (35%)	$454,181
				Profit (10%)	$2,325,302
				Contingency (10%)	$2,325,302
				Total Capital Costs:	**$28,357,802**
B. O&M COSTS					
9	**Administrative Requirements**				
9.1	Five-Year Reviews	Each	$15,522	6	$93,130
10	**Monitoring**				
10.1	Annual Groundwater Monitoring	Per year	$15,000	2	$30,000
				Total O&M Costs:	**$123,130**

C. 30-YEAR PRESENT VALUE [1]

O&M Costs $112,262

D. COST SUMMARY

Notes:

1. Present Value = Future Value / (1+i)^n, where i is the Real Discount Rate (0.7%) and n is time in years.

APPENDIX C

TABLE 7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	**Inorganics**												
				ARSENIC	1.43E-02	(mg/L)	1.23E-04	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.8E-04	4.30E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.4E+00
				CHROMIUM, HEXAVALENT	1.40E-03	(mg/L)	2.40E-05	(mg/kg-day)	5.00E-01	per (mg/kg-day)	1.2E-05	4.20E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.4E-02
				COBALT	1.92E-02	(mg/L)	1.64E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.74E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.9E+00
				IRON	6.26E+01	(mg/L)	5.36E-01	(mg/kg-day)	NA	per (mg/kg-day)	--	1.88E+00	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.7E+00
				MANGANESE	7.61E+00	(mg/L)	6.52E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	2.28E-01	(mg/kg-day)	2.40E-02	(mg/kg-day)	9.5E+00
				SELENIUM	1.34E-02	(mg/L)	1.15E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	4.02E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.0E-02
				CYANIDE	5.33E-01	(mg/L)	4.57E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.60E-02	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.6E+01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	1.47E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.1E-05	2.58E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	6.34E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.6E-05	1.11E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	5.65E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	4.1E-06	9.89E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	5.48E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	4.0E-04	9.59E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	3.60E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.6E-05	6.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	2.40E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	8.39E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.1E-01
				NAPHTHALENE	3.11E-02	(mg/L)	2.66E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	9.31E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.7E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	6.59E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	4.2E-07	2.31E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	2.9E-05
				BETA-BHC	6.60E-05	(mg/L)	5.65E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	1.0E-06	1.98E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	7.79E-08	(mg/kg-day)	1.70E+01	per (mg/kg-day)	1.3E-06	2.73E-07	(mg/kg-day)	3.00E-05	(mg/kg-day)	9.1E-03
				DIELDRIN	7.80E-06	(mg/L)	6.68E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	1.1E-06	2.34E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	4.7E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	6.34E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	5.8E-07	2.22E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	1.7E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	4.88E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	3.9E-07	1.71E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	3.4E-04
				NITROBENZENE	1.10E-03	(mg/L)	9.42E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.30E-05	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.6E-02
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	9.42E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	5.2E-07	3.30E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	8.2E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	4.86E-05	(mg/kg-day)	7.20E-01	per (mg/kg-day)	3.5E-05	2.25E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	7.5E-03
			Exp. Route Total								**7.2E-04**					**3.2E+01**
			Dermal	**Inorganics**												
				ARSENIC	1.43E-02	(mg/L)	6.85E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.0E-06	2.40E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.0E-03
				CHROMIUM, HEXAVALENT	1.40E-03	(mg/L)	2.68E-07	(mg/kg-day)	2.00E+01	per (mg/kg-day)	5.4E-06	4.68E-07	(mg/kg-day)	7.50E-05	(mg/kg-day)	6.2E-03
				COBALT	1.92E-02	(mg/L)	3.66E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.28E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.3E-03
				IRON	6.26E+01	(mg/L)	2.99E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.05E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.5E-02
				MANGANESE	7.61E+00	(mg/L)	3.64E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.27E-03	(mg/kg-day)	9.60E-04	(mg/kg-day)	1.3E+00
				SELENIUM	1.34E-02	(mg/L)	6.40E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.24E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.5E-04
				CYANIDE	5.33E-01	(mg/L)	2.55E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	8.92E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	8.9E-02
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	2.10E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.5E-04	3.68E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	7.98E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.8E-04	1.40E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	1.18E-03	(mg/kg-day)	7.30E-02	per (mg/kg-day)	8.6E-05	2.06E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	1.16E-03	(mg/kg-day)	7.30E+00	per (mg/kg-day)	8.5E-03	2.03E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	7.91E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.8E-04	1.38E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	3.26E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.14E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.9E-01
				NAPHTHALENE	3.11E-02	(mg/L)	1.68E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.87E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.9E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	2.53E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	1.6E-07	8.85E-08	(mg/kg-day)	8.00E-03	(mg/kg-day)	1.1E-05
				BETA-BHC	6.60E-05	(mg/L)	2.17E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	3.9E-07	7.59E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	1.43E-06	(mg/kg-day)	1.70E+01	per (mg/kg-day)	2.4E-05	4.99E-06	(mg/kg-day)	3.00E-05	(mg/kg-day)	1.7E-01
				DIELDRIN	7.80E-06	(mg/L)	1.21E-07	(mg/kg-day)	1.60E+01	per (mg/kg-day)	1.9E-06	4.22E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	8.4E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	6.99E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	6.4E-07	2.45E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	1.9E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	7.38E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	5.9E-07	2.58E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	5.2E-04
				NITROBENZENE	1.10E-03	(mg/L)	6.69E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.34E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.2E-03
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	1.41E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	7.8E-08	4.94E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.2E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	2.19E-06	(mg/kg-day)	7.20E-01	per (mg/kg-day)	1.6E-06	1.74E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	5.8E-04
			Exp. Route Total								**9.9E-03**					**2.0E+00**
		Exposure Point Total									**1.1E-02**					**3.4E+01**
	Exposure Medium Total										**1.1E-02**					**3.4E+01**

TABLE 7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
	Air	Shower Head	Inhalation	**Volatiles**												
				NAPHTHALENE	4.84E-02	(mg/m^3)	1.72E+01	$(\mu g/m^3)$	3.40E-05	per $(\mu g/m^3)$	5.9E-04	4.64E-02	(mg/m^3)	3.00E-03	(mg/m^3)	1.5E+01
				BENZENE	1.90E-04	(mg/m^3)	6.77E-02	$(\mu g/m^3)$	7.80E-06	per $(\mu g/m^3)$	5.3E-07	1.82E-04	(mg/m^3)	3.00E-02	(mg/m^3)	6.1E-03
				VINYL CHLORIDE	2.47E-03	(mg/m^3)	8.83E-01	$(\mu g/m^3)$	4.40E-06	per $(\mu g/m^3)$	3.9E-06	2.37E-03	(mg/m^3)	1.00E-01	(mg/m^3)	2.4E-02
			Exp. Route Total								**5.9E-04**					**1.5E+01**
		Exposure Point Total									**5.9E-04**					**1.5E+01**
	Exposure Medium Total										**5.9E-04**					**1.5E+01**
Groundwater Total											**1.1E-02**					**4.9E+01**
										Total of Receptor Risks Across All Media	**1.1E-02**				Total of Receptor Hazards Across All Media	**4.9E+01**

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 7.2
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	**Inorganics**												
				ARSENIC	1.43E-02	(mg/L)	6.13E-05	(mg/kg-day)	1.50E+00	per (mg/kg-day)	9.2E-05	7.15E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.4E+00
				CHROMIUM, HEXAVALENT	1.40E-03	(mg/L)	3.17E-05	(mg/kg-day)	5.00E-01	per (mg/kg-day)	1.6E-05	6.98E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	2.3E-02
				COBALT	1.92E-02	(mg/L)	8.19E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	9.55E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.2E+00
				IRON	6.26E+01	(mg/L)	2.67E-01	(mg/kg-day)	NA	per (mg/kg-day)	--	3.12E+00	(mg/kg-day)	7.00E-01	(mg/kg-day)	4.5E+00
				MANGANESE	7.61E+00	(mg/L)	3.25E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	3.80E-01	(mg/kg-day)	2.40E-02	(mg/kg-day)	1.6E+01
				SELENIUM	1.34E-02	(mg/L)	5.73E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	6.68E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.3E-01
				CYANIDE	5.33E-01	(mg/L)	2.28E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.66E-02	(mg/kg-day)	1.00E-03	(mg/kg-day)	2.7E+01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	1.95E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.4E-05	4.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	8.38E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.1E-05	1.84E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	7.48E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	5.5E-06	1.65E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	7.25E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.3E-04	1.60E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	4.76E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.5E-05	1.05E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	1.20E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.40E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.5E-01
				NAPHTHALENE	3.11E-02	(mg/L)	1.33E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.55E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	7.7E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	3.29E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	2.1E-07	3.84E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	4.8E-05
				BETA-BHC	6.60E-05	(mg/L)	2.82E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	5.1E-07	3.29E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	3.89E-08	(mg/kg-day)	1.70E+01	per (mg/kg-day)	6.6E-07	4.54E-07	(mg/kg-day)	3.00E-05	(mg/kg-day)	1.5E-02
				DIELDRIN	7.80E-06	(mg/L)	3.33E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	5.3E-07	3.89E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	7.8E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	3.16E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	2.9E-07	3.69E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	2.8E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	2.44E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	1.9E-07	2.84E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	5.7E-04
				NITROBENZENE	1.10E-03	(mg/L)	4.70E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	5.48E-05	(mg/kg-day)	2.00E-03	(mg/kg-day)	2.7E-02
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	4.70E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.6E-07	5.48E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.4E-02
				VINYL CHLORIDE	7.50E-04	(mg/L)	NA	(mg/kg-day)	7.20E-01	per (mg/kg-day)	--	3.74E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.2E-02
			Exp. Route Total								**7.4E-02**					**5.3E+01**
			Dermal	**Inorganics**												
				ARSENIC	1.43E-02	(mg/L)	2.70E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.1E-07	3.15E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.1E-02
				CHROMIUM, HEXAVALENT	1.40E-03	(mg/L)	2.79E-07	(mg/kg-day)	2.00E+01	per (mg/kg-day)	5.6E-06	6.15E-07	(mg/kg-day)	7.50E-05	(mg/kg-day)	8.2E-03
				COBALT	1.92E-02	(mg/L)	1.44E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.68E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.6E-03
				IRON	6.26E+01	(mg/L)	1.18E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.38E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.0E-02
				MANGANESE	7.61E+00	(mg/L)	1.43E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.67E-03	(mg/kg-day)	9.60E-04	(mg/kg-day)	1.7E+00
				SELENIUM	1.34E-02	(mg/L)	2.52E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.94E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	5.9E-04
				CYANIDE	5.33E-01	(mg/L)	1.00E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.17E-04	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.2E-01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	2.52E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.8E-04	5.54E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	9.56E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.0E-04	2.10E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	1.41E-03	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.0E-04	3.11E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	1.39E-03	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.0E-02	3.06E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	9.47E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.9E-04	2.09E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	1.48E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.72E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.3E-01
				NAPHTHALENE	3.11E-02	(mg/L)	7.58E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	8.85E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.4E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	1.14E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	7.2E-08	1.33E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	1.7E-05
				BETA-BHC	6.60E-05	(mg/L)	9.80E-08	(mg/kg-day)	1.80E+00	per (mg/kg-day)	1.8E-07	1.14E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	6.44E-07	(mg/kg-day)	1.70E+01	per (mg/kg-day)	1.1E-05	7.52E-06	(mg/kg-day)	3.00E-05	(mg/kg-day)	2.5E-01
				DIELDRIN	7.80E-06	(mg/L)	5.45E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	8.7E-07	6.36E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	1.3E-02
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	3.16E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	2.9E-07	3.68E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	2.8E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	3.34E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	2.7E-07	3.89E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	7.8E-04
				NITROBENZENE	1.10E-03	(mg/L)	3.02E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.53E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.8E-03
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	6.23E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.4E-08	7.27E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.8E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	NA	(mg/kg-day)	7.20E-01	per (mg/kg-day)	--	2.52E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	8.4E-04
			Exp. Route Total								**1.2E-02**					**2.7E+00**
		Exposure Point Total									**8.5E-02**					**5.6E+01**
	Exposure Medium Total										**8.5E-02**					**5.6E+01**
Groundwater Total											**8.5E-02**					**5.6E+01**
										Total of Receptor Risks Across All Media	**8.5E-02**				Total of Receptor Hazards Across All Media	**5.6E+01**

