HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

Name of Site: Stibnite/Yellow Pine Mining Area

CERCLIS ID: ID9122307607

Contact Persons

Site Investigation:	USDA Forest Service, Payette National Forest McCall, Idaho
Documentation Record:	USEPA Region 10 Seattle, Washington

Pathways, Components, or Threats Not Scored

The ground water migration, soil exposure, and air migration pathways were not scored in this HRS documentation record for the Stibnite/Yellow Pine Mining Area site. The HRS site score based on the overland/flood component of the surface water migration pathway is sufficient to warrant listing on the NPL. The drinking water threat of the surface water migration pathway was not scored because there are no known intakes within 15 miles downstream of the site.

HRS DOCUMENTATION RECORD

Name of Site: Stibnite/Yellow Pine Mining Area
CERCLIS ID: ID9122307607

EPA Region: 10 | Date Prepared: August 31, 2001

Street Address of Site: About 14 miles east of Yellow Pine, Idaho on Forest Road 50412
Township 18 North, Range 9 East, sections 2, 3, 10, 11, 14, 15, 16, 21, and 22.

County and State: Valley County, Idaho

General Location in the State: The site is located in the south-central panhandle area of Idaho. The general location of the site within the State of Idaho is shown on Figure 1 of the preliminary assessment/site investigation report (Ref. 5, pg. 4). Figure 2 of the same report shows surface water drainage features and private and public land boundaries (Ref. 5, pg. 5).

Topographic Map: The location of the Stibnite/Yellow Pine Mining Area is shown on the Stibnite, Idaho Quadrangle, U.S. Geological Survey, 7.5 minute series topographic map (Ref. 4).

Latitude: 44E53N330N | Longitude: 115E20N430W

The latitude and longitude measurements are for the center point of the Bradley tailings/neutralized ore pile (Ref. 4).

<u>Scores</u>

Air Pathway	Not Scored (NS)
Ground Water Pathway	NS
Soil Exposure Pathway	NS
Surface Water Pathway	100.00
HRS SITE SCORE	**50.00**

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENT SCORESHEET

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENT Factor Categories and Factors **DRINKING WATER THREAT**		Maximum Value	Assigned Value
Likelihood of Release			
1.	Observed Release	550	550
2.	Potential to Release by Overland Flow:		
	2a. Containment	10	NS
	2b. Runoff	25	NS
	2c. Distance to Surface Water	25	NS
3.	Potential to Release by Flood:		
	3a. Containment (Flood)	10	NS
	3b. Flood Frequency	50	NS
	3c. Potential to Release by Flood (lines 3a x 3b)	500	NS
4.	Potential to Release (lines 2d + 3c, subject to maximum of 500)	500	NS
5.	Likelihood of Release (higher of lines 1 and 4)	550	550
Waste Characteristics			
6.	Toxicity/Persistence	(a)	NS
7.	Hazardous Waste Quantity	(a)	1,000,000
8.	Waste Characteristics	100	NS
Targets			
9.	Nearest Intake	50	NS
10.	Population		
	10a. Level I Concentrations	(b)	NS
	10b. Level II Concentrations	(b)	NS
	10c. Potential Contamination	(b)	NS
	10d. Population (lines 10a + 10b + 10c)	(b)	NS
11.	Resources	5	NS
12.	Targets (lines 9 + 10d + 11)	(b)	NS
13.	DRINKING WATER THREAT SCORE ([lines 5 x 8 x 12]/82,500), subject to a maximum of 100	100	NS

a Maximum value applies to waste characteristics category.
b Maximum value not applicable.

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENT SCORESHEET

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENT Factor Categories and Factors **HUMAN FOOD CHAIN THREAT**		Maximum Value	Assigned Value
Likelihood of Release			
14.	Likelihood of Release (same as line 5)	550	550
Waste Characteristics			
15.	Toxicity/Persistence/Bioaccumulation	(a)	2×10^8
16.	Hazardous Waste Quantity	(a)	1,000,000
17.	Waste Characteristics	1,000	1,000
Targets			
18.	Food Chain Individual	50	20
19.	Population		
	19a. Level I Concentrations	(b)	0
	19b. Level II Concentrations	(b)	0
	19c. Potential Contamination	(b)	0.0003
	10d. Population (lines 19a + 19b + 19c)	(b)	0.0003
20.	Targets (lines 18 + 19d)	(b)	20.0003
21.	HUMAN FOOD CHAIN THREAT SCORE ([lines 14 x 17 x 20]/82,500, subject to a maximum of 100)	100	100

a Maximum value applies to waste characteristics category.

b Maximum value not applicable.

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENT SCORESHEET

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENT Factor Categories and Factors **ENVIRONMENTAL THREAT**		Maximum Value	Assigned Value
Likelihood of Release			
22.	Likelihood of Release (same as line 5)	550	550
Waste Characteristics			
23.	Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	2×10^8
24.	Hazardous Waste Quantity	(a)	1,000,000
25.	Waste Characteristics	1,000	1,000
Targets			
26.	Population		
	26a. Level I Concentrations	(b)	0
	26b. Level II Concentrations	(b)	320
	26c. Potential Contamination	(b)	0.15
	26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	320.15
27.	Targets	(b)	320.15
28.	ENVIRONMENTAL THREAT SCORE ([lines 22 x 25 x 27]/82,500, subject to a maximum of 60)	60	60
29.	WATERSHED SCORE[c] (lines 13 + 21 + 28, subject to a maximum of 100)	100	100
30.	SURFACE WATER OVERLAND FLOW/FLOOD COMPONENT SCORE[c]	100	100

a Maximum value applies to waste characteristics category.
b Maximum value not applicable.
c Do not round to nearest integer.