Carcinogenic risks for the child resident exposure to vinyl chloride are included in the adult resident intake calculations.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Franklin Slag Pile	Ingestion	**Inorganics**												
				ALUMINUM	3.19E+00	(mg/L)	1.56E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.09E-03	(mg/kg-day)	1.00E+00	(mg/kg-day)	1.1E-03
				ARSENIC	1.47E-02	(mg/L)	7.20E-08	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.1E-07	5.04E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.7E-02
				CADMIUM	3.99E-03	(mg/L)	1.95E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	1.37E-06	(mg/kg-day)	5.00E-04	(mg/kg-day)	2.7E-03
				CHROMIUM, HEXAVALENT	1.39E-01	(mg/L)	6.80E-07	(mg/kg-day)	5.00E-01	per (mg/kg-day)	3.4E-07	4.76E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.6E-02
				COBALT	1.84E-02	(mg/L)	8.98E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	6.29E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.1E-02
				IRON	6.36E+01	(mg/L)	3.11E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	2.18E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	3.1E-02
				MANGANESE	7.31E+00	(mg/L)	3.57E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	2.50E-03	(mg/kg-day)	2.40E-02	(mg/kg-day)	1.0E-01
				NICKEL	3.62E-02	(mg/L)	1.77E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.24E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	6.2E-04
				SELENIUM	1.96E-02	(mg/L)	9.59E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	6.71E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.3E-03
				VANADIUM	1.99E-02	(mg/L)	9.75E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	6.82E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.4E-03
				ZINC	7.52E-01	(mg/L)	3.68E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	2.58E-04	(mg/kg-day)	3.00E-01	(mg/kg-day)	8.6E-04
				CYANIDE	5.33E-01	(mg/L)	2.61E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.83E-04	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.8E-01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	4.21E-09	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.1E-09	2.95E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	1.81E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.3E-08	1.27E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	1.61E-08	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.2E-09	1.13E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	1.57E-08	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.1E-07	1.10E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	1.03E-08	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.5E-09	7.19E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	1.37E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	9.59E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.4E-03
				NAPHTHALENE	3.11E-02	(mg/L)	1.52E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.06E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	5.3E-04
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	3.77E-11	(mg/kg-day)	6.30E+00	per (mg/kg-day)	2.4E-10	2.64E-09	(mg/kg-day)	8.00E-03	(mg/kg-day)	3.3E-07
				BETA-BHC	6.60E-05	(mg/L)	3.23E-10	(mg/kg-day)	1.80E+00	per (mg/kg-day)	5.8E-10	2.26E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	4.45E-11	(mg/kg-day)	1.70E+01	per (mg/kg-day)	7.6E-10	3.12E-09	(mg/kg-day)	3.00E-05	(mg/kg-day)	1.0E-04
				DIELDRIN	7.80E-06	(mg/L)	3.82E-11	(mg/kg-day)	1.60E+01	per (mg/kg-day)	6.1E-10	2.67E-09	(mg/kg-day)	5.00E-05	(mg/kg-day)	5.3E-05
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	3.62E-11	(mg/kg-day)	9.10E+00	per (mg/kg-day)	3.3E-10	2.53E-09	(mg/kg-day)	1.30E-05	(mg/kg-day)	1.9E-04
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	2.79E-08	(mg/kg-day)	8.00E-03	per (mg/kg-day)	2.2E-10	1.95E-06	(mg/kg-day)	5.00E-01	(mg/kg-day)	3.9E-06
				NITROBENZENE	1.10E-03	(mg/L)	5.38E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	3.77E-07	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.9E-04
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	5.38E-09	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.0E-10	3.77E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	9.4E-05
				VINYL CHLORIDE	7.50E-04	(mg/L)	3.67E-09	(mg/kg-day)	7.20E-01	per (mg/kg-day)	2.6E-09	2.57E-07	(mg/kg-day)	3.00E-03	(mg/kg-day)	8.6E-05
			Exp. Route Total								**5.9E-07**					**3.8E-01**
			Dermal	**Inorganics**												
				ALUMINUM	3.19E+00	(mg/L)	1.08E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	7.59E-05	(mg/kg-day)	1.00E+00	(mg/kg-day)	7.6E-05
				ARSENIC	1.47E-02	(mg/L)	4.99E-09	(mg/kg-day)	1.50E+00	per (mg/kg-day)	7.5E-09	3.50E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.2E-03
				CADMIUM	3.99E-03	(mg/L)	1.35E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	9.47E-08	(mg/kg-day)	2.50E-05	(mg/kg-day)	3.8E-03
				CHROMIUM, HEXAVALENT	1.39E-01	(mg/L)	9.44E-08	(mg/kg-day)	2.00E+01	per (mg/kg-day)	1.9E-06	6.61E-06	(mg/kg-day)	7.50E-05	(mg/kg-day)	8.8E-02
				COBALT	1.84E-02	(mg/L)	2.49E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.75E-07	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.8E-04
				IRON	6.36E+01	(mg/L)	2.16E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.51E-03	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.2E-03
				MANGANESE	7.31E+00	(mg/L)	2.48E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	1.74E-04	(mg/kg-day)	9.60E-04	(mg/kg-day)	1.8E-01
				NICKEL	3.62E-02	(mg/L)	2.46E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.72E-07	(mg/kg-day)	8.00E-04	(mg/kg-day)	2.2E-04
				SELENIUM	1.96E-02	(mg/L)	6.65E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	4.66E-07	(mg/kg-day)	5.00E-03	(mg/kg-day)	9.3E-05
				VANADIUM	1.99E-02	(mg/L)	6.76E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	4.73E-07	(mg/kg-day)	1.30E-04	(mg/kg-day)	3.6E-03
				ZINC	7.52E-01	(mg/L)	1.53E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.07E-05	(mg/kg-day)	3.00E-01	(mg/kg-day)	3.6E-05
				CYANIDE	5.33E-01	(mg/L)	1.81E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.27E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.3E-02
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	3.15E-07	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.3E-07	2.20E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	1.19E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.7E-07	8.36E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	1.76E-06	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.3E-07	1.24E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	1.74E-06	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.3E-05	1.22E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	1.18E-06	(mg/kg-day)	7.30E-01	per (mg/kg-day)	8.6E-07	8.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	1.01E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	7.07E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.8E-02
				NAPHTHALENE	3.11E-02	(mg/L)	5.69E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.98E-05	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.0E-03
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	7.57E-11	(mg/kg-day)	6.30E+00	per (mg/kg-day)	4.8E-10	5.30E-09	(mg/kg-day)	8.00E-03	(mg/kg-day)	6.6E-07
				BETA-BHC	6.60E-05	(mg/L)	6.49E-10	(mg/kg-day)	1.80E+00	per (mg/kg-day)	1.2E-09	4.54E-08	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	4.27E-09	(mg/kg-day)	1.70E+01	per (mg/kg-day)	7.3E-08	2.99E-07	(mg/kg-day)	3.00E-05	(mg/kg-day)	1.0E-02
				DIELDRIN	7.80E-06	(mg/L)	3.61E-10	(mg/kg-day)	1.60E+01	per (mg/kg-day)	5.8E-09	2.53E-08	(mg/kg-day)	5.00E-05	(mg/kg-day)	5.1E-04
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	2.09E-10	(mg/kg-day)	9.10E+00	per (mg/kg-day)	1.9E-09	1.46E-08	(mg/kg-day)	1.30E-05	(mg/kg-day)	1.1E-03
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	2.24E-07	(mg/kg-day)	8.00E-03	per (mg/kg-day)	1.8E-09	1.57E-05	(mg/kg-day)	5.00E-01	(mg/kg-day)	3.1E-05
				NITROBENZENE	1.10E-03	(mg/L)	2.51E-09	(mg/kg-day)	NA	per (mg/kg-day)	--	1.75E-07	(mg/kg-day)	2.00E-03	(mg/kg-day)	8.8E-05
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	6.14E-09	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.4E-10	4.30E-07	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.1E-04
				VINYL CHLORIDE	7.50E-04	(mg/L)	2.34E-09	(mg/kg-day)	7.20E-01	per (mg/kg-day)	1.7E-09	1.64E-07	(mg/kg-day)	3.00E-03	(mg/kg-day)	5.5E-05
			Exp. Route Total								**1.7E-05**					**3.2E-01**
		Exposure Point Total									**1.7E-05**					**7.1E-01**
	Exposure Medium Total										**1.7E-05**					**7.1E-01**

TABLE 7.3
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
	Air in Trench	Franklin Slag Pile	Inhalation	**Volatiles**												
				BENZENE	1.37E-02	(mg/m^3)	4.47E-03	$(\mu g/m^3)$	7.80E-06	per $(\mu g/m^3)$	3.5E-08	3.13E-04	(mg/m^3)	3.00E-02	(mg/m^3)	1.0E-02
				NAPHTHALENE	2.71E-01	(mg/m^3)	8.83E-02	$(\mu g/m^3)$	3.40E-05	per $(\mu g/m^3)$	3.0E-06	6.18E-03	(mg/m^3)	3.00E-03	(mg/m^3)	2.1E+00
				VINYL CHLORIDE	1.05E-02	(mg/m^3)	3.44E-03	$(\mu g/m^3)$	4.40E-06	per $(\mu g/m^3)$	1.5E-08	2.41E-04	(mg/m^3)	1.00E-01	(mg/m^3)	2.4E-03
			Exp. Route Total								**3.1E-06**					**2.1E+00**
		Exposure Point Total									**3.1E-06**					**2.1E+00**
	Exposure Medium Total										**3.1E-06**					**2.1E+00**
Groundwater Total											**2.0E-05**					**2.8E+00**
										Total of Receptor Risks Across All Media	**2.0E-05**				Total of Receptor Hazards Across All Media	**2.8E+00**

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Off-Site Resident Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater Child	Tap Water	**Inorganics**					**Inorganics**					
			ARSENIC	9.2E-05	4.1E-07	--	9E-05	ARSENIC	Skin	2.4E+00	1.1E-02	--	2.4
			CHROMIUM, HEXAVALENT	1.6E-05	5.6E-06	--	2E-05	CHROMIUM, HEXAVALENT	None	2.3E-02	8.2E-03	--	0.03
			COBALT	--	--	--	NA	COBALT	Thyroid	3.2E+00	5.6E-03	--	3.2
			IRON	--	--	--	NA	IRON	Digestive System	4.5E+00	2.0E-02	--	4.5
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.6E+01	1.7E+00	--	18
			SELENIUM	--	--	--	NA	SELENIUM	Clinical selenosis	1.3E-01	5.9E-04	--	0.1
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	2.7E+01	1.2E-01	--	27
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	1.4E-05	1.8E-04	--	2E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	6.1E-05	7.0E-04	--	8E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	5.5E-06	1.0E-04	--	1E-04	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.3E-04	1.0E-02	--	1E-02	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.5E-05	6.9E-04	--	7E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			2-METHYLNAPHTHALENE	--	--	--	NA	2-METHYLNAPHTHALENE	Lungs	3.5E-01	4.3E-01	--	0.8
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Body Weight	7.7E-02	4.4E-02	--	0.1
			Pesticides/PCBs					**Pesticides/PCBs**					
			ALPHA-BHC	2.1E-07	7.2E-08	--	3E-07	ALPHA-BHC	Liver	4.8E-05	1.7E-05	--	0.00006
			BETA-BHC	5.1E-07	1.8E-07	--	7E-07	BETA-BHC	NA	--	--	--	NA
			ALDRIN	6.6E-07	1.1E-05	--	1E-05	ALDRIN	Liver	1.5E-02	2.5E-01	--	0.3
			DIELDRIN	5.3E-07	8.7E-07	--	1E-06	DIELDRIN	Liver	7.8E-03	1.3E-02	--	0.02
			HEPTACHLOR EPOXIDE	2.9E-07	2.9E-07	--	6E-07	HEPTACHLOR EPOXIDE	Liver	2.8E-02	2.8E-02	--	0.06
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	1.9E-07	2.7E-07	--	5E-07	1,1-BIPHENYL	Kidney	5.7E-04	7.8E-04	--	0.001
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Blood	2.7E-02	1.8E-03	--	0.03
			Volatiles					**Volatiles**					
			BENZENE	2.6E-07	3.4E-08	--	3E-07	BENZENE	Immune System	1.4E-02	1.8E-03	--	0.02
			VINYL CHLORIDE	--	--	--	NA	VINYL CHLORIDE	Liver	1.2E-02	8.4E-04	--	0.01
			(Total for Child)	7.4E-02	1.2E-02	---	9E-02		(Total for Child)	5.3E+01	2.7E+00	---	56

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile

Scenario Timeframe: Futur
Receptor Population: Off-Site Residen
Receptor Age: Child and Adul

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater Adult	Tap Water	**Inorganics**					**Inorganics**					
			ARSENIC	1.8E-04	1.0E-06	--	2E-04	ARSENIC	Skin	1.4E+00	8.0E-03	--	1.4
			CHROMIUM, HEXAVALENT	1.2E-05	5.4E-06	--	2E-05	CHROMIUM, HEXAVALENT	None	1.4E-02	6.2E-03	--	0.02
			COBALT	--	--	--	NA	COBALT	Thyroid	1.9E+00	4.3E-03	--	1.9
			IRON	--	--	--	NA	IRON	Digestive System	2.7E+00	1.5E-02	--	2.7
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	9.5E+00	1.3E+00	--	11
			SELENIUM	--	--	--	NA	SELENIUM	Clinical selenosis	8.0E-02	4.5E-04	--	0.08
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	1.6E+01	8.9E-02	--	16
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	1.1E-05	1.5E-04	--	2E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.6E-05	5.8E-04	--	6E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	4.1E-06	8.6E-05	--	9E-05	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.0E-04	8.5E-03	--	9E-03	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.6E-05	5.8E-04	--	6E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			2-METHYLNAPHTHALENE	--	--	--	NA	2-METHYLNAPHTHALENE	Lungs	2.1E-01	2.9E-01	--	0.5
			NAPHTHALENE	--	--	5.9E-04	6E-04	NAPHTHALENE	Body Weight	4.7E-02	2.9E-02	1.5E+01	16
			Pesticides/PCBs					**Pesticides/PCBs**					
			ALPHA-BHC	4.2E-07	1.6E-07	--	6E-07	ALPHA-BHC	Liver	2.9E-05	1.1E-05	--	0.00004
			BETA-BHC	1.0E-06	3.9E-07	--	1E-06	BETA-BHC	NA	--	--	--	NA
			ALDRIN	1.3E-06	2.4E-05	--	3E-05	ALDRIN	Liver	9.1E-03	1.7E-01	--	0.2
			DIELDRIN	1.1E-06	1.9E-06	--	3E-06	DIELDRIN	Liver	4.7E-03	8.4E-03	--	0.01
			HEPTACHLOR EPOXIDE	5.8E-07	6.4E-07	--	1E-06	HEPTACHLOR EPOXIDE	Liver	1.7E-02	1.9E-02	--	0.04
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	3.9E-07	5.9E-07	--	1E-06	1,1-BIPHENYL	Kidney	3.4E-04	5.2E-04	--	0.0009
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Blood	1.6E-02	1.2E-03	--	0.02
			Volatiles					**Volatiles**					
			BENZENE	5.2E-07	7.8E-08	5.3E-07	1E-06	BENZENE	Immune System	8.2E-03	1.2E-03	6.1E-03	0.02
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05	VINYL CHLORIDE	Liver	7.5E-03	5.8E-04	2.4E-02	0.03
			(Total for Adult)	7.2E-04	9.9E-03	5.9E-04	1E-02		(Total for Adult)	3.2E+01	2.0E+00	1.5E+01	49

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile

Scenario Timeframe: Futurc

Receptor Population: Off-Site Residen

Receptor Age: Child and Adul

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater Adult + Child	Tap Water	**Inorganics**										
			ARSENIC	2.8E-04	1.4E-06	NA	3E-04						
			CHROMIUM, HEXAVALENT	2.8E-05	1.1E-05	NA	4E-05						
			COBALT	NA	NA	NA	NA						
			IRON	NA	NA	NA	NA						
			MANGANESE	NA	NA	NA	NA						
			SELENIUM	NA	NA	NA	NA						
			PAHs										
			BENZO(A)ANTHRACENE	2.5E-05	3.4E-04	NA	4E-04						
			BENZO(B)FLUORANTHENE	1.1E-04	1.3E-03	NA	1E-03						
			BENZO(K)FLUORANTHENE	9.6E-06	1.9E-04	NA	2E-04						
			BENZO(A)PYRENE	9.3E-04	1.9E-02	NA	2E-02						
			INDENO(1,2,3-C,D)PYRENE	6.1E-05	1.3E-03	NA	1E-03						
			2-METHYLNAPHTHALENE	NA	NA	NA	NA						
			NAPHTHALENE	NA	NA	5.9E-04	6E-04						
			Pesticides/PCBs										
			ALPHA-BHC	6.2E-07	2.3E-07	NA	9E-07						
			BETA-BHC	1.5E-06	5.7E-07	NA	2E-06						
			ALDRIN	2.0E-06	3.5E-05	NA	4E-05						
			DIELDRIN	1.6E-06	2.8E-06	NA	4E-06						
			HEPTACHLOR EPOXIDE	8.6E-07	9.2E-07	NA	2E-06						
			Semivolatiles										
			1,1-BIPHENYL	5.9E-07	8.6E-07	NA	1E-06						
			NITROBENZENE	NA	NA	NA	NA						
			Volatiles										
			BENZENE	7.8E-07	1.1E-07	5.3E-07	1E-06						
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05						
			(Total for Child + Adult)	7.4E-02	2.2E-02	5.9E-04	1E-01		**Total Hazard Index Across Groundwater (Child)**				**5.6E+01**
	Total Risk Across Groundwater (Adult + Child)						**1E-01**		**Total Hazard Index Across Groundwater (Adult)**				**4.9E+01**
	Total Risk Across All Media and All Exposure Routes						**1E-01**		**Total Hazard Index Across All Media and All Exposure Routes (Child)**				**56**
									Total Hazard Index Across All Media and All Exposure Routes (Adult)				**49**

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Futurc Receptor Population: Off-Site Resident Receptor Age: Child and Adul

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total

Total Hazard Index Skin (Child)	**2**
Total Hazard Index Thyroid (Child)	**3**
Total Hazard Index Digestive System (Child)	**4**
Total Hazard Index Central Nervous System (Child)	**18**
Total Hazard Index Clinical Selenosis (Child	**0.1**
Total Hazard Index Lungs (Child)	**0.8**
Total Hazard Index Body Weight (Child)	**0.1**
Total Hazard Index Liver (Child)	**0.3**
Total Hazard Index Kidneys (Child)	**0.001**
Total Hazard Index Blood (Child)	**0.03**
Total Hazard Index Immune System (Child	**0.02**
Total Hazard Index Endrocrine System (Child	**27**
Total Hazard Index Hexavalent Chromium (Child	**0.03**

Total Hazard Index Skin (Adult)	**1**
Total Hazard Index Thyroid (Adult)	**2**
Total Hazard Index Digestive System (Adult)	**3**
Total Hazard Index Central Nervous System (Adult)	**11**
Total Hazard Index Clinical Selenosis (Adult)	**0.08**
Total Hazard Index Lungs (Adult)	**0.5**
Total Hazard Index Body Weight (Adult)	**16**
Total Hazard Index Liver (Adult)	**0.3**
Total Hazard Index Kidneys (Adult)	**0.0009**
Total Hazard Index Blood (Adult)	**0.02**
Total Hazard Index Immune System (Adult	**0.02**
Total Hazard Index Endrocrine System (Adult)	**16**
Total Hazard Index Hexavalent Chromium (Adult	**0.02**

TABLE 9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Franklin Slag Pile	**Inorganics**					**Inorganics**					
			ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	1.1E-03	7.6E-05	--	0.001
			ARSENIC	1.1E-07	7.5E-09	--	1E-07	ARSENIC	Skin	1.7E-02	1.2E-03	--	0.02
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	2.7E-03	3.8E-03	--	0.007
			CHROMIUM, HEXAVALENT	3.4E-07	1.9E-06	--	2E-06	CHROMIUM, HEXAVALENT	None	1.6E-02	8.8E-02	--	0.10
			COBALT	--	--	--	NA	COBALT	Thyroid	2.1E-02	5.8E-04	--	0.02
			IRON	--	--	--	NA	IRON	Digestive System	3.1E-02	2.2E-03	--	0.03
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.0E-01	1.8E-01	--	0.3
			NICKEL	--	--	--	NA	NICKEL	Body Weight	6.2E-04	2.2E-04	--	0.0008
			SELENIUM	--	--	--	NA	SELENIUM	Clinical selenosis	1.3E-03	9.3E-05	--	0.001
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.4E-03	3.6E-03	--	0.005
			ZINC	--	--	--	NA	ZINC	Blood	8.6E-04	3.6E-05	--	0.0009
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	1.8E-01	1.3E-02	--	0.2
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	3.1E-09	2.3E-07	--	2E-07	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	1.3E-08	8.7E-07	--	9E-07	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	1.2E-09	1.3E-07	--	1E-07	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	1.1E-07	1.3E-05	--	1E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	7.5E-09	8.6E-07	--	9E-07	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			2-METHYLNAPHTHALENE	--	--	--	NA	2-METHYLNAPHTHALENE	Lungs	2.4E-03	1.8E-02	--	0.02
			NAPHTHALENE	--	--	3.0E-06	3E-06	NAPHTHALENE	Body Weight	5.3E-04	2.0E-03	2.1E+00	2
			Pesticides/PCBs					**Pesticides/PCBs**					
			ALPHA-BHC	2.4E-10	4.8E-10	--	7E-10	ALPHA-BHC	Liver	3.3E-07	6.6E-07	--	0.000001
			BETA-BHC	5.8E-10	1.2E-09	--	2E-09	BETA-BHC	NA	--	--	--	NA
			ALDRIN	7.6E-10	7.3E-08	--	7E-08	ALDRIN	Liver	1.0E-04	1.0E-02	--	0.01
			DIELDRIN	6.1E-10	5.8E-09	--	6E-09	DIELDRIN	Liver	5.3E-05	5.1E-04	--	0.0006
			HEPTACHLOR EPOXIDE	3.3E-10	1.9E-09	--	2E-09	HEPTACHLOR EPOXIDE	Liver	1.9E-04	1.1E-03	--	0.001
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	2.2E-10	1.8E-09	--	2E-09	1,1-BIPHENYL	Kidney	3.9E-06	3.1E-05	--	0.00004
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Blood	1.9E-04	8.8E-05	--	0.0003
			Volatiles					**Volatiles**					
			BENZENE	3.0E-10	3.4E-10	3.5E-08	4E-08	BENZENE	Immune System	9.4E-05	1.1E-04	1.0E-02	0.01
			VINYL CHLORIDE	2.6E-09	1.7E-09	1.5E-08	2E-08	VINYL CHLORIDE	Liver	8.6E-05	5.5E-05	2.4E-03	0.003
			(Total)	5.9E-07	1.68E-05	3.1E-06	2E-05		(Total)	3.8E-01	3.2E-01	2.1E+00	3
						Total Risk Across Groundwater	**2E-05**					**Total Hazard Index Across Groundwater**	**3**
						Total Risk Across All Media and All Exposure Routes	**2E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**3**

TABLE 9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Construction Worker Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total

Total Hazard Index Skin	**0.02**
Total Hazard Index Thyroid	**0.02**
Total Hazard Index Digestive System	**0.03**
Total Hazard Index Central Nervous System	**0.3**
Total Hazard Index Lungs	**0.02**
Total Hazard Index Body Weight	**2**
Total Hazard Index Kidneys	**0.01**
Total Hazard Index Hair	**0.01**
Total Hazard Index Liver	**0.01**
Total Hazard Index Clinical Selenosis	**0.001**
Total Hazard Index Blood	**0.001**
Total Hazard Index Immune System	**0.01**
Total Hazard Index Endocrine System	**0.2**
Total Hazard Index Hexavalent Chromium	**0.1**

TABLE 10.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Off-Site Resident Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	**Inorganics**					**Inorganics**					
	Child		ARSENIC	9.2E-05	4.1E-07	--	9E-05	ARSENIC	Skin	2.4E+00	1.1E-02	--	2.4
			CHROMIUM, HEXAVALENT	1.6E-05	5.6E-06	--	2E-05	CHROMIUM, HEXAVALENT	None	--	--	--	NA
			COBALT	--	--	--	NA	COBALT	Thyroid	3.2E+00	5.6E-03	--	3.2
			IRON	--	--	--	NA	IRON	Digestive System	4.5E+00	2.0E-02	--	4.5
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.6E+01	1.7E+00	--	18
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	2.7E+01	1.2E-01	--	27
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	1.4E-05	1.8E-04	--	2E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	6.1E-05	7.0E-04	--	8E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	5.5E-06	1.0E-04	--	1E-04	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.3E-04	1.0E-02	--	1E-02	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.5E-05	6.9E-04	--	7E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			Pesticides/PCBs					**Pesticides/PCBs**					
			BETA-BHC	5.1E-07	1.8E-07	--	7E-07	BETA-BHC	NA	--	--	--	NA
			ALDRIN	6.6E-07	1.1E-05	--	1E-05	ALDRIN	Liver	--	--	--	NA
			DIELDRIN	5.3E-07	8.7E-07	--	1E-06	DIELDRIN	Liver	--	--	--	NA
			HEPTACHLOR EPOXIDE	2.9E-07	2.9E-07	--	6E-07	HEPTACHLOR EPOXIDE	Liver	--	--	--	NA
			Volatiles					**Volatiles**					
			VINYL CHLORIDE	--	--	--	NA	VINYL CHLORIDE	Liver	--	--	--	NA
			(Total for Child)	7.4E-02	1.2E-02	---	9E-02		(Total for Child)	5.2E+01	1.9E+00	---	54

TABLE 10.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Off-Site Resident Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap Water	**Inorganics**					**Inorganics**					
	Adult		ARSENIC	1.8E-04	1.0E-06	--	2E-04	ARSENIC	Skin	--	--	--	NA
			CHROMIUM, HEXAVALENT	1.2E-05	5.4E-06	--	2E-05	CHROMIUM, HEXAVALENT	None	--	--	--	NA
			COBALT	--	--	--	NA	COBALT	Thyroid	1.9E+00	4.3E-03	--	1.9
			IRON	--	--	--	NA	IRON	Digestive System	2.7E+00	1.5E-02	--	2.7
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	9.5E+00	1.3E+00	--	11
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	1.6E+01	8.9E-02	--	16
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	1.1E-05	1.5E-04	--	2E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.6E-05	5.8E-04	--	6E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	4.1E-06	8.6E-05	--	9E-05	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	4.0E-04	8.5E-03	--	9E-03	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.6E-05	5.8E-04	--	6E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	5.9E-04	6E-04	NAPHTHALENE	Body Weight	4.7E-02	2.9E-02	1.5E+01	16
			Pesticides/PCBs					**Pesticides/PCBs**					
			BETA-BHC	1.0E-06	3.9E-07	--	1E-06	BETA-BHC	NA	--	--	--	NA
			ALDRIN	1.3E-06	2.4E-05	--	3E-05	ALDRIN	Liver	--	--	--	NA
			DIELDRIN	1.1E-06	1.9E-06	--	3E-06	DIELDRIN	Liver	--	--	--	NA
			HEPTACHLOR EPOXIDE	5.8E-07	6.4E-07	--	1E-06	HEPTACHLOR EPOXIDE	Liver	--	--	--	NA
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	3.9E-07	5.9E-07	--	1E-06	1,1-BIPHENYL	Kidney	--	--	--	NA
			Volatiles					**Volatiles**					
			BENZENE	5.2E-07	7.8E-08	5.3E-07	1E-06	BENZENE	Immune System	--	--	--	NA
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05	VINYL CHLORIDE	Liver	--	--	--	NA
			(Total for Adult)	7.2E-04	9.9E-03	5.9E-04	1E-02		(Total for Adult)	3.0E+01	1.5E+00	1.5E+01	47

TABLE 10.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future
Receptor Population: Off-Site Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater Adult + Child	Tap Water	**Inorganics**										
			ARSENIC	2.8E-04	1.4E-06	NA	3E-04						
			CHROMIUM, HEXAVALENT	2.8E-05	1.1E-05	NA	4E-05						
			PAHs										
			BENZO(A)ANTHRACENE	2.5E-05	3.4E-04	NA	4E-04						
			BENZO(B)FLUORANTHENE	1.1E-04	1.3E-03	NA	1E-03						
			BENZO(K)FLUORANTHENE	9.6E-06	1.9E-04	NA	2E-04						
			BENZO(A)PYRENE	9.3E-04	1.9E-02	NA	2E-02						
			INDENO(1,2,3-C,D)PYRENE	6.1E-05	1.3E-03	NA	1E-03						
			NAPHTHALENE	NA	NA	5.9E-04	6E-04						
			Pesticides/PCBs										
			BETA-BHC	1.5E-06	5.7E-07	NA	2E-06						
			ALDRIN	2.0E-06	3.5E-05	NA	4E-05						
			DIELDRIN	1.6E-06	2.8E-06	NA	4E-06						
			HEPTACHLOR EPOXIDE	8.6E-07	9.2E-07	NA	2E-06						
			Semivolatiles										
			1,1-BIPHENYL	3.9E-07	5.9E-07	NA	1E-06						
			Volatiles										
			BENZENE	5.2E-07	7.8E-08	5.3E-07	1E-06						
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05						
			(Total for Child + Adult)	7.4E-02	2.2E-02	5.9E-04	1E-01		**Total Hazard Index Across Groundwater (Child)**				**54**
	Total Risk Across Groundwater (Adult + Child)						**1E-01**		**Total Hazard Index Across Groundwater (Adult)**				**47**
	Total Risk Across All Media and All Exposure Routes						**1E-01**		**Total Hazard Index Across All Media and All Exposure Routes (Child)**				**54**
									Total Hazard Index Across All Media and All Exposure Routes (Adult)				**47**

Total Hazard Index Skin (Child)	**2**
Total Hazard Index Thyroid (Child)	**3**
Total Hazard Index Digestive System (Child)	**4**
Total Hazard Index Central Nervous System (Child)	**18**
Total Hazard Index Endocrine System (Child)	**27**

Total Hazard Index Thyroid (Adult)	**2**
Total Hazard Index Digestive System (Adult)	**3**
Total Hazard Index Central Nervous System (Adult)	**11**
Total Hazard Index Endocrine System (Adult)	**16**

TABLE 10.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Construction Worker Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Franklin Slag Pile	**Inorganics**					**Inorganics**					
			CHROMIUM, HEXAVALENT	3.4E-07	1.9E-06	--	2E-06	CHROMIUM, HEXAVALENT	None	--	--	--	NA
			PAHs					**PAHs**					
			BENZO(A)PYRENE	1.1E-07	1.3E-05	--	1E-05	BENZO(A)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Body Weight	--	--	2.1E+00	2
			(Total)	4.5E-07	1.5E-05	---	2E-05		(Total)	---	---	2.1E+00	2
						Total Risk Across Groundwater	**2E-05**					**Total Hazard Index Across Groundwater**	**2**
						Total Risk Across All Media and All Exposure Routes	**2E-05**					**Total Hazard Index Across All Media and All Exposure Routes**	**2**