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S	S^2
1. Ground Water Migration Pathway Score (S_{gw})	NS	--
2a. Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	100	10,000
2b. Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS	
2c. Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	100	10,000
3. Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	NS	--
4. Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	--
5. Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	--	10,000
6. **HRS Site Score** Divide the value on line 5 by 4 and take the square root.	50.00	

REFERENCES

Reference Number	Description of the Reference
1.	U.S. Environmental Protection Agency. Hazard Ranking System, 52 FR 51532 (40 CFR Part 300), Appendix A. December 14, 1990. 162 pages.
2.	U.S. Environmental Protection Agency. Superfund Chemical Data Matrix (SCDM). June 1996. 5 pages.
3.	Greystone. Stibnite Valley Site Inspection Valley County, Idaho. Contract No. 53-0256-2-15. September 1993. 184 pages hand numbered by PRC, top right.
3a.	Greystone. Stibnite Valley Site Inspection Valley County, Idaho. Contract No. 53-0256-2-15. September 1993. Pages from the CLP data package (Appendix IV), 27 pages hand numbered by PRC, top right.
4.	U.S. Geological Survey. Stibnite Quadrangle, Idaho. 7.5 Minute Series. Topographic Map. 1973, and Yellow Pine Quadrangle, Idaho. 7.5 Minute Series. Topographic Map. 1973. Features added by PRC.
5.	USDA Forest Service. Preliminary Assessment/ Site Investigation Stibnite Mining Area. December 1993. 306 pages hand numbered by PRC, top right.
6.	James M. Montgomery, Consulting Engineers. Final Environmental Impact Statement Stibnite Mining Project Gold Mine and Mill. May 1981. 168 pages plus bibliography, index, and appendices.
7.	U.S. Geological Survey. Calendar Year Streamflow Statistics for USA. USGS 13311000 EF of SF Salmon River at Stibnite ID. Water Years 1929 through 1996. 1 page.
8.	IDHW, Division of Environment. Water Quality Status Report, Report No. 70. Water Quality Trend Monitoring From 1979-1985 in the Stibnite Mining District Valley County, Idaho. January 1987. 28 pages plus appendix.
9.	The S.M. Stoller Corporation. Conceptual Remedial Action Plan for the Stibnite Mine. Draft, January 25, 1995. Prepared for: Stibnite Mine, Inc. 137 pages plus six appendices.
10.	Greystone. Field Sampling Plan for Stibnite Valley Preliminary Site Assessment. October 1992. 33 pages plus appendices.
11.	James M. Montgomery, Consulting Engineers. Cultural Resources Inventory/Assessment Package Environmental Impact Statement, Stibnite Mining Project, Gold Mine and Mill. May 1981. 4 chapters plus addendums.
12.	U.S. Department of Commerce, National Oceanic and Atmospheric Administration. 50 CFR Part 226, 58 FR 68543. Designated Critical Habitat; Snake River Sockeye Salmon, Snake River Spring/Summer Chinook Salmon, and Snake River Fall Chinook Salmon; Final Rule. December 28, l993. Copies of pages 68543 through 68554 only.
13.	Walsh, Kevin K., Environmental Coordinator, Stibnite Mine, Inc. Stibnite Mine Project 1992 Environmental Monitoring Report. March 1993. 30 pages plus appendices.
14.	David Zimmermann. PRC Environmental Management, Inc. Telephone conversation with Bob Thieleke, Technical Operations Manager. Quantalex, Inc. Subject: Data Validation Procedures - Stibnite Project. August 31, 1994.

15. USDA Forest Service, Payette National Forest, Krassel Ranger District. Preliminary Draft Environmental Impact Statement, Stibnite Mine Expansion Project. March 1994. 6 chapters plus appendices.

16. David Zimmermann. PRC Environmental Management, Inc. Telephone conversation with Mark Sydnor, Project Manager. Greystone. Subject: Sample Depths - Stibnite Site Inspection. August 30, 1994.

17. Trainor, Pat. USDA Forest Service. Letter to Mark Ader, U.S. Environmental Protection Agency, Region 10. August 23, 1994. 2 pages.

18. U.S. Environmental Protection Agency. STORET Summary, Meadow Creek water sampling results. August 30, 1994. 16 pages.

19. Greystone. Wetland/Riparian Technical Report, Stibnite Mine Expansion Project. February 1994. 5 chapters plus appendices.

19a. Acetate overlay of Figure 4-1 of Reference 19. Enlarged 175 percent.

20. Calculations of sample quantitation detection limits for sediment samples in the overland/flood migration component of the surface water pathway. Hand written by PRC Environmental Management, Inc., September 1994. 11 pages.

21. Hydrologic Unit Map - 1974, State of Idaho. Department of the Interior, U.S. Geological Survey. 1974.

22. USEPA. Office of Solid Waste and Emergency Response. Quick Reference Fact Sheet, Publication 9285.7-14FS, "Using Qualified Data to Document an Observed Release and Observed Contamination." November 1996. 18 pages.

23. URS Corporation. Stibnite Area Site Characterization Report, Volume I, Sections 1-11. September 12, 2000. Excerpt, 113 pages, plus excerpts from Appendix A1, appendix C, and Appendix D.

24. Woodke, Mark, START QA Chemist, Ecology & Environment. Memorandum to Dan Frank, Project Manager, Ecology & Environment. Subject: TDD:01-03-0019; regarding the application of bias qualifiers in conjunction with the Stibnite Area Site Characterization. April 16, 2001. 4 pages.

25. Frank, Daniel, Ecology & Environment. Contact Report regarding telephone conversation with Kim Apperson, Biologist, Idaho Department of Fish and Game. Subject: Stibnite/Yellow Pine Mine Pit Fisheries. April 9, 2001. 1 page.

26. Woodke, Mark, START QA Chemist, Ecology & Environment. Memorandum to Dan Frank, Project Manager, Ecology & Environment. Subject: TDD:01-03-0019; regarding sample detection limits. April 16, 2001. 1 page.

27. USEPA Region 10, START. Stibnite Mining Site Removal Report, Yellow Pine, Idaho. February 1999. 53 pages, plus appendices.

28. Ecology & Environment. Stibnite Mine Removal Oversight Trip Report. October 31, 1995. 22 pages.

29. Payette National Forest. Biological Evaluation of the Time Critical Removal Action at Cinnabar Mine and Meadow Creek on Threatened, Endangered, Sensitive, and Proposed Species. March 1998. 32 pages.

30. SAIC. Draft Final Remedial Work Plan for the Stibnite Mine Site, Payette National Forest, Idaho. Prepared for the US Forest Service. April 3, 2000. 39 pages.

31. U.S. Department of Interior. 50 CFR Part 17, 64 FR 58910. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for Bull Trout in the Conterminous United States; Final Rule. November 1, l999. 44 pages.

32. Idaho Department of Fish and Game. Idaho 2000 and 2001 Fishing Seasons and Rules Including Steelhead. 2000. Excerpted. 12 pages.

33. Karamas, Tara. USEPA. Personal communication with Bruce Schuld, State of Idaho, Division of Environmental Quality, regarding fishing in the vicinity of Stibnite, ID. August 24, 2001. 1 page.

SITE DESCRIPTION

The Stibnite/Yellow Pine Mining Area site is located approximately 14 miles east of the Town of Yellow Pine in Valley County, Idaho, in the Payette National Forest. The site comprises a number of waste source areas resulting from mining activities along Meadow Creek and the East Fork of the South Fork Salmon River (EFSF Salmon River). The site includes both National Forest Service lands and private lands, although most of the mining and processing areas were on patented (private) claims (Ref. 3, pg. 5).

Mining and mineral processing, primarily of gold, antimony, and tungsten, occurred at the site intermittently since the early 1900s through the late 1990s (Ref. 5, pg. 6; Ref. 23, pp. 1-2, 1-3). During World War II, the mining area gained significance as the largest producer of strategic metals, specifically antimony and tungsten, which had many wartime uses (Ref. 5, pg. 6). Major historic mining operations in the vicinity include (1) the Meadow Creek Mine and ore processing facilities in the Meadow Creek Valley, which were operated between 1919 and 1927 by the Meadow Creek Silver Mines Company and between 1928 and 1938 by the Yellow Pine Company; (2) the Yellow Pine Mine underground workings and open pit on the EFSF Salmon River (Glory Hole), operated between 1937 and 1952 by the Bradley Mining Company; and (3) the West End mining area, which was operated between 1982 and 1990 by various entities including Canadian Superior Mining Company (a dissolved former subsidiary of Mobil Corporation), Twin River Developments (TRD), Pioneer Metals Corporation (Pioneer Metals), and Barrier Reef, Inc. (Ref. 4; Ref. 15, pp. 3-22, 3-23; Ref. 23, p. 1-2). An open pit mine and leach pad was also operated on Midnight Creek (Ref. 15, pg. 3-22). Hecla Mining Company (Hecla) mined oxide gold ore between 1988 and 1992, and Stibnite Mine, Incorporated (SMI) mined gold in the West End area and Garnet Creek between 1991 and 1997 (Ref. 4; Ref. 5, pp. 6-7; Ref. 23, pg. 1-2). SMI ceased mining operations in 1997 and declared bankruptcy in 1999 (Ref. 23, pg. 1-2, 1-3). The site is currently inactive.

The majority of the ore processing occurred in the Meadow Creek Valley. Bradley Mining Company operated processing facilities intermittently until 1957, including a mill, flotation plant, and a smelter. During operation of the Meadow Creek Mine and Yellow Pine Mine, mine tailings were disposed of in impoundments throughout the Meadow Creek Valley floor (Ref. 5, pp. 10, 11, 12, App. A, pg. 5; Ref. 23, pg. 1-2). Initially, tailings were disposed of in areas in lower Meadow Creek Valley adjacent to the processing facilities. A larger tailings impoundment was built near the end of World War II in upper Meadow Creek Valley above Blowout Creek (Ref. 23, pg. 1-2). The creation of this tailings pile, referred to as the Bradley tailings pile, resulted in ponding of upper Meadow Creek behind the impoundment (Ref. 4). In both the upper and lower valley, Meadow Creek was diverted to provide room for tailings deposits, but during winters the tailings were discharged directly to Meadow Creek. The Meadow Creek area was largely idle between 1952 and 1978. During this time, upper and lower Meadow Creek diversions failed, allowing the creek to erode directly through tailings (Ref. 23, pg. 1-2; Ref. 27, pg. 2-3).

Leach pads and associated cyanidation processing facilities were constructed in the Meadow Creek Valley during gold mining operations conducted by Canadian Superior Mining and TRD between 1982 and 1984 (Ref. 5, pg. 6; Ref. 23, pg. 1-2). Neutralized ore from the leach pads was used to encapsulate the Bradley tailings to prevent erosion of the fine-grained tailings material. During this time, Canadian Superior also reconstructed the Meadow Creek Diversion Channel around the Bradley tailings pile, built a keyway (earthen dam) at the base of the tailings pile, realigned lower Meadow Creek, and covered the tailings in lower Meadow Creek with waste rock and other materials (Ref. 5, pg. 12; Ref. 23, pg. 1-2). Operation of the leach pads and the deposition of neutralized ore on the Bradley tailings pile, now referred to as the Bradley tailings/neutralized ore pile, was continued by Pioneer Metals and subsequently by SMI until 1997 (Ref. 23, pg. 1-2).