TABLE 11
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Unfiltered	Ingestion	**Inorganics**												
		Tap Water		ALUMINUM	3.19E+00	(mg/L)	2.73E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	9.57E-02	(mg/kg-day)	1.00E+00	(mg/kg-day)	9.6E-02
				ARSENIC	1.47E-02	(mg/L)	1.26E-04	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.9E-04	4.41E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.5E+00
				CADMIUM	3.99E-03	(mg/L)	3.41E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.19E-04	(mg/kg-day)	5.00E-04	(mg/kg-day)	2.4E-01
				CHROMIUM, HEXAVALENT	1.39E-01	(mg/L)	2.14E-03	(mg/kg-day)	5.00E-01	per (mg/kg-day)	1.1E-03	4.17E-03	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.4E+00
				COBALT	1.84E-02	(mg/L)	1.57E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.50E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.8E+00
				IRON	6.36E+01	(mg/L)	5.45E-01	(mg/kg-day)	NA	per (mg/kg-day)	--	1.91E+00	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.7E+00
				MANGANESE	7.31E+00	(mg/L)	6.26E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	2.19E-01	(mg/kg-day)	2.40E-02	(mg/kg-day)	9.1E+00
				NICKEL	3.62E-02	(mg/L)	3.10E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.09E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	5.4E-02
				SELENIUM	1.96E-02	(mg/L)	1.68E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.87E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.2E-01
				VANADIUM	1.99E-02	(mg/L)	1.71E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.97E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.2E-01
				ZINC	7.52E-01	(mg/L)	6.44E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.25E-02	(mg/kg-day)	3.00E-01	(mg/kg-day)	7.5E-02
				CYANIDE	5.33E-01	(mg/L)	4.57E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.60E-02	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.6E+01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	1.33E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	9.7E-06	2.58E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	5.70E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	4.2E-05	1.11E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	5.09E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	3.7E-06	9.89E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	4.93E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	3.6E-04	9.59E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	3.24E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	2.4E-05	6.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	2.40E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	8.39E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.1E-01
				NAPHTHALENE	3.11E-02	(mg/L)	2.66E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	9.31E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.7E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	6.59E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	4.2E-07	2.31E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	2.9E-05
				BETA-BHC	6.60E-05	(mg/L)	5.65E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	1.0E-06	1.98E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	7.79E-08	(mg/kg-day)	1.70E+01	per (mg/kg-day)	1.3E-06	2.73E-07	(mg/kg-day)	3.00E-05	(mg/kg-day)	9.1E-03
				DIELDRIN	7.80E-06	(mg/L)	6.68E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	1.1E-06	2.34E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	4.7E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	6.34E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	5.8E-07	2.22E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	1.7E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	4.88E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	3.9E-07	1.71E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	3.4E-04
				NITROBENZENE	1.10E-03	(mg/L)	9.42E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.30E-05	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.6E-02
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	9.42E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	5.2E-07	3.30E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	8.2E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	4.86E-05	(mg/kg-day)	7.20E-01	per (mg/kg-day)	3.5E-05	2.25E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	7.5E-03
			Exp. Route Total								**1.7E-03**					**3.4E+01**
Groundwater	Groundwater	Unfiltered	Dermal	**Inorganics**												
		Tap Water		ALUMINUM	3.19E+00	(mg/L)	1.53E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.34E-04	(mg/kg-day)	1.00E+00	(mg/kg-day)	5.3E-04
				ARSENIC	1.47E-02	(mg/L)	7.03E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.1E-06	2.46E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.2E-03
				CADMIUM	3.99E-03	(mg/L)	1.90E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	6.67E-07	(mg/kg-day)	2.50E-05	(mg/kg-day)	2.7E-02
				CHROMIUM, HEXAVALENT	1.39E-01	(mg/L)	2.39E-05	(mg/kg-day)	2.00E+01	per (mg/kg-day)	4.8E-04	4.65E-05	(mg/kg-day)	7.50E-05	(mg/kg-day)	6.2E-01
				COBALT	1.84E-02	(mg/L)	3.51E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.23E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.1E-03
				IRON	6.36E+01	(mg/L)	3.04E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.06E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.5E-02
				MANGANESE	7.31E+00	(mg/L)	3.49E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.22E-03	(mg/kg-day)	9.60E-04	(mg/kg-day)	1.3E+00
				NICKEL	3.62E-02	(mg/L)	3.46E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.21E-06	(mg/kg-day)	8.00E-04	(mg/kg-day)	1.5E-03
				SELENIUM	1.96E-02	(mg/L)	9.37E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.28E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	6.6E-04
				VANADIUM	1.99E-02	(mg/L)	9.52E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.33E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	2.6E-02
				ZINC	7.52E-01	(mg/L)	2.16E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	7.55E-05	(mg/kg-day)	3.00E-01	(mg/kg-day)	2.5E-04
				CYANIDE	5.33E-01	(mg/L)	2.55E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	8.92E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	8.9E-02
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	1.89E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.4E-04	3.68E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	7.18E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.2E-04	1.40E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	1.06E-03	(mg/kg-day)	7.30E-02	per (mg/kg-day)	7.7E-05	2.06E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	1.05E-03	(mg/kg-day)	7.30E+00	per (mg/kg-day)	7.6E-03	2.03E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	7.12E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	5.2E-04	1.38E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	3.26E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.14E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.9E-01
				NAPHTHALENE	3.11E-02	(mg/L)	1.68E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.87E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.9E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	2.53E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	1.6E-07	8.85E-08	(mg/kg-day)	8.00E-03	(mg/kg-day)	1.1E-05
				BETA-BHC	6.60E-05	(mg/L)	2.17E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	3.9E-07	7.59E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	1.43E-06	(mg/kg-day)	1.70E+01	per (mg/kg-day)	2.4E-05	4.99E-06	(mg/kg-day)	3.00E-05	(mg/kg-day)	1.7E-01
				DIELDRIN	7.80E-06	(mg/L)	1.21E-07	(mg/kg-day)	1.60E+01	per (mg/kg-day)	1.9E-06	4.22E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	8.4E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	6.99E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	6.4E-07	2.45E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	1.9E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	7.38E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	5.9E-07	2.58E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	5.2E-04

TABLE 11

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				NITROBENZENE	1.10E-03	(mg/L)	6.69E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.34E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.2E-03
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	1.41E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	7.8E-08	4.94E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.2E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	2.19E-06	(mg/kg-day)	7.20E-01	per (mg/kg-day)	1.6E-06	1.74E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	5.8E-04
			Exp. Route Total								**9.4E-03**					**2.6E+00**
		Exposure Point Total									**1.1E-02**					**3.6E+01**
	Exposure Medium Total										**1.1E-02**					**3.6E+01**
	Air	Shower Head	Inhalation	**Volatiles**												
				NAPHTHALENE	4.84E-02	(mg/m^3)	1.72E+01	$(\mu g/m^3)$	3.40E-05	per $(\mu g/m^3)$	5.9E-04	4.64E-02	(mg/m^3)	3.00E-03	(mg/m^3)	1.5E+01
				BENZENE	1.90E-04	(mg/m^3)	6.77E-02	$(\mu g/m^3)$	7.80E-06	per $(\mu g/m^3)$	5.3E-07	1.82E-04	(mg/m^3)	3.00E-02	(mg/m^3)	6.1E-03
				VINYL CHLORIDE	2.47E-03	(mg/m^3)	8.83E-01	$(\mu g/m^3)$	4.40E-06	per $(\mu g/m^3)$	3.9E-06	2.37E-03	(mg/m^3)	1.00E-01	(mg/m^3)	2.4E-02
			Exp. Route Total								**5.9E-04**					**1.5E+01**
		Exposure Point Total									**5.9E-04**					**1.5E+01**
	Exposure Medium Total										**5.9E-04**					**1.5E+01**
Groundwater Total											**1.2E-02**					**5.2E+01**
										Total of Receptor Risks Across All Media	**1.2E-02**				Total of Receptor Hazards Across All Media	**5.2E+01**

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 12

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Unfiltered Tap Water	Ingestion	**Inorganics**												
				ALUMINUM	3.19E+00	(mg/L)	1.36E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	1.59E-01	(mg/kg-day)	1.00E+00	(mg/kg-day)	1.6E-01
				ARSENIC	1.47E-02	(mg/L)	6.29E-05	(mg/kg-day)	1.50E+00	per (mg/kg-day)	9.4E-05	7.33E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.4E+00
				CADMIUM	3.99E-03	(mg/L)	1.70E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.99E-04	(mg/kg-day)	5.00E-04	(mg/kg-day)	4.0E-01
				CHROMIUM, HEXAVALENT	1.39E-01	(mg/L)	3.15E-03	(mg/kg-day)	5.00E-01	per (mg/kg-day)	1.6E-03	6.93E-03	(mg/kg-day)	3.00E-03	(mg/kg-day)	2.3E+00
				COBALT	1.84E-02	(mg/L)	7.85E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	9.15E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.1E+00
				IRON	6.36E+01	(mg/L)	2.72E-01	(mg/kg-day)	NA	per (mg/kg-day)	--	3.17E+00	(mg/kg-day)	7.00E-01	(mg/kg-day)	4.5E+00
				MANGANESE	7.31E+00	(mg/L)	3.12E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	3.64E-01	(mg/kg-day)	2.40E-02	(mg/kg-day)	1.5E+01
				NICKEL	3.62E-02	(mg/L)	1.55E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.81E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	9.0E-02
				SELENIUM	1.96E-02	(mg/L)	8.38E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	9.77E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.0E-01
				VANADIUM	1.99E-02	(mg/L)	8.51E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	9.93E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	2.0E-01
				ZINC	7.52E-01	(mg/L)	3.21E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	3.75E-02	(mg/kg-day)	3.00E-01	(mg/kg-day)	1.2E-01
				CYANIDE	5.33E-01		2.28E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.66E-02	(mg/kg-day)	1.00E-03	(mg/kg-day)	2.7E+01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	1.95E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.4E-05	4.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	8.38E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.1E-05	1.84E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	7.48E-05	(mg/kg-day)	7.30E-02	per (mg/kg-day)	5.5E-06	1.65E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	7.25E-05	(mg/kg-day)	7.30E+00	per (mg/kg-day)	5.3E-04	1.60E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	4.76E-05	(mg/kg-day)	7.30E-01	per (mg/kg-day)	3.5E-05	1.05E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	1.20E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.40E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.5E-01
				NAPHTHALENE	3.11E-02	(mg/L)	1.33E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.55E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	7.7E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	3.29E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	2.1E-07	3.84E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	4.8E-05
				BETA-BHC	6.60E-05	(mg/L)	2.82E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	5.1E-07	3.29E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	3.89E-08	(mg/kg-day)	1.70E+01	per (mg/kg-day)	6.6E-07	4.54E-07	(mg/kg-day)	3.00E-05	(mg/kg-day)	1.5E-02
				DIELDRIN	7.80E-06	(mg/L)	3.33E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	5.3E-07	3.89E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	7.8E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	3.16E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	2.9E-07	3.69E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	2.8E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	2.44E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	1.9E-07	2.84E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	5.7E-04
				NITROBENZENE	1.10E-03	(mg/L)	4.70E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	5.48E-05	(mg/kg-day)	2.00E-03	(mg/kg-day)	2.7E-02
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	4.70E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.6E-07	5.48E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.4E-02
				VINYL CHLORIDE	7.50E-04	(mg/L)	NA	(mg/kg-day)	7.20E-01	per (mg/kg-day)	--	3.74E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.2E-02
			Exp. Route Total								**2.3E-03**					**5.6E+01**

TABLE 12
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Unfiltered Tap Water	Dermal	**Inorganics**												
				ALUMINUM	3.19E+00	(mg/L)	6.01E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	7.02E-04	(mg/kg-day)	1.00E+00	(mg/kg-day)	7.0E-04
				ARSENIC	1.47E-02	(mg/L)	2.77E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.2E-07	3.23E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.1E-02
				CADMIUM	3.99E-03	(mg/L)	7.51E-08	(mg/kg-day)	NA	per (mg/kg-day)	--	8.76E-07	(mg/kg-day)	2.50E-05	(mg/kg-day)	3.5E-02
				CHROMIUM, HEXAVALENT	1.39E-01	(mg/L)	2.77E-05	(mg/kg-day)	2.00E+01	per (mg/kg-day)	5.5E-04	6.11E-05	(mg/kg-day)	7.50E-05	(mg/kg-day)	8.1E-01
				COBALT	1.84E-02	(mg/L)	1.38E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.61E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.4E-03
				IRON	6.36E+01	(mg/L)	1.20E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.40E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.0E-02
				MANGANESE	7.31E+00	(mg/L)	1.38E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.61E-03	(mg/kg-day)	9.60E-04	(mg/kg-day)	1.7E+00
				NICKEL	3.62E-02	(mg/L)	1.36E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.59E-06	(mg/kg-day)	8.00E-04	(mg/kg-day)	2.0E-03
				SELENIUM	1.96E-02	(mg/L)	3.69E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.31E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.6E-04
				VANADIUM	1.99E-02	(mg/L)	3.75E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	4.38E-06	(mg/kg-day)	1.30E-04	(mg/kg-day)	3.4E-02
				ZINC	7.52E-01	(mg/L)	8.50E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	9.91E-05	(mg/kg-day)	3.00E-01	(mg/kg-day)	3.3E-04
				CYANIDE	5.33E-01	(mg/L)	1.00E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.17E-04	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.2E-01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	2.52E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	1.8E-04	5.54E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	9.56E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	7.0E-04	2.10E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	1.41E-03	(mg/kg-day)	7.30E-02	per (mg/kg-day)	1.0E-04	3.11E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	1.39E-03	(mg/kg-day)	7.30E+00	per (mg/kg-day)	1.0E-02	3.06E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	9.47E-04	(mg/kg-day)	7.30E-01	per (mg/kg-day)	6.9E-04	2.09E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	1.48E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.72E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.3E-01
				NAPHTHALENE	3.11E-02	(mg/L)	7.58E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	8.85E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.4E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	1.14E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	7.2E-08	1.33E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	1.7E-05
				BETA-BHC	6.60E-05	(mg/L)	9.80E-08	(mg/kg-day)	1.80E+00	per (mg/kg-day)	1.8E-07	1.14E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	6.44E-07	(mg/kg-day)	1.70E+01	per (mg/kg-day)	1.1E-05	7.52E-06	(mg/kg-day)	3.00E-05	(mg/kg-day)	2.5E-01
				DIELDRIN	7.80E-06	(mg/L)	5.45E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	8.7E-07	6.36E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	1.3E-02
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	3.16E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	2.9E-07	3.68E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	2.8E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	3.34E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	2.7E-07	3.89E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	7.8E-04
				NITROBENZENE	1.10E-03	(mg/L)	3.02E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.53E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.8E-03
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	6.23E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.4E-08	7.27E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.8E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	NA	(mg/kg-day)	7.20E-01	per (mg/kg-day)	--	2.52E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	8.4E-04
			Exp. Route Total								**1.2E-02**					**3.5E+00**
		Exposure Point Total									**1.5E-02**					**5.9E+01**
	Exposure Medium Total										**1.5E-02**					**5.9E+01**
Groundwater Total											**1.5E-02**					**5.9E+01**
										Total of Receptor Risks Across All Media	**1.5E-02**				Total of Receptor Hazards Across All Media	**5.9E+01**