In 1993, the Payette National Forest conducted sampling at the site for a preliminary assessment/site investigation (PA/SI). Samples collected from the Bradley tailings/neutralized ore pile and from waste piles in the lower Meadow Creek Valley documented elevated concentrations of metals, including antimony, arsenic, cadmium, copper, lead, and mercury, in the tailings and spent ore material. Surface water and sediment samples collected in Meadow Creek and the EFSF Salmon River documented a release of metals, including antimony, arsenic, cadmium, lead, and mercury (see Section 4.1.2.1.1 of this document).

In 1995, SMI entered into an Administrative Order on Consent (AOC) with EPA to stabilize the Bradley tailings/neutralized ore disposal area and improve water quality in Meadow Creek (Ref. 23, pg. 1-3). Activities conducted in 1996 and 1997 included redirecting discharge from, and draining, the Meadow Creek Pond that lay behind the tailings impoundment, and beginning the construction of a new diversion channel to minimize contact of stream flow with the Bradley tailings/neutralized ore pile (Ref. 23, pg. 1-3; Ref. 28, pg. 5). SMI ceased mining activities at the site in 1997 due to economic considerations and did not complete the AOC work. EPA terminated the AOC in December 1997. In May 1998, a new AOC was signed between Mobil, EPA, and the Forest Service to stabilize and reclaim the Bradley tailings/neutralized ore disposal area (Ref. 23, pg. 1-3).

A Site Characterization was conducted from 1997 through 1999 by the Stibnite Site Characterization Voluntary Consent Order Respondents, consisting of SMI, Hecla, and Mobil (Ref. 23, pg. 1-1). The Site Characterization involved extensive sampling in the area of surface water, ground water, seeps and springs, soil, sediment, and fish tissue (Ref. 23, pg. ii). Surface water samples were collected in 1997 from both Meadow Creek and the EFSF Salmon River. The analytical results for these samples indicate an observed release by chemical analysis of antimony, arsenic, copper, and lead to Meadow Creek and antimony, arsenic, copper, lead, and mercury to the EFSF Salmon River (see Section 4.1.2.1.1 of this document).

The EFSF Salmon River is a fishery for mountain whitefish and steelhead smolts downstream of its confluence with Midnight Creek (which flows into EFSF Salmon River approximately 1.7 miles downstream of EFSF Salmon River's confluence with Meadow Creek) (Ref. 33). The EFSF Salmon River is critical habitat for the Snake River spring/summer chinook salmon, a Federally designated threatened species, and is a critical spawning area for the maintenance of summer chinook (Ref. 5, pg. 26; Ref. 12, pp. 68552-68554; Ref. 21; Ref. 23, pg. 3-3). The EFSF Salmon River is also habitat for the bull trout, a Federally designated threatened species (Ref. 23, pg. 3-3; Ref. 31). Both Meadow Creek and the EFSF Salmon River support perennial wetlands within 15 miles downstream of the site (Ref. 19; Ref. 19a).

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Number of the source: 1

Name and description of the source: Lower Meadow Creek Valley Tailings and the Bradley Tailings/Neutralized Ore Pile

Source Type: Pile

Source 1 consists of the Bradley tailings/neutralized ore pile located in upper Meadow Creek Valley and piles of tailings and waste rock that were deposited throughout the valley floor.

The tailings consist of fine-grained material produced by the milling and processing of ore, which mainly occurred in the Meadow Creek Valley. Mined ore was crushed twice and processed by flotation (Ref. 5, pg. 6). Metal concentrates were then transported off-site for further processing until a smelter was built in 1948 to process the concentrates on-site (Ref. 5, pg. 6). The fine-grained tailings were initially deposited in areas in lower Meadow Creek Valley along each side of the creek and at the confluence with the EFSF Salmon River (Ref. 5, pg. 12; Ref. 23, pp. 1-2, 4-2, 4-3, 6-2, Figure 4-1, Figure 4-2). The creek was diverted in the lower valley to accommodate the tailings piles, which cover an approximate total of 15 acres (Ref. 23, pg. 1-16, Figure 4-1, Figure 4-2). Tailings were also deposited on the banks of the EFSF Salmon River just downstream of the confluence with Meadow Creek (Ref. 5, pg. 12; Ref. 23, pp. 8-82, 8-83). In 1946, a large impoundment, now referred to as the Bradley tailings/neutralized ore pile, was constructed in upper Meadow Creek Valley upstream of Blowout Creek (Ref. 23, pg. 4-3). This impoundment resulted in the ponding of water upstream of the pile, creating what is referred to as Meadow Creek Pond (Ref. 23, pg. 1-2). During the construction of the Bradley tailings/neutralized ore pile, Meadow Creek was diverted from its natural channel to provide room for the tailings. An estimated 3.7 to 4.2 million tons of tailings were deposited in the Bradley tailings/neutralized ore pile before 1952 when the mine closed due to economic considerations (Ref. 5, pg. 6; Ref. 6, pg. 12; Ref. 15, pg. 3-20; Ref. 23, pp. 1-2, 4-3; Ref. 27, pg. 2-2, App. A, pg. 5). The site was largely idle from 1952 until 1978, during which time the upper and lower Meadow Creek diversions failed and the creek flowed directly through tailings (Ref. 23, pp. 1-2, 4-5).