Carcinogenic risks for the child resident exposure to vinyl chloride are included in the adult resident intake calculations.
EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future
Receptor Population: Off-Site Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Unfiltered	**Inorganics**					**Inorganics**					
	Child	Tap Water	ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	1.6E-01	7.0E-04	--	0.2
			ARSENIC	9.4E-05	4.2E-07	--	9E-05	ARSENIC	Skin	2.4E+00	1.1E-02	--	2.5
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	4.0E-01	3.5E-02	--	0.4
			CHROMIUM, HEXAVALENT	1.6E-03	5.5E-04	--	2E-03	CHROMIUM, HEXAVALENT	None	2.3E+00	8.1E-01	--	3.1
			COBALT	--	--	--	NA	COBALT	Thyroid	3.1E+00	5.4E-03	--	3.1
			IRON	--	--	--	NA	IRON	Digestive System	4.5E+00	2.0E-02	--	4.6
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.5E+01	1.7E+00	--	17
			NICKEL	--	--	--	NA	NICKEL	Body Weight	9.0E-02	2.0E-03	--	0.1
			SELENIUM	--	--	--	NA	SELENIUM	Clinical selenosis	2.0E-01	8.6E-04	--	0.2
			VANADIUM	--	--	--	NA	VANADIUM	Hair	2.0E-01	3.4E-02	--	0.2
			ZINC	--	--	--	NA	ZINC	Blood	1.2E-01	3.3E-04	--	0.1
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	2.7E+01	1.2E-01	--	27
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	1.4E-05	1.8E-04	--	2E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	6.1E-05	7.0E-04	--	8E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	5.5E-06	1.0E-04	--	1E-04	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.3E-04	1.0E-02	--	1E-02	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.5E-05	6.9E-04	--	7E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			2-METHYLNAPHTHALENE	--	--	--	NA	2-METHYLNAPHTHALENE	Lungs	3.5E-01	4.3E-01	--	0.8
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Body Weight	7.7E-02	4.4E-02	--	0.1
			Pesticides/PCBs					**Pesticides/PCBs**					
			ALPHA-BHC	2.1E-07	7.2E-08	--	3E-07	ALPHA-BHC	Liver	4.8E-05	1.7E-05	--	0.00006
			BETA-BHC	5.1E-07	1.8E-07	--	7E-07	BETA-BHC	NA	--	--	--	NA
			ALDRIN	6.6E-07	1.1E-05	--	1E-05	ALDRIN	Liver	1.5E-02	2.5E-01	--	0.3
			DIELDRIN	5.3E-07	8.7E-07	--	1E-06	DIELDRIN	Liver	7.8E-03	1.3E-02	--	0.02
			HEPTACHLOR EPOXIDE	2.9E-07	2.9E-07	--	6E-07	HEPTACHLOR EPOXIDE	Liver	2.8E-02	2.8E-02	--	0.06
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	1.9E-07	2.7E-07	--	5E-07	1,1-BIPHENYL	Kidney	5.7E-04	7.8E-04	--	0.001
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Blood	2.7E-02	1.8E-03	--	0.03
			Volatiles					**Volatiles**					
			BENZENE	2.6E-07	3.4E-08	--	3E-07	BENZENE	Immune System	1.4E-02	1.8E-03	--	0.02
			VINYL CHLORIDE	--	--	--	NA	VINYL CHLORIDE	Liver	1.2E-02	8.4E-04	--	0.01
			(Total for Child)	7.5E-02	1.2E-02	---	9E-02		(Total for Child)	5.6E+01	3.5E+00	---	59

TABLE 13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future
Receptor Population: Off-Site Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Unfiltered	**Inorganics**					**Inorganics**					
	Adult	Tap Water	ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	9.6E-02	5.3E-04	--	0.1
			ARSENIC	1.9E-04	1.1E-06	--	2E-04	ARSENIC	Skin	1.5E+00	8.2E-03	--	1.5
			CADMIUM	--	--	--	NA	CADMIUM	Kidneys	2.4E-01	2.7E-02	--	0.3
			CHROMIUM, HEXAVALENT	1.1E-03	4.8E-04	--	2E-03	CHROMIUM, HEXAVALENT	None	1.4E+00	6.2E-01	--	2.0
			COBALT	--	--	--	NA	COBALT	Thyroid	1.8E+00	4.1E-03	--	1.8
			IRON	--	--	--	NA	IRON	Digestive System	2.7E+00	1.5E-02	--	2.7
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	9.1E+00	1.3E+00	--	10
			NICKEL	--	--	--	NA	NICKEL	Body Weight	5.4E-02	1.5E-03	--	0.06
			SELENIUM	--	--	--	NA	SELENIUM	Clinical selenosis	1.2E-01	6.6E-04	--	0.1
			VANADIUM	--	--	--	NA	VANADIUM	Hair	1.2E-01	2.6E-02	--	0.1
			ZINC	--	--	--	NA	ZINC	Blood	7.5E-02	2.5E-04	--	0.08
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	1.6E+01	8.9E-02	--	16
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	9.7E-06	1.4E-04	--	1E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.2E-05	5.2E-04	--	6E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	3.7E-06	7.7E-05	--	8E-05	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.6E-04	7.6E-03	--	8E-03	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.4E-05	5.2E-04	--	5E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			2-METHYLNAPHTHALENE	--	--	--	NA	2-METHYLNAPHTHALENE	Lungs	2.1E-01	2.9E-01	--	0.5
			NAPHTHALENE	--	--	5.9E-04	6E-04	NAPHTHALENE	Body Weight	4.7E-02	2.9E-02	1.5E+01	16
			Pesticides/PCBs					**Pesticides/PCBs**					
			ALPHA-BHC	4.2E-07	1.6E-07	--	6E-07	ALPHA-BHC	Liver	2.9E-05	1.1E-05	--	0.00004
			BETA-BHC	1.0E-06	3.9E-07	--	1E-06	BETA-BHC	NA	--	--	--	NA
			ALDRIN	1.3E-06	2.4E-05	--	3E-05	ALDRIN	Liver	9.1E-03	1.7E-01	--	0.2
			DIELDRIN	1.1E-06	1.9E-06	--	3E-06	DIELDRIN	Liver	4.7E-03	8.4E-03	--	0.01
			HEPTACHLOR EPOXIDE	5.8E-07	6.4E-07	--	1E-06	HEPTACHLOR EPOXIDE	Liver	1.7E-02	1.9E-02	--	0.04
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	3.9E-07	5.9E-07	--	1E-06	1,1-BIPHENYL	Kidney	3.4E-04	5.2E-04	--	0.0009
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Blood	1.6E-02	1.2E-03	--	0.02
			Volatiles					**Volatiles**					
			BENZENE	5.2E-07	7.8E-08	5.3E-07	1E-06	BENZENE	Immune System	8.2E-03	1.2E-03	6.1E-03	0.02
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05	VINYL CHLORIDE	Liver	7.5E-03	5.8E-04	2.4E-02	0.03
			(Total for Adult)	1.8E-03	9.4E-03	5.9E-04	1E-02		(Total for Adult)	3.4E+01	2.6E+00	1.5E+01	52

TABLE 13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future
Receptor Population: Off-Site Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Unfiltered	**Inorganics**										
	Child + Adult	Tap Water	ALUMINUM	NA	NA	NA	NA						
			ARSENIC	2.8E-04	1.5E-06	NA	3E-04						
			CADMIUM	NA	NA	NA	NA						
			CHROMIUM, HEXAVALENT	2.6E-03	1.0E-03	NA	4E-03						
			COBALT	NA	NA	NA	NA						
			IRON	NA	NA	NA	NA						
			MANGANESE	NA	NA	NA	NA						
			NICKEL	NA	NA	NA	NA						
			SELENIUM	NA	NA	NA	NA						
			VANADIUM	NA	NA	NA	NA						
			ZINC	NA	NA	NA	NA						
			CYANIDE	NA	NA	NA	NA						
			PAHs										
			BENZO(A)ANTHRACENE	2.4E-05	3.2E-04	NA	3E-04						
			BENZO(B)FLUORANTHENE	1.0E-04	1.2E-03	NA	1E-03						
			BENZO(K)FLUORANTHENE	9.2E-06	1.8E-04	NA	2E-04						
			BENZO(A)PYRENE	8.9E-04	1.8E-02	NA	2E-02						
			INDENO(1,2,3-C,D)PYRENE	5.8E-05	1.2E-03	NA	1E-03						
			2-METHYLNAPHTHALENE	NA	NA	NA	NA						
			NAPHTHALENE	NA	NA	5.9E-04	6E-04						
			Pesticides/PCBs										
			ALPHA-BHC	6.2E-07	2.3E-07	NA	9E-07						
			BETA-BHC	1.5E-06	5.7E-07	NA	2E-06						
			ALDRIN	2.0E-06	3.5E-05	NA	4E-05						
			DIELDRIN	1.6E-06	2.8E-06	NA	4E-06						
			HEPTACHLOR EPOXIDE	8.6E-07	9.2E-07	NA	2E-06						
			Semivolatiles										
			1,1-BIPHENYL	5.9E-07	8.6E-07	NA	1E-06						
			NITROBENZENE	NA	NA	NA	NA						
			Volatiles										
			BENZENE	7.8E-07	1.1E-07	5.3E-07	1E-06						
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05						
			(Total for Child + Adult)	7.7E-02	2.2E-02	5.9E-04	1E-01		**Total Hazard Index Across Groundwater (Child)**				**5.9E+01**
	Total Risk Across Groundwater (Adult + Child)						**1E-01**		**Total Hazard Index Across Groundwater (Adult)**				**5.2E+01**
	Total Risk Across All Media and All Exposure Routes						**1E-01**		**Total Hazard Index Across All Media and All Exposure Routes (Child)**				**59**
									Total Hazard Index Across All Media and All Exposure Routes (Adult)				**52**

TABLE 13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Off-Site Resident Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total

Total Hazard Index Skin (Child)	**2**
Total Hazard Index Thyroid (Child)	**3**
Total Hazard Index Digestive System (Child)	**5**
Total Hazard Index Central Nervous System (Child)	**17**
Total Hazard Index Lungs (Child)	**0.8**
Total Hazard Index Body Weight (Child)	**0.2**
Total Hazard Index Liver (Child)	**0.3**
Total Hazard Index Kidneys (Child)	**0.4**
Total Hazard Index Hair (Child)	**0.2**
Total Hazard Index Blood (Child)	**0.1**
Total Hazard Index Clinical Selenosis (Child)	**0.2**
Total Hazard Index Immune System (Child)	**0.02**
Total Hazard Index Endrocrine System (Child)	**27**
Total Hazard Index Hexavalent Chromium (Child)	**3**

Total Hazard Index Skin (Adult)	**1**
Total Hazard Index Thyroid (Adult)	**2**
Total Hazard Index Digestive System (Adult)	**3**
Total Hazard Index Central Nervous System (Adult)	**10**
Total Hazard Index Lungs (Adult)	**0.5**
Total Hazard Index Body Weight (Adult)	**16**
Total Hazard Index Kidneys (Adult)	**0.3**
Total Hazard Index Hair (Adult)	**0.1**
Total Hazard Index Liver (Adult)	**0.2**
Total Hazard Index Clinical Selenosis (Adult)	**0.1**
Total Hazard Index Blood (Adult)	**0.1**
Total Hazard Index Immune System (Adult)	**0.02**
Total Hazard Index Endrocrine System (Adult)	**16**
Total Hazard Index Hexavalent Chromium (Adult)	**2**

TABLE 14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Off-Site Resident Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Unfiltered	**Inorganics**					**Inorganics**					
	Child	Tap Water	ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	1.6E-01	7.0E-04	--	0.2
			ARSENIC	9.4E-05	4.2E-07	--	9E-05	ARSENIC	Skin	2.4E+00	1.1E-02	--	2.5
			CHROMIUM, HEXAVALENT	1.6E-03	5.5E-04	--	2E-03	CHROMIUM, HEXAVALENT	None	2.3E+00	8.1E-01	--	3.1
			COBALT	--	--	--	NA	COBALT	Thyroid	3.1E+00	5.4E-03	--	3.1
			IRON	--	--	--	NA	IRON	Digestive System	4.5E+00	2.0E-02	--	4.6
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.5E+01	1.7E+00	--	17
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	2.7E+01	1.2E-01	--	27
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	1.4E-05	1.8E-04	--	2E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	6.1E-05	7.0E-04	--	8E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	5.5E-06	1.0E-04	--	1E-04	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.3E-04	1.0E-02	--	1E-02	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	3.5E-05	6.9E-04	--	7E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			Pesticides/PCBs					**Pesticides/PCBs**					
			BETA-BHC	5.1E-07	1.8E-07	--	7E-07	BETA-BHC	NA	--	--	--	NA
			ALDRIN	6.6E-07	1.1E-05	--	1E-05	ALDRIN	Liver	--	--	--	NA
			DIELDRIN	5.3E-07	8.7E-07	--	1E-06	DIELDRIN	Liver	--	--	--	NA
			HEPTACHLOR EPOXIDE	2.9E-07	2.9E-07	--	6E-07	HEPTACHLOR EPOXIDE	Liver	--	--	--	NA
			Volatiles					**Volatiles**					
			VINYL CHLORIDE	--	--	--	NA	VINYL CHLORIDE	Liver	--	--	--	NA
			(Total for Child)	7.5E-02	1.2E-02	---	9E-02		(Total for Child)	5.4E+01	2.6E+00	---	57

TABLE 14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Off-Site Resident Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Unfiltered	**Inorganics**					**Inorganics**					
	Adult	Tap Water	ALUMINUM	--	--	--	NA	ALUMINUM	Central Nervous System	9.6E-02	5.3E-04	--	0.1
			ARSENIC	1.9E-04	1.1E-06	--	2E-04	ARSENIC	Skin	--	--	--	NA
			CHROMIUM, HEXAVALENT	1.1E-03	4.8E-04	--	2E-03	CHROMIUM, HEXAVALENT	None	1.4E+00	6.2E-01	--	2.0
			COBALT	--	--	--	NA	COBALT	Thyroid	1.8E+00	4.1E-03	--	1.8
			IRON	--	--	--	NA	IRON	Digestive System	2.7E+00	1.5E-02	--	2.7
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	9.1E+00	1.3E+00	--	10
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	1.6E+01	8.9E-02	--	16
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	9.7E-06	1.4E-04	--	1E-04	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	4.2E-05	5.2E-04	--	6E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	3.7E-06	7.7E-05	--	8E-05	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	3.6E-04	7.6E-03	--	8E-03	BENZO(A)PYRENE	NA	--	--	--	NA
			INDENO(1,2,3-C,D)PYRENE	2.4E-05	5.2E-04	--	5E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			NAPHTHALENE	--	--	5.9E-04	6E-04	NAPHTHALENE	Body Weight	4.7E-02	2.9E-02	1.5E+01	16
			Pesticides/PCBs					**Pesticides/PCBs**					
			BETA-BHC	1.0E-06	3.9E-07	--	1E-06	BETA-BHC	NA	--	--	--	NA
			ALDRIN	1.3E-06	2.4E-05	--	3E-05	ALDRIN	Liver	--	--	--	NA
			DIELDRIN	1.1E-06	1.9E-06	--	3E-06	DIELDRIN	Liver	--	--	--	NA
			HEPTACHLOR EPOXIDE	5.8E-07	6.4E-07	--	1E-06	HEPTACHLOR EPOXIDE	Liver	--	--	--	NA
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	3.9E-07	5.9E-07	--	1E-06	1,1-BIPHENYL	Kidney	--	--	--	NA
			Volatiles					**Volatiles**					
			BENZENE	5.2E-07	7.8E-08	5.3E-07	1E-06	BENZENE	Immune System	--	--	--	NA
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05	VINYL CHLORIDE	Liver	--	--	--	NA
			(Total for Adult)	1.8E-03	9.4E-03	5.9E-04	1E-02		(Total for Adult)	3.1E+01	2.0E+00	1.5E+01	49

TABLE 14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future
Receptor Population: Off-Site Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater Adult + Child	Unfiltered	**Inorganics**										
			ARSENIC	2.8E-04	1.5E-06	NA	3E-04						
			CHROMIUM, HEXAVALENT	2.6E-03	1.0E-03	NA	4E-03						
			PAHs										
			BENZO(A)ANTHRACENE	2.4E-05	3.2E-04	NA	3E-04						
			BENZO(B)FLUORANTHENE	1.0E-04	1.2E-03	NA	1E-03						
			BENZO(K)FLUORANTHENE	9.2E-06	1.8E-04	NA	2E-04						
			BENZO(A)PYRENE	8.9E-04	1.8E-02	NA	2E-02						
			INDENO(1,2,3-C,D)PYRENE	5.8E-05	1.2E-03	NA	1E-03						
			NAPHTHALENE	NA	NA	5.9E-04	6E-04						
			Pesticides/PCBs										
			BETA-BHC	1.5E-06	5.7E-07	NA	2E-06						
			ALDRIN	2.0E-06	3.5E-05	NA	4E-05						
			DIELDRIN	1.6E-06	2.8E-06	NA	4E-06						
			HEPTACHLOR EPOXIDE	8.6E-07	9.2E-07	NA	2E-06						
			Semivolatiles										
			1,1-BIPHENYL	3.9E-07	5.9E-07	NA	1E-06						
			Volatiles										
			BENZENE	5.2E-07	7.8E-08	5.3E-07	1E-06						
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05						
			(Total for Child + Adult)	7.7E-02	2.2E-02	5.9E-04	1E-01		**Total Hazard Index Across Groundwater (Child)**				**57**
	Total Risk Across Groundwater (Adult + Child)						**1E-01**		**Total Hazard Index Across Groundwater (Adult)**				**49**
	Total Risk Across All Media and All Exposure Routes						**1E-01**		**Total Hazard Index Across All Media and All Exposure Routes (Child)**				**57**
									Total Hazard Index Across All Media and All Exposure Routes (Adult)				**49**

Total Hazard Index Skin (Child)	**2**
Total Hazard Index Thyroid (Child)	**3**
Total Hazard Index Digestive System (Child)	**3**
Total Hazard Index Central Nervous System (Child)	**17**
Total Hazard Index Hexavalent Chromium (Child)	**3**
Total Hazard Index Endocrine System (Child)	**27**

Total Hazard Index Thyroid (Adult)	**2**
Total Hazard Index Digestive System (Adult)	**3**
Total Hazard Index Central Nervous System (Adult)	**10**
Total Hazard Index Hexavalent Chromium (Adult)	**2**
Total Hazard Index Endocrine System (Adult)	**16**

TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Franklin Slag Pile

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS-DISSOLVED									
ARSENIC	ug/L	1.21E+01	1.43E+01	1.88E+01		ug/L	1.43E+01	95%UCLM-KMt	ProUCL
CHROMIUM	ug/L	NA	NA	1.40E+00	J	ug/L	1.40E+00	Maximum	LOW #DETECTS
COBALT	ug/L	1.17E+01	1.92E+01	2.20E+01	J	ug/L	1.92E+01	95%UCLM-KMt	ProUCL
IRON	ug/L	4.73E+04	6.26E+04	9.12E+04		ug/L	6.26E+04	95%UCLM-N	ProUCL
MANGANESE	ug/L	4.10E+03	7.61E+03	7.78E+03		ug/L	7.61E+03	95%UCLM-C	ProUCL
SELENIUM	ug/L	NA	NA	1.34E+01	J	ug/L	1.34E+01	Maximum	LOW #DETECTS
INORGANICS-TOTAL									
ALUMINUM	ug/L	1.43E+03	3.19E+03	4.68E+03		ug/L	3.19E+03	95%UCLM-KMC	ProUCL
ARSENIC	ug/L	1.26E+01	1.47E+01	1.96E+01		ug/L	1.47E+01	95%UCLM-KMt	ProUCL
CADMIUM	ug/L	4.00E+00	3.99E+00	1.52E+01		ug/L	3.99E+00	95%UCLM-KMt	ProUCL
CHROMIUM	ug/L	3.73E+01	1.39E+02	2.20E+02		ug/L	1.39E+02	97.5%UCLM-KMC	ProUCL
COBALT	ug/L	1.23E+01	1.84E+01	3.17E+01	J	ug/L	1.84E+01	95%UCLM-KMt	ProUCL
CYANIDE	ug/L	3.51E+02	5.33E+02	7.88E+02		ug/L	5.33E+02	95%UCLM-G	ProUCL
IRON	ug/L	4.88E+04	6.36E+04	8.69E+04		ug/L	6.36E+04	95%UCLM-N	ProUCL
LEAD	ug/L	6.60E+01	NA	4.71E+02		ug/L	4.73E+01	Mean	USEPA 1994
MANGANESE	ug/L	3.96E+03	7.31E+03	7.66E+03		ug/L	7.31E+03	95%UCLM-C	ProUCL
NICKEL	ug/L	3.04E+01	3.62E+01	1.35E+02		ug/L	3.62E+01	95%UCLM-KMt	ProUCL
SELENIUM	ug/L	1.24E+01	NA	1.96E+01	J	ug/L	1.96E+01	Maximum	LOW #DETECTS
THALLIUM	ug/L	NA	NA	1.80E+00	J-	ug/L	1.80E+00	Maximum	LOW #DETECTS
VANADIUM	ug/L	1.21E+01	1.99E+01	2.88E+01	J	ug/L	1.99E+01	95%UCLM-KMt	ProUCL
ZINC	ug/L	7.63E+02	7.52E+02	2.83E+03		ug/L	7.52E+02	95%UCLM-KMt	ProUCL
PAHS									
2-METHYLNAPHTHALENE	ug/L	1.53E+01	NA	2.80E+01		ug/L	2.80E+01	Maximum	LOW #DETECTS
BENZO[A]ANTHRACENE	ug/L	7.30E-01	NA	8.60E-01	J	ug/L	8.60E-01	Maximum	LOW #DETECTS
BENZO[A]PYRENE	ug/L	1.98E+00	NA	3.20E+00	J	ug/L	3.20E+00	Maximum	LOW #DETECTS
BENZO[B]FLUORANTHENE	ug/L	2.22E+00	NA	3.70E+00	J	ug/L	3.70E+00	Maximum	LOW #DETECTS

TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Franklin Slag Pile

Chemical of Potential Concern	Units	Mean Detected Concentration	95% UCLM	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
BENZO[K]FLUORANTHENE	ug/L	2.03E+00	NA	3.30E+00	J	ug/L	3.30E+00	Maximum	LOW #DETECTS
INDENO[1,2,3-C,D]PYRENE	ug/L	1.21E+00	NA	2.10E+00	J	ug/L	2.10E+00	Maximum	LOW #DETECTS
NAPHTHALENE	ug/L	3.36E+01	3.11E+01	1.20E+02		ug/L	3.11E+01	95%UCLM-KMt	ProUCL
PESTICIDES									
ALDRIN	ug/L	7.00E-03	NA	9.10E-03	J	ug/L	9.10E-03	Maximum	LOW #DETECTS
ALPHA-BHC	ug/L	4.30E-03	NA	7.70E-03	J	ug/L	7.70E-03	Maximum	LOW #DETECTS
BETA-BHC	ug/L	NA	NA	6.60E-02	J	ug/L	6.60E-02	Maximum	LOW #DETECTS
DIELDRIN	ug/L	5.90E-03	NA	7.80E-03	J	ug/L	7.80E-03	Maximum	LOW #DETECTS
HEPTACHLOR EPOXIDE	ug/L	6.30E-03	NA	7.40E-03	J	ug/L	7.40E-03	Maximum	LOW #DETECTS
SVOCs									
1,1-BIPHENYL	ug/L	2.01E+00	NA	5.70E+00		ug/L	5.70E+00	Maximum	LOW %DETECTS
DIBENZOFURAN	ug/L	NA	NA	1.10E+01		ug/L	1.10E+01	Maximum	LOW %DETECTS
NITROBENZENE	ug/L	NA	NA	1.10E+00	J	ug/L	1.10E+00	Maximum	LOW %DETECTS
VOCs									
BENZENE	ug/L	1.01E+00	1.10E+00	3.10E+00		ug/L	1.10E+00	95%UCLM-KMp	ProUCL
VINYL CHLORIDE	ug/L	5.15E-01	NA	7.50E-01		ug/L	7.50E-01	Maximum	LOW #DETECTS

Note: Statistics calculated by the EPA program ProUCL.
95%UCLM-C indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Chebyshev test.
95%UCLM-G indicates that the 95 percent upper confidence limit on the mean is based on the approximate or adjusted gamma distribution.
95%UCLM-KMC indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) Chebyshev test.
95%UCLM-KMp indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) percentile boostrap test.
95%UCLM-KMt indicates that the 95 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) student's t-test.
95%UCLM-N indicates that the 95 percent upper confidence limit on the mean is based on the student's t-test for normal distributions.
97.5%UCLM-KMC indicates that the 97.5 percent upper confidence limit on the mean is based on the non-parametric Kaplan-Meier (KM) Chebyshev test.
LOW #DETECTS indicates number of detects, ProUCL unable to determine 95UCL.
USEPA 1994 = The arithmetic mean is used per USEPA lead model guidance (USEPA 1994).
NA = Not Applicable