In the early 1980s, open pit mining of low-grade oxide gold ore was undertaken in the West End area (Ref. 4; Ref. 23, pg. 1-2). On/off leach pads and associated cyanidation processing facilities were constructed in the vicinity of the former Meadow Creek Mine and Bradley processing facilities in the Meadow Creek Valley (Ref. 23, pg. 1-2). During this time, the Meadow Creek Diversion Channel was reconstructed and a keyway, or earthen dam, was constructed in 1982 across the historic Meadow Creek channel at the base of the Bradley tailings pile (Ref. 5, pg. 12). The keyway was constructed with a french drain in the historic creek channel to allow passage of water through the embankment (Ref. 5, pg. 12). The keyway is about 1,000 feet long, 200 feet wide, and 75 feet high and was constructed with waste rock from the open pit to add structural stability to the pile prior to the deposition of neutralized ore from the leach pads on top of the tailings (Ref. 5, pg. 12; Ref. 23, pp. 1-2, 4-6).

Leaching was a four-week cycle, generally involving one week of leaching and three weeks of washing and neutralization (Ref. 5, pg. 9). Crushed ore was piled onto the impervious asphalt leach pads, saturated with water, and sprinkled with sodium hydroxide to raise the pH of the pile (Ref. 5, pg. 7). A dilute alkaline sodium cyanide solution was then sprinkled over the pile. As the solution passed through the ore, the gold and silver dissolved from the ore into the solution and was drained to a lined pregnant solution pond for further processing (Ref. 5, pg. 7). The spent ore was then washed with a calcium hypochlorite solution and saturated with a dilute acid hypochlorite solution to convert any remaining cyanide into the cyanate form (Ref. 5, pg. 9). Following this neutralization, the ore was hauled from the leach pads and spread over the Bradley tailings behind the keyway in 1- to 2-foot lifts. Each lift was left in place for a period of 10 to 14 days to allow for volatization of residual cyanide (Ref. 5, pg. 13). An estimated 3.9 to 6.05 million tons of neutralized ore were deposited in the Bradley tailings/neutralized ore pile until 1997 (Ref. 15, pg. 3-20; Ref. 23, pg. 1-2; Ref. 27, pg. 2-3, App. A, pg. 6). Spent ore and waste rock were also deposited over the tailings piles in the lower Meadow Creek Valley (Ref. 5, pg. 12; Ref. 23, pp. 1-2, Table 6.2-1). Most of the lower Meadow Creek Valley tailings deposits are covered with 3 to 5 feet of waste rock, although some areas adjacent to the creek remain exposed (Ref. 5, pg. 12; Ref. 23, 1-18, Table 6.2-1). The tailings in the Bradley tailings/neutralized ore pile are encapsulated with 30 to 40 feet of neutralized ore (Ref. 5, pg. 13; Ref. 23, Table 6.2-1).

In 1995, SMI entered into an AOC with EPA to stabilize the Bradley tailings/neutralized ore pile area, including reinforcing the Meadow Creek diversion channel and draining Meadow Creek Pond behind the pile (Ref. 23, pg. 1-3; Ref. 28, pg. 6, Ref 29, pg. 3). Subsequent removal actions conducted in 1995 included:

- widening, regrading, and lining 1,000 feet of the Meadow Creek diversion channel;
- construction of five check dams on the historic Meadow Creek channel to reduce downstream migration of tailings;
- filling the historic Meadow Creek channel with waste rock;
- placing a filter fabric over exposed tailings; and
- construction of a dike across Meadow Creek Pond to isolate tailings and facilitate draining the pond (Ref. 28, pg. 6).

However, SMI began construction of a new diversion channel, rather than reinforcing the existing diversion channel (Ref. 27, pg. 2-3, Ref 29, pg. 3). SMI's activities in 1996 and 1997 resulted in contaminated tailings material discharging to Meadow Creek via the existing diversion, bank destabilization in the existing diversion, and tailings material becoming exposed in the newly constructed diversion channel (Ref. 27, pg. 2-3; Ref. 29, pg. 3). SMI did not complete the AOC work and EPA terminated the AOC in December 1997 (Ref. 23, pg. 1-3; Ref. 27, pg. 2-4, 3-2).

In May 1998, a new AOC to stabilize and reclaim the Bradley tailings/neutralized ore disposal area was signed by Mobil, EPA, and the Forest Service (Ref. 23, pg. 1-3; Ref. 27, App. A). Removal activities conducted in 1998 included:

- construction to correct and/or replace the Meadow Creek diversion channel;
- lining other, previous diversion areas to reduce seepage;
- building a drainage on the north side of the pile;
- dewatering and backfilling the Meadow Creek Pond behind the pile;
- reinforcing unstable areas on the pile and channel banks affected by seepage; and
- regrading and revegetating the pile to minimize ponding water and erosion (Ref. 27, pp. 6-1 through 6-6).

Most of the lower Meadow Creek Valley tailings deposits are currently vegetated, although some areas remain barren (Ref. 23, pg. 1-16). Any reclamation or stabilization activities associated with these deposits have been incomplete and the potential remains for continued release of metals and sediment to Meadow Creek (Ref. 23, Table 6.2-1; Ref. 30, pp. 17, 18; see Section 4.1.2.1.1 of this document). The tailings located on the banks of the EFSF Salmon River downstream of the confluence with Meadow Creek are exposed on a steep gradient sloping toward the river and show evidence of erosion into the river (Ref. 23, pp. 8-82, 8-83). The Bradley tailings/neutralized ore pile has been graded to promote runoff and revegetation efforts have met only partial success (Ref. 23, pg. 1-3; Ref. 27, App. C, photos 11-3 through 11-9; Ref. 30, pp. 9, 12). Meadow Creek Pond has been drained, covered with neutralized ore, sloped, and seeded (Ref. 30, pg. 9). Additionally, seeps and springs associated with tailings both in the lower valley and the Bradley tailings/neutralized ore pile continue to drain to Meadow Creek (Ref. 23, pg. 1-9).

Location of the source, with reference to a map of the site: Tailings have been deposited throughout the lower Meadow Creek Valley floor on both sides of Meadow Creek and on the banks of the EFSF Salmon River just downstream of the confluence with Meadow Creek. The Bradley tailings/neutralized ore pile is located in the upper Meadow Creek Valley upstream of Blowout Creek (Ref. 4).

Containment

Release via overland migration and/or flood:

There are no containment structures, such as a maintained, engineered cover, functioning and maintained run-on control system and runoff management system, associated with either the lower Meadow Creek Valley tailings piles or the Bradley tailings/neutralized ore pile (Ref. 27, App. C, photos 11-5 through 11-9). The source is not designed, constructed, operated, and maintained to prevent a washout of hazardous substances by flood (Ref. 1, Table 4-8; Ref. 29, photos 1-9 through 20, photos 11-1 through 11-9). In addition, there is evidence of hazardous substance migration from the source based on observed releases by direct observation and chemical analysis (see Section 4.1.2.1.1 of this document). Therefore, a containment factor value of 10 is assigned (Ref. 1, Table 4-2).

2.4.1 Hazardous Substances

In 1993, samples were collected from the lower Meadow Creek Valley tailings piles and the Bradley tailings/neutralized ore pile as part of a PA/SI conducted by the Payette National Forest (Ref. 3, pg. 9; Ref. 5, pp. 11-13, 27, 28, Figure 5, Figure 6). Samples were analyzed by an EPA-contract laboratory using CLP methodology, EPA level IV quality assurance/quality control procedures, and functional guidelines (Ref. 5, pg. 27) (Ref. 14). Source samples were analyzed for the target analyte list of inorganics and weak and dissociable (WAD) cyanide (Ref. 3, pg. 9).

Tailings samples G1STC, G2STC, G3STC, and G4STC were collected from the banks of Meadow Creek below the keyway (Ref. 3, pg. 9; Ref. 5, pg. 12). Sample J2DTCP was collected from tailings on the banks of the EFSF Salmon River, north of the confluence of the river and Meadow Creek (Ref. 3, pg. 9; Ref. 5, pg. 12). Samples D1STC and D2STC were collected from tailings material on the south side of the Bradley tailings/neutralized ore pile in Meadow Creek (Ref. 3, pg. 9; Ref. 5, pg. 12). Samples D3STC, D4STC, and D5STC, were collected from neutralized ore material on the Bradley tailings/neutralized ore pile (Ref. 3, pg. 9; Ref. 5, pg. 13). All 1993 sample locations are shown on Figure 6 of the PA/SI report (Ref. 4; Ref. 5, pg. 28). Sample locations are indicated on the figure by the first two characters of the sample number and a symbol representing different sample matrices. For example, the location of soil sample D3STC is indicated by a triangle with D3 next to it on the figure. The analytical results of the 1993 sampling event are presented below.

In 1997, samples were collected from lower Meadow Creek Valley tailings and waste rock piles and the Bradley tailings/neutralized ore pile for a Site Characterization (Ref. 23, pp. 1-9, 1-10, Figure 8.4-2). The results of this sampling event confirm the presence of elevated concentrations of metals, such as antimony, arsenic, copper, lead, and mercury, in the tailings and neutralized ore material throughout the valley (Ref. 23, pp. 8-74, 8-79 through 8-81, Table 8.4-3, Table 8.4-4, Figure 8.4-2).

Hazardous Substance	Evidence	Concentration (mg/kg)	Reference
Tailings Samples - 1993			
Antimony Arsenic Cadmium Mercury	Analytical (G1STC)	5,100 J 1,560 3.0 0.93 J	Ref. 3, pp. 9, 104
Antimony Arsenic Cadmium Copper Mercury	Analytical (G2STC)	339 J 1,620 5.3 37.5 0.78 J	Ref. 3, pp. 9, 105
Antimony Arsenic Mercury	Analytical (G3STC)	91.0 J 82.5 1.0 J	Ref. 3, pp. 9, 106

Hazardous Substance	Evidence	Concentration (mg/kg)	Reference
Antimony Arsenic Cadmium Copper Lead Mercury	Analytical (G4STC)	465 J 1,140 3.4 106 163 1.1 J	Ref. 3, pp. 9, 107
Antimony Arsenic Cadmium Mercury	Analytical (J2DTCP)	1,510 J 715 1.5 1.2 J	Ref. 3, pp. 9, 111
Antimony Arsenic Cadmium Copper Lead Mercury	Analytical (D1STC)	539 J 1,240 3.4 76.0 156 0.83 J	Ref. 3, pp. 9, 97
Antimony Arsenic Cadmium Lead Mercury	Analytical (D2DTC or D2STC)	1,140 J 450 2.0 32.4 0.84 J	Ref. 3, pp. 9, 98
Neutralized Ore Samples - 1993			
Antimony Arsenic Mercury	Analytical (D3STC)	79.7 J 2,260 2.2 J	Ref. 3, pp. 9, 99
Antimony Arsenic Mercury	Analytical (D4STC)	199 J 2,320 2.4 J	Ref. 3, pp. 9, 100
Antimony Arsenic Mercury	Analytical (D5STC)	79.3 J 1,030 1.6 J	Ref. 3, pp. 9, 101
Cyanide	Deposition		Ref. 5, pg. 13

J - Results for mercury are estimated because pre-digestion matrix spike recovery criteria were not met (43.4 %R) (Ref. 3, pp. 91, 92). Sample results are biased low. Results for antimony are estimated because pre-digestion matrix spike recovery criteria were not met (261 %R) (Ref. 3, pp. 91, 92). Sample results are biased high.