TABLE 7.2

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Residen
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratior		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentratior		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	**Inorganics**												
				ARSENIC	1.43E-02	(mg/L)	6.13E-05	(mg/kg-day)	1.50E+00	per (mg/kg-day)	9.2E-05	7.15E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	2.4E+00
				CHROMIUM, HEXAVALENT	1.40E-03	(mg/L)	3.17E-05	(mg/kg-day)	5.00E-01	per (mg/kg-day)	1.6E-05	6.98E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	2.3E-02
				COBALT	1.92E-02	(mg/L)	8.19E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	9.55E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.2E+00
				IRON	6.26E+01	(mg/L)	2.67E-01	(mg/kg-day)	NA	per (mg/kg-day)	--	3.12E+00	(mg/kg-day)	7.00E-01	(mg/kg-day)	4.5E+00
				MANGANESE	7.61E+00	(mg/L)	3.25E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	3.80E-01	(mg/kg-day)	2.40E-02	(mg/kg-day)	1.6E+01
				SELENIUM	1.34E-02	(mg/L)	5.73E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	6.68E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	1.3E-01
				CYANIDE	5.33E-01	(mg/L)	2.28E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	2.66E-02	(mg/kg-day)	1.00E-03	(mg/kg-day)	2.7E+01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	1.95E-05	(mg/kg-day)	1.00E-01	per (mg/kg-day)	1.9E-06	4.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	8.38E-05	(mg/kg-day)	1.00E-01	per (mg/kg-day)	8.4E-06	1.84E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	7.48E-05	(mg/kg-day)	1.00E-02	per (mg/kg-day)	7.5E-07	1.65E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	7.25E-05	(mg/kg-day)	1.00E+00	per (mg/kg-day)	7.2E-05	1.60E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.3E-01
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	4.76E-05	(mg/kg-day)	1.00E-01	per (mg/kg-day)	4.8E-06	1.05E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	1.20E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.40E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	3.5E-01
				NAPHTHALENE	3.11E-02	(mg/L)	1.33E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.55E-03	(mg/kg-day)	2.00E-02	(mg/kg-day)	7.7E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	3.29E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	2.1E-07	3.84E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	4.8E-05
				BETA-BHC	6.60E-05	(mg/L)	2.82E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	5.1E-07	3.29E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	3.89E-08	(mg/kg-day)	1.70E+01	per (mg/kg-day)	6.6E-07	4.54E-07	(mg/kg-day)	3.00E-05	(mg/kg-day)	1.5E-02
				DIELDRIN	7.80E-06	(mg/L)	3.33E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	5.3E-07	3.89E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	7.8E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	3.16E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	2.9E-07	3.69E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	2.8E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	2.44E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	1.9E-07	2.84E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	5.7E-04
				NITROBENZENE	1.10E-03	(mg/L)	4.70E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	5.48E-05	(mg/kg-day)	2.00E-03	(mg/kg-day)	2.7E-02
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	4.70E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	2.6E-07	5.48E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.4E-02
				VINYL CHLORIDE	7.50E-04	(mg/L)	NA	(mg/kg-day)	7.20E-01	per (mg/kg-day)	--	3.74E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.2E-02
			Exp. Route Total								**7.3E-02**					**5.4E+01**
			Dermal	**Inorganics**												
				ARSENIC	1.43E-02	(mg/L)	2.70E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	4.1E-07	3.15E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.1E-02
				CHROMIUM, HEXAVALENT	1.40E-03	(mg/L)	2.79E-07	(mg/kg-day)	2.00E+01	per (mg/kg-day)	5.6E-06	6.15E-07	(mg/kg-day)	7.50E-05	(mg/kg-day)	8.2E-03
				COBALT	1.92E-02	(mg/L)	1.44E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.68E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	5.6E-03
				IRON	6.26E+01	(mg/L)	1.18E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.38E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.0E-02
				MANGANESE	7.61E+00	(mg/L)	1.43E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.67E-03	(mg/kg-day)	9.60E-04	(mg/kg-day)	1.7E+00
				SELENIUM	1.34E-02	(mg/L)	2.52E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.94E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	5.9E-04
				CYANIDE	5.33E-01	(mg/L)	1.00E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	1.17E-04	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.2E-01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	2.52E-04	(mg/kg-day)	1.00E-01	per (mg/kg-day)	2.5E-05	5.54E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	9.56E-04	(mg/kg-day)	1.00E-01	per (mg/kg-day)	9.6E-05	2.10E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	1.41E-03	(mg/kg-day)	1.00E-02	per (mg/kg-day)	1.4E-05	3.11E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	1.39E-03	(mg/kg-day)	1.00E+00	per (mg/kg-day)	1.4E-03	3.06E-03	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.0E+01
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	9.47E-04	(mg/kg-day)	1.00E-01	per (mg/kg-day)	9.5E-05	2.09E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	1.48E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.72E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	4.3E-01
				NAPHTHALENE	3.11E-02	(mg/L)	7.58E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	8.85E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.4E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	1.14E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	7.2E-08	1.33E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	1.7E-05
				BETA-BHC	6.60E-05	(mg/L)	9.80E-08	(mg/kg-day)	1.80E+00	per (mg/kg-day)	1.8E-07	1.14E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	6.44E-07	(mg/kg-day)	1.70E+01	per (mg/kg-day)	1.1E-05	7.52E-06	(mg/kg-day)	3.00E-05	(mg/kg-day)	2.5E-01
				DIELDRIN	7.80E-06	(mg/L)	5.45E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	8.7E-07	6.36E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	1.3E-02
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	3.16E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	2.9E-07	3.68E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	2.8E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	3.34E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	2.7E-07	3.89E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	7.8E-04
				NITROBENZENE	1.10E-03	(mg/L)	3.02E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	3.53E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.8E-03
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	6.23E-07	(mg/kg-day)	5.50E-02	per (mg/kg-day)	3.4E-08	7.27E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.8E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	NA	(mg/kg-day)	7.20E-01	per (mg/kg-day)	--	2.52E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	8.4E-04
			Exp. Route Total								**1.6E-03**					**1.3E+01**
		Exposure Point Total									**7.5E-02**					**6.7E+01**
	Exposure Medium Total										**7.5E-02**					**6.7E+01**
Groundwater Total											**7.5E-02**					**6.7E+01**
										Total of Receptor Risks Across All Media	**7.5E-02**				Total of Receptor Hazards Across All Media	**6.7E+01**

Carcinogenic risks for the child resident exposure to vinyl chloride are included in the adult resident intake calculatior
EPC = Exposure Point Concentratior
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentratior

TABLE 7.1
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	**Inorganics**												
				ARSENIC	1.43E-02	(mg/L)	1.23E-04	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.8E-04	4.30E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.4E+00
				CHROMIUM, HEXAVALENT	1.40E-03	(mg/L)	2.40E-05	(mg/kg-day)	5.00E-01	per (mg/kg-day)	1.2E-05	4.20E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	1.4E-02
				COBALT	1.92E-02	(mg/L)	1.64E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.74E-04	(mg/kg-day)	3.00E-04	(mg/kg-day)	1.9E+00
				IRON	6.26E+01	(mg/L)	5.36E-01	(mg/kg-day)	NA	per (mg/kg-day)	--	1.88E+00	(mg/kg-day)	7.00E-01	(mg/kg-day)	2.7E+00
				MANGANESE	7.61E+00	(mg/L)	6.52E-02	(mg/kg-day)	NA	per (mg/kg-day)	--	2.28E-01	(mg/kg-day)	2.40E-02	(mg/kg-day)	9.5E+00
				SELENIUM	1.34E-02	(mg/L)	1.15E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	4.02E-04	(mg/kg-day)	5.00E-03	(mg/kg-day)	8.0E-02
				CYANIDE	5.33E-01	(mg/L)	4.57E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.60E-02	(mg/kg-day)	1.00E-03	(mg/kg-day)	1.6E+01
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	1.47E-05	(mg/kg-day)	1.00E-01	per (mg/kg-day)	1.5E-06	2.58E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	6.34E-05	(mg/kg-day)	1.00E-01	per (mg/kg-day)	6.3E-06	1.11E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	5.65E-05	(mg/kg-day)	1.00E-02	per (mg/kg-day)	5.7E-07	9.89E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	5.48E-05	(mg/kg-day)	1.00E+00	per (mg/kg-day)	5.5E-05	9.59E-05	(mg/kg-day)	3.00E-04	(mg/kg-day)	3.2E-01
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	3.60E-05	(mg/kg-day)	1.00E-01	per (mg/kg-day)	3.6E-06	6.29E-05	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	2.40E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	8.39E-04	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.1E-01
				NAPHTHALENE	3.11E-02	(mg/L)	2.66E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	9.31E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	4.7E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	6.59E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	4.2E-07	2.31E-07	(mg/kg-day)	8.00E-03	(mg/kg-day)	2.9E-05
				BETA-BHC	6.60E-05	(mg/L)	5.65E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	1.0E-06	1.98E-06	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	7.79E-08	(mg/kg-day)	1.70E+01	per (mg/kg-day)	1.3E-06	2.73E-07	(mg/kg-day)	3.00E-05	(mg/kg-day)	9.1E-03
				DIELDRIN	7.80E-06	(mg/L)	6.68E-08	(mg/kg-day)	1.60E+01	per (mg/kg-day)	1.1E-06	2.34E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	4.7E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	6.34E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	5.8E-07	2.22E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	1.7E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	4.88E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	3.9E-07	1.71E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	3.4E-04
				NITROBENZENE	1.10E-03	(mg/L)	9.42E-06	(mg/kg-day)	NA	per (mg/kg-day)	--	3.30E-05	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.6E-02
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	9.42E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	5.2E-07	3.30E-05	(mg/kg-day)	4.00E-03	(mg/kg-day)	8.2E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	4.86E-05	(mg/kg-day)	7.20E-01	per (mg/kg-day)	3.5E-05	2.25E-05	(mg/kg-day)	3.00E-03	(mg/kg-day)	7.5E-03
			Exp. Route Total								**3.0E-04**					**3.2E+01**
			Dermal	**Inorganics**												
				ARSENIC	1.43E-02	(mg/L)	6.85E-07	(mg/kg-day)	1.50E+00	per (mg/kg-day)	1.0E-06	2.40E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	8.0E-03
				CHROMIUM, HEXAVALENT	1.40E-03	(mg/L)	2.68E-07	(mg/kg-day)	2.00E+01	per (mg/kg-day)	5.4E-06	4.68E-07	(mg/kg-day)	7.50E-05	(mg/kg-day)	6.2E-03
				COBALT	1.92E-02	(mg/L)	3.66E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	1.28E-06	(mg/kg-day)	3.00E-04	(mg/kg-day)	4.3E-03
				IRON	6.26E+01	(mg/L)	2.99E-03	(mg/kg-day)	NA	per (mg/kg-day)	--	1.05E-02	(mg/kg-day)	7.00E-01	(mg/kg-day)	1.5E-02
				MANGANESE	7.61E+00	(mg/L)	3.64E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.27E-03	(mg/kg-day)	9.60E-04	(mg/kg-day)	1.3E+00
				SELENIUM	1.34E-02	(mg/L)	6.40E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.24E-06	(mg/kg-day)	5.00E-03	(mg/kg-day)	4.5E-04
				CYANIDE	5.33E-01	(mg/L)	2.55E-05	(mg/kg-day)	NA	per (mg/kg-day)	--	8.92E-05	(mg/kg-day)	1.00E-03	(mg/kg-day)	8.9E-02
				PAHs												
				BENZO(A)ANTHRACENE	8.60E-04	(mg/L)	2.10E-04	(mg/kg-day)	1.00E-01	per (mg/kg-day)	2.1E-05	3.68E-04	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(B)FLUORANTHENE	3.70E-03	(mg/L)	7.98E-04	(mg/kg-day)	1.00E-01	per (mg/kg-day)	8.0E-05	1.40E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(K)FLUORANTHENE	3.30E-03	(mg/L)	1.18E-03	(mg/kg-day)	1.00E-02	per (mg/kg-day)	1.2E-05	2.06E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				BENZO(A)PYRENE	3.20E-03	(mg/L)	1.16E-03	(mg/kg-day)	1.00E+00	per (mg/kg-day)	1.2E-03	2.03E-03	(mg/kg-day)	3.00E-04	(mg/kg-day)	6.8E+00
				INDENO(1,2,3-C,D)PYRENE	2.10E-03	(mg/L)	7.91E-04	(mg/kg-day)	1.00E-01	per (mg/kg-day)	7.9E-05	1.38E-03	(mg/kg-day)	NA	(mg/kg-day)	--
				2-METHYLNAPHTHALENE	2.80E-02	(mg/L)	3.26E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	1.14E-03	(mg/kg-day)	4.00E-03	(mg/kg-day)	2.9E-01
				NAPHTHALENE	3.11E-02	(mg/L)	1.68E-04	(mg/kg-day)	NA	per (mg/kg-day)	--	5.87E-04	(mg/kg-day)	2.00E-02	(mg/kg-day)	2.9E-02
				Pesticides/PCBs												
				ALPHA-BHC	7.70E-06	(mg/L)	2.53E-08	(mg/kg-day)	6.30E+00	per (mg/kg-day)	1.6E-07	8.85E-08	(mg/kg-day)	8.00E-03	(mg/kg-day)	1.1E-05
				BETA-BHC	6.60E-05	(mg/L)	2.17E-07	(mg/kg-day)	1.80E+00	per (mg/kg-day)	3.9E-07	7.59E-07	(mg/kg-day)	NA	(mg/kg-day)	--
				ALDRIN	9.10E-06	(mg/L)	1.43E-06	(mg/kg-day)	1.70E+01	per (mg/kg-day)	2.4E-05	4.99E-06	(mg/kg-day)	3.00E-05	(mg/kg-day)	1.7E-01
				DIELDRIN	7.80E-06	(mg/L)	1.21E-07	(mg/kg-day)	1.60E+01	per (mg/kg-day)	1.9E-06	4.22E-07	(mg/kg-day)	5.00E-05	(mg/kg-day)	8.4E-03
				HEPTACHLOR EPOXIDE	7.40E-06	(mg/L)	6.99E-08	(mg/kg-day)	9.10E+00	per (mg/kg-day)	6.4E-07	2.45E-07	(mg/kg-day)	1.30E-05	(mg/kg-day)	1.9E-02
				Semivolatiles												
				1,1-BIPHENYL	5.70E-03	(mg/L)	7.38E-05	(mg/kg-day)	8.00E-03	per (mg/kg-day)	5.9E-07	2.58E-04	(mg/kg-day)	5.00E-01	(mg/kg-day)	5.2E-04
				NITROBENZENE	1.10E-03	(mg/L)	6.69E-07	(mg/kg-day)	NA	per (mg/kg-day)	--	2.34E-06	(mg/kg-day)	2.00E-03	(mg/kg-day)	1.2E-03
				Volatiles												
				BENZENE	1.10E-03	(mg/L)	1.41E-06	(mg/kg-day)	5.50E-02	per (mg/kg-day)	7.8E-08	4.94E-06	(mg/kg-day)	4.00E-03	(mg/kg-day)	1.2E-03
				VINYL CHLORIDE	7.50E-04	(mg/L)	2.19E-06	(mg/kg-day)	7.20E-01	per (mg/kg-day)	1.6E-06	1.74E-06	(mg/kg-day)	3.00E-03	(mg/kg-day)	5.8E-04
			Exp. Route Total								**1.4E-03**					**8.7E+00**
		Exposure Point Total									**1.7E-03**					**4.1E+01**
	Exposure Medium Total										**1.7E-03**					**4.1E+01**

TABLE 7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Scenario Timeframe: Future
Receptor Population: Offsite Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
	Air	Shower Head	Inhalation	**Volatiles**												
				NAPHTHALENE	4.84E-02	(mg/m^3)	1.72E+01	($\mu g/m^3$)	3.40E-05	per ($\mu g/m^3$)	5.9E-04	4.64E-02	(mg/m^3)	3.00E-03	(mg/m^3)	1.5E+01
				BENZENE	1.90E-04	(mg/m^3)	6.77E-02	($\mu g/m^3$)	7.80E-06	per ($\mu g/m^3$)	5.3E-07	1.82E-04	(mg/m^3)	3.00E-02	(mg/m^3)	6.1E-03
				VINYL CHLORIDE	2.47E-03	(mg/m^3)	8.83E-01	($\mu g/m^3$)	4.40E-06	per ($\mu g/m^3$)	3.9E-06	2.37E-03	(mg/m^3)	1.00E-01	(mg/m^3)	2.4E-02
			Exp. Route Total								**5.9E-04**					**1.5E+01**
		Exposure Point Total									**5.9E-04**					**1.5E+01**
	Exposure Medium Total										**5.9E-04**					**1.5E+01**
Groundwater Total											**2.3E-03**					**5.6E+01**
										Total of Receptor Risks Across All Media	**2.3E-03**				Total of Receptor Hazards Across All Media	**5.6E+01**

EPC = Exposure Point Concentration
CSF = Cancer Slope Factor
RfD = Reference Dose
RfC = Reference Concentration