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

There is currently insufficient information to determine a hazardous constituent quantity for this source.

Hazardous Substance	Constituent Quantity (pounds) (Mass - S)	Reference

sum: (pounds)

Hazardous Constituent Quantity Value (S): NS

2.4.2.1.2 Hazardous Wastestream Quantity

There is currently insufficient information to determine a hazardous wastestream quantity for this source.

Hazardous Wastestream	Quantity (pounds)	Reference

sum: (pounds)

Hazardous Wastestream Quantity Value (W): NS

2.4.2.1.3 Volume

According to a 1998 AOC between EPA, the Forest Service, and Mobil, the Bradley tailings/neutralized ore pile contains approximately 3.7 million tons of tailings and approximately 3.9 million tons of neutralized ore, for an estimated total of 7.6 million tons of waste material in the pile (Ref. 27, App. A, pp. 5, 6). Source 1 also includes the tailings and waste rock piles in the lower Meadow Creek Valley along each side of the creek and at the confluence with EFSF Salmon River. Therefore, 7.6 million tons is considered a low estimate of the volume of Source 1.

Using a conversion of one ton equals one cubic yard, 7,600,000 tons equals 7,600,000 cubic yards (Ref. 1, Table 2-5). A waste quantity divisor of 2.5 for waste pile is used to calculate the volume assigned value as follows (Ref. 1, Table 2-5):

7,600,000/2.5 = 3,040,000

Dimension of source: 7,600,000 cubic yards

References(s): 27, App. A, pp. 5, 6

Volume Assigned Value: 3,040,000

2.4.2.1.4 Area

A volume measure for this source has been determined. Therefore, the area measure is assigned a value of zero.

Area of source (ft^2): N/A

Reference(s): 1, Section 2.4.2.1.3

Area Assigned Value: 0

2.4.2.1.5 Source Hazardous Waste Quantity Value

The hazardous waste quantity factor value is based on the volume estimate for the Bradley tailings/neutralized ore pile of 7.6 million cubic yards.

Source Hazardous Waste Quantity Value: 3,040,000

SITE SUMMARY OF SOURCE DESCRIPTIONS

		Containment			
	Source Hazardous			Air	
Source Number	Waste Quantity Value	Ground Water	Surface Water	Gas	Particulate
1	3,040,000	NS	10	NS	NS

OTHER POSSIBLE SOURCES

Other possible sources include, but are not limited to, the following:

Contaminated Soil
Twelve soil samples (MCM-1 through MCM-12) were collected in 1997 from the Meadow Creek Mine hillside behind the former Bradley mill and Hecla heap leach pad as part of a Site Characterization (Ref. 23, pg. 8-74, Figure 8.4-2). These samples, when compared with concentrations in three reference soil samples collected in the upper Meadow Creek Valley, indicate that this area of contaminated soil contains elevated concentrations of metals, such as arsenic and mercury (Ref. 23, pp. 8-76, 8-81, 8-82, Table 8.4-2, Table 8.4-5).

Four soil samples (SMST-1, SMST-2, SMST-3, and SMST-5) were collected in 1999 from the area of the remains of the dismantled smelter stack located behind the former Bradley smelter as part of a Site Characterization (Ref. 23, Table 6.2-1, pg. 8-74, Figure 8.4-2). The area is characterized by the presence of an ashy residue (Ref. 23, pg. 8-87). When compared with concentrations detected in the 1997 reference soil samples, the analytical results of this sampling indicate that this area of contaminated soil contains elevated concentrations of metals, such as antimony, arsenic, and mercury (Ref. 23, pg. 8-87, Table 8.4-2, Table 8.4-12).

Former SMI Leach Pads and Processing Ponds
In the early 1980s, five asphalt pads, four lined process ponds, and associated structures were constructed in the Meadow Creek Valley northwest of the confluence of Meadow Creek and the EFSF Salmon River (Ref. 5, pg. 13; Ref. 23, pg. 1-2). These facilities were used to process low-grade gold oxide ore mined from the West End area and the Garnet Creek Pit initially by Canadian Superior and TRD until 1985 and, subsequently, by Pioneer Metals (1985-1990) and SMI (1991-1997) (Ref. 5, pp. 4, 5; Ref. 23, pp. 1-2, 1-3). The spent ore from the leach pads was disposed of in the Bradley tailings/neutralized ore pile (the leaching process is described in Section 2.2 of this document). The asphalt pads and all liners were engineered for a 10-year life (Ref. 5, pg. 13). Testing and visual inspections conducted in 1993 indicated that the ponds were leaking (Ref. 5, pp. 14, 216, 217). In addition, analytical results of samples collected from monitoring wells in 1993 indicated a release of cyanide to ground water (Ref. 5, pg. 13). The leach pads and process ponds are no longer active and are currently undergoing closure (Ref. 23, Table 6.2-1). Wastestreams associated with the leach pads and process ponds include cyanide leaching solutions and mined ore containing metals.

Former Hecla Heap Leach Pile

Hecla mined oxide gold ore from the Homestake Pit, located on the EFSF Salmon River near Sugar Creek, between 1988 and 1992 (Ref. 4; Ref. 23, pg. 1-3). Ore was hauled to the Meadow Creek Valley where an impervious heap leach pad was constructed northwest of Meadow Creek in 1990 for gold extraction (Ref. 5, pg. 9; Ref. 23, pg. 1-3). The heap pad was built as a dedicated, one-time heap leach pile and processing with cyanide and other chemical solutions began as the pad was loaded from 1990 through 1992 (Ref. 5, pg. 9; Ref. 23, pg. 1-3). Solutions containing the leached metals were drained to pregnant solution ponds adjacent to the pile (Ref. 5, pp. 7, 9, Figure 5). Neutralization of the spent ore, using hydrogen peroxide and bio-neutralization precesses, began in 1992 and was completed in 1993 (Ref. 5, pp. 9, 129-131). The spent ore pile covers approximately 12 acres and contains approximately 1.3 million tons of spent ore (Ref. 5, pp. 9). Surface reclamation activities were conducted in 1993 and 1994 and the area is currently undergoing continuing reclamation (Ref. 23, pg. 1-3, Table 6.2-1). Wastestreams associated with the heap leach pile include cyanide leaching solutions and mined ore containing metals.

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

The Stibnite/Yellow Pine Mining Area site is located in the drainage of the EFSF Salmon River. Streamflow in the area is derived from mountain runoff, precipitation, and ground water influx (Ref. 3, pg. 29). Average annual precipitation in the Stibnite area is 35.97 inches (Ref. 3, pg. 29). Rainfall in the summer is characterized by occasional thunderstorms, while winter precipitation is characterized by cold, wet periods and heavy snowfall (Ref. 3, pg. 29).

The Stibnite Mining District vicinity is drained by the EFSF Salmon River and its tributary feeder creeks; Meadow Creek, Garnet Creek, Fiddle Creek, Midnight Creek, and Sugar Creek as shown on Reference 4. The Meadow Creek Valley is a narrow, flat-bottomed valley surrounded by steep mountains. Elevations range from 6,300 feet above sea level at the valley floor to 8,600 feet at nearby mountain tops (Ref. 3, pg. 29; Ref. 4).

Mining activity has occurred primarily along Meadow Creek and the EFSF Salmon River, as shown in Reference 4. The source at the highest elevation in Meadow Creek is the Bradley tailings/neutralized ore pile. The Bradley tailings/neutralized ore pile was deposited in the upper Meadow Creek Valley and resulted in the formation of a pond behind the pile (Ref. 6, pg. 12). During the 1993 PA/SI, the most upstream probable point of entry (PPE) was established at sampling location C1 on the former Meadow Creek Pond, also the farthest upgradient known area of tailings disposal in Meadow Creek, as shown in Reference 4. Although there are multiple PPEs along Meadow Creek, distances have been measureed from sampling location C1. The 15-mile in-water segment and pertinent features along the migration route are summarized below and are shown on Reference 4.

Mile	Feature
0.0	Probable point of entry in Meadow Creek
0.66	Blowout Creek enters Meadow Creek
1.53	Meadow Creek enters the EFSFSR
1.87	Garnet Creek enters EFSFSR
2.88	Fiddle Creek enters EFSFSR
3.28	Midnight Creek enters EFSFSR
3.34	EFSFSR enters old open pit mine referred to as the Yellow Pine Mine or Glory Hole
3.41	EFSFSR exits Glory Hole
4.05	Sugar Creek enters EFSFSR

The Bradley tailings/neutralized ore pile was deposited in the Meadow Creek Valley and resulted in the formation of a pond behind the pile (Ref. 6, pg. 12). In 1981, the Meadow Creek stream bottom was rerouted for 1.26 miles around the spent ore disposal area to eliminate erosion of the tailings pile and to minimize potential metal and sediment loading to the EFSF Salmon River (Ref. 15, pg. 3-21). It was anticipated that construction of the diversion channel would eliminate the 26-acre pond located behind the tailings pile (Ref. 15, pg. 3-21). However, springs on the next slope continued to feed water to the pond (Ref. 15, pg. 3-21). In 1982 a keyway, or dam, was constructed across the historic Meadow Creek channel to contain the tailings prior to placement of spent ore on top of the tailings (Ref. 5, pg. 12). It was constructed with a french drain in the historic Meadow Creek channel to allow passage of water through the embankment (Ref. 5, pg. 12).

The former Meadow Creek Pond was located at the southwestern edge of the site above the Bradley tailings/neutralized ore pile and adjacent to the Meadow Creek Diversion Channel (Ref. 23, pg. 3-2). In 1995, the pond was divided by a dike into upper and lower ponds (Ref. 23, pg. 3-2). After building the dike, the pond outlet channel that had eroded through the Bradley tailings pile was backfilled with overburden (Ref. 23, pg. 4-8). The backfilling of the pond outlet channel resulted in the pond level rising to an all-time high during the spring of 1996 (Ref. 23, pg. 4-8). This resulted in additional saturation of the Bradley tailings/neutralized ore pile and an increase in metals release to Meadow Creek (Ref. 23, pg. 4-8). The ponds were drained in 1998 during Mobil's reclamation work at the Bradley tailings/neutralized ore disposal area, which included restoring the flow path of Meadow Creek through the wetlands above the disposal area (Ref. 23, p. 3-2).

The flow rate of the EFSFSR at Stibnite (gaging station USGS 13311000) is reported as 38.0 cubic feet per second (cfs), which is the annual mean for water years 1929 through 1996 (Ref. 7). The average monthly discharge or flow rate of the EFSF Salmon River 200 yards below Sugar Creek is 50.4 cfs (Ref. 6, pg. 17). Discharge measurements at the gaging station at Stibnite between 1993 and 1997 ranged from flows of 315 cfs during peak snowmelt in early June to about 10 cfs or less during September (Ref. 23, pg. 3-3). The flow rate for Meadow Creek is estimated as approximately 17 cfs (Ref. 5, pg. 25).

Beneficial stream uses are designated by the State of Idaho (Ref. 23, p. 