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile

Scenario Timeframe: Future
Receptor Population: Off-Site Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater Child	Tap Water	**Inorganics**					**Inorganics**					
			ARSENIC	9.2E-05	4.1E-07	--	9E-05	ARSENIC	Skin	2.4E+00	1.1E-02	--	2.4
			CHROMIUM, HEXAVALENT	1.6E-05	5.6E-06	--	2E-05	CHROMIUM, HEXAVALENT	None	2.3E-02	8.2E-03	--	0.03
			COBALT	--	--	--	NA	COBALT	Thyroid	3.2E+00	5.6E-03	--	3.2
			IRON	--	--	--	NA	IRON	Digestive System	4.5E+00	2.0E-02	--	4.5
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	1.6E+01	1.7E+00	--	18
			SELENIUM	--	--	--	NA	SELENIUM	Clinical selenosis	1.3E-01	5.9E-04	--	0.1
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	2.7E+01	1.2E-01	--	27
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	1.9E-06	2.5E-05	--	3E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	8.4E-06	9.6E-05	--	1E-04	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	7.5E-07	1.4E-05	--	1E-05	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	7.2E-05	1.4E-03	--	1E-03	BENZO(A)PYRENE	NA	5.3E-01	1.0E+01	--	10.7
			INDENO(1,2,3-C,D)PYRENE	4.8E-06	9.5E-05	--	1E-04	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			2-METHYLNAPHTHALENE	--	--	--	NA	2-METHYLNAPHTHALENE	Lungs	3.5E-01	4.3E-01	--	0.8
			NAPHTHALENE	--	--	--	NA	NAPHTHALENE	Body Weight	7.7E-02	4.4E-02	--	0.1
			Pesticides/PCBs					**Pesticides/PCBs**					
			ALPHA-BHC	2.1E-07	7.2E-08	--	3E-07	ALPHA-BHC	Liver	4.8E-05	1.7E-05	--	0.00006
			BETA-BHC	5.1E-07	1.8E-07	--	7E-07	BETA-BHC	NA	--	--	--	NA
			ALDRIN	6.6E-07	1.1E-05	--	1E-05	ALDRIN	Liver	1.5E-02	2.5E-01	--	0.3
			DIELDRIN	5.3E-07	8.7E-07	--	1E-06	DIELDRIN	Liver	7.8E-03	1.3E-02	--	0.02
			HEPTACHLOR EPOXIDE	2.9E-07	2.9E-07	--	6E-07	HEPTACHLOR EPOXIDE	Liver	2.8E-02	2.8E-02	--	0.06
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	1.9E-07	2.7E-07	--	5E-07	1,1-BIPHENYL	Kidney	5.7E-04	7.8E-04	--	0.001
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Blood	2.7E-02	1.8E-03	--	0.03
			Volatiles					**Volatiles**					
			BENZENE	2.6E-07	3.4E-08	--	3E-07	BENZENE	Immune System	1.4E-02	1.8E-03	--	0.02
			VINYL CHLORIDE	--	--	--	NA	VINYL CHLORIDE	Liver	1.2E-02	8.4E-04	--	0.01
			(Total for Child)	7.3E-02	1.6E-03	---	7E-02		(Total for Child)	5.4E+01	1.3E+01	---	67

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future
Receptor Population: Off-Site Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater Adult	Tap Water	**Inorganics**					**Inorganics**					
			ARSENIC	1.8E-04	1.0E-06	--	2E-04	ARSENIC	Skin	1.4E+00	8.0E-03	--	1.4
			CHROMIUM, HEXAVALENT	1.2E-05	5.4E-06	--	2E-05	CHROMIUM, HEXAVALENT	None	1.4E-02	6.2E-03	--	0.02
			COBALT	--	--	--	NA	COBALT	Thyroid	1.9E+00	4.3E-03	--	1.9
			IRON	--	--	--	NA	IRON	Digestive System	2.7E+00	1.5E-02	--	2.7
			MANGANESE	--	--	--	NA	MANGANESE	Central Nervous System	9.5E+00	1.3E+00	--	11
			SELENIUM	--	--	--	NA	SELENIUM	Clinical selenosis	8.0E-02	4.5E-04	--	0.08
			CYANIDE	--	--	--	NA	CYANIDE	Endocrine System	1.6E+01	8.9E-02	--	16
			PAHs					**PAHs**					
			BENZO(A)ANTHRACENE	1.5E-06	2.1E-05	--	2E-05	BENZO(A)ANTHRACENE	NA	--	--	--	NA
			BENZO(B)FLUORANTHENE	6.3E-06	8.0E-05	--	9E-05	BENZO(B)FLUORANTHENE	NA	--	--	--	NA
			BENZO(K)FLUORANTHENE	5.7E-07	1.2E-05	--	1E-05	BENZO(K)FLUORANTHENE	NA	--	--	--	NA
			BENZO(A)PYRENE	5.5E-05	1.2E-03	--	1E-03	BENZO(A)PYRENE	NA	3.2E-01	6.8E+00	--	7.1
			INDENO(1,2,3-C,D)PYRENE	3.6E-06	7.9E-05	--	8E-05	INDENO(1,2,3-C,D)PYRENE	NA	--	--	--	NA
			2-METHYLNAPHTHALENE	--	--	--	NA	2-METHYLNAPHTHALENE	Lungs	2.1E-01	2.9E-01	--	0.5
			NAPHTHALENE	--	--	5.9E-04	6E-04	NAPHTHALENE	Body Weight	4.7E-02	2.9E-02	1.5E+01	16
			Pesticides/PCBs					**Pesticides/PCBs**					
			ALPHA-BHC	4.2E-07	1.6E-07	--	6E-07	ALPHA-BHC	Liver	2.9E-05	1.1E-05	--	0.00004
			BETA-BHC	1.0E-06	3.9E-07	--	1E-06	BETA-BHC	NA	--	--	--	NA
			ALDRIN	1.3E-06	2.4E-05	--	3E-05	ALDRIN	Liver	9.1E-03	1.7E-01	--	0.2
			DIELDRIN	1.1E-06	1.9E-06	--	3E-06	DIELDRIN	Liver	4.7E-03	8.4E-03	--	0.01
			HEPTACHLOR EPOXIDE	5.8E-07	6.4E-07	--	1E-06	HEPTACHLOR EPOXIDE	Liver	1.7E-02	1.9E-02	--	0.04
			Semivolatiles					**Semivolatiles**					
			1,1-BIPHENYL	3.9E-07	5.9E-07	--	1E-06	1,1-BIPHENYL	Kidney	3.4E-04	5.2E-04	--	0.0009
			NITROBENZENE	--	--	--	NA	NITROBENZENE	Blood	1.6E-02	1.2E-03	--	0.02
			Volatiles					**Volatiles**					
			BENZENE	5.2E-07	7.8E-08	5.3E-07	1E-06	BENZENE	Immune System	8.2E-03	1.2E-03	6.1E-03	0.02
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05	VINYL CHLORIDE	Liver	7.5E-03	5.8E-04	2.4E-02	0.03
			(Total for Adult)	3.0E-04	1.4E-03	5.9E-04	2E-03		(Total for Adult)	3.2E+01	8.7E+00	1.5E+01	56

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future Receptor Population: Off-Site Resident Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater Adult + Child	Tap Water	**Inorganics**										
			ARSENIC	2.8E-04	1.4E-06	NA	3E-04						
			CHROMIUM, HEXAVALENT	2.8E-05	1.1E-05	NA	4E-05						
			COBALT	NA	NA	NA	NA						
			IRON	NA	NA	NA	NA						
			MANGANESE	NA	NA	NA	NA						
			SELENIUM	NA	NA	NA	NA						
			PAHs										
			BENZO(A)ANTHRACENE	3.4E-06	4.6E-05	NA	5E-05						
			BENZO(B)FLUORANTHENE	1.5E-05	1.8E-04	NA	2E-04						
			BENZO(K)FLUORANTHENE	1.3E-06	2.6E-05	NA	3E-05						
			BENZO(A)PYRENE	1.3E-04	2.6E-03	NA	3E-03						
			INDENO(1,2,3-C,D)PYRENE	8.4E-06	1.7E-04	NA	2E-04						
			2-METHYLNAPHTHALENE	NA	NA	NA	NA						
			NAPHTHALENE	NA	NA	5.9E-04	6E-04						
			Pesticides/PCBs										
			ALPHA-BHC	6.2E-07	2.3E-07	NA	9E-07						
			BETA-BHC	1.5E-06	5.7E-07	NA	2E-06						
			ALDRIN	2.0E-06	3.5E-05	NA	4E-05						
			DIELDRIN	1.6E-06	2.8E-06	NA	4E-06						
			HEPTACHLOR EPOXIDE	8.6E-07	9.2E-07	NA	2E-06						
			Semivolatiles										
			1,1-BIPHENYL	5.9E-07	8.6E-07	NA	1E-06						
			NITROBENZENE	NA	NA	NA	NA						
			Volatiles										
			BENZENE	7.8E-07	1.1E-07	5.3E-07	1E-06						
			VINYL CHLORIDE	3.5E-05	1.6E-06	3.9E-06	4E-05						
			(Total for Child + Adult)	7.3E-02	3.0E-03	5.9E-04	8E-02		**Total Hazard Index Across Groundwater (Child)**				**6.7E+01**
	Total Risk Across Groundwater (Adult + Child)						**8E-02**		**Total Hazard Index Across Groundwater (Adult)**				**5.6E+01**
	Total Risk Across All Media and All Exposure Routes						**8E-02**		**Total Hazard Index Across All Media and All Exposure Routes (Child)**				**67**
									Total Hazard Index Across All Media and All Exposure Routes (Adult)				**56**

TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FRANKLIN SLAG PILE - GROUNDWATER

Location: Franklin Slag Pile
Scenario Timeframe: Future
Receptor Population: Off-Site Resident
Receptor Age: Child and Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Dermal	Inhalation	Exposure Routes Total		Primary Target Organ	Ingestion	Dermal	Inhalation	Exposure Routes Total

Total Hazard Index Skin (Child)	**2**
Total Hazard Index Thyroid (Child)	**3**
Total Hazard Index Digestive System (Child)	**4**
Total Hazard Index Central Nervous System (Child)	**18**
Total Hazard Index Clinical Selenosis (Child)	**0.1**
Total Hazard Index Lungs (Child)	**0.8**
Total Hazard Index Body Weight (Child)	**0.1**
Total Hazard Index Liver (Child)	**0.3**
Total Hazard Index Kidneys (Child)	**0.001**
Total Hazard Index Blood (Child)	**0.03**
Total Hazard Index Immune System (Child)	**0.02**
Total Hazard Index Endrocrine System (Child)	**27**
Total Hazard Index Hexavalent Chromium (Child)	**0.03**
Total Hazard Index Benzo(a)pyrene (Child)	**11**

Total Hazard Index Skin (Adult)	**1**
Total Hazard Index Thyroid (Adult)	**2**
Total Hazard Index Digestive System (Adult)	**3**
Total Hazard Index Central Nervous System (Adult)	**11**
Total Hazard Index Clinical Selenosis (Adult)	**0.08**
Total Hazard Index Lungs (Adult)	**0.5**
Total Hazard Index Body Weight (Adult)	**16**
Total Hazard Index Liver (Adult)	**0.3**
Total Hazard Index Kidneys (Adult)	**0.0009**
Total Hazard Index Blood (Adult)	**0.02**
Total Hazard Index Immune System (Adult)	**0.02**
Total Hazard Index Endrocrine System (Adult)	**16**
Total Hazard Index Hexavalent Chromium (Adult)	**0.02**
Total Hazard Index Benzo(a)pyrene (Adult)	**7**

APPENDIX D

August 12, 2020

Mr. Paul Leonard, Acting Director
Superfund & Emergency Management Division
United States Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Re: Franklin Slag Pile Superfund Site
Record of Decision
Letter of Concurrence
City of Philadelphia, Philadelphia County, Pennsylvania

Dear Mr. Leonard:

The Pennsylvania Department of Environmental Protection (DEP) has reviewed the Record of Decision (ROD) for the Franklin Slag Pile Superfund Site (Site), which was received by this office on July 10, 2020. This ROD presents the selected remedial actions for Operable Unit 1 (OU1), the slag pile, and Operable Unit 2 (OU2), site-wide groundwater.

The selected remedy for OU1 includes the following major components:

- Excavation of slag and soils contaminated above the clean-up levels;
- On-Site treatment with a stabilization agent to decrease the leachability of lead such that the material is no longer classified as a characteristic hazardous waste;
- Transport of slag and soil for disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle D facility as non-hazardous solid waste;
- Institutional Controls to limit contact with contaminated media by restricting disturbance of soil via grading, excavation, or installation of wells and preventing use of the Site property for purposes other than commercial/industrial, unless approved by EPA and PADEP; and
- As part of the construction phase, at least two years of groundwater sampling following slag and soil removal to ensure that such action did not impact area groundwater.

The selected remedy for OU2 is No Action. Once the OU1 Remedy is implemented, the slag pile and contaminated soil will no longer be a potential source of groundwater contamination.

DEP hereby concurs with EPA's proposed remedy with the following conditions:

- DEP will be given the opportunity to review and comment on documents and concur with decisions related to the design and implementation of the remedial action, to assure compliance with Pennsylvania's Applicable, Relevant and Appropriate Requirements (ARARs) and to be considered requirements (TBCs).

- DEP will have the opportunity to review and comment before any modification to the ROD and the issuance of an Explanation of Significant Difference (ESD).

- This concurrence with the selected remedial action is not intended to provide any assurances pursuant to CERCLA Section 104(c)(3), 42 U.S.C. 9604(c)(3).

- Concurrence with the remedy should not be interpreted as acceptance of on-site Operation and Maintenance (O&M) by DEP. State O&M obligations will be determined during design of the remedy and the completion of a Superfund State Contract.

- EPA will assure that the DEP is provided an opportunity to fully participate in any negotiations with responsible parties.

- DEP reserves the right and responsibility to take independent enforcement actions pursuant to state law.

- Pennsylvania asserts that the Land Recycling and Environmental Remediation Standards Act (Act 2) and the regulations promulgated under the Act (25 Pa. Code Chapter 250) are ARARs for the selected remedy under CERCLA Section 121(d)(2).

Thank you for the opportunity to comment and concur on this EPA Record of Decision. If you have any questions regarding this matter, please do not hesitate to contact me.

Sincerely,

Patrick L. Patterson
Regional Director
Southeast Regional Office

cc: Mr. Haneiko, EPA Region III
Mr. R. Patel
Ms. McClennen
Ms. Wagner
Mr. Cherry
Mr. Harms
Re 30 (TDG20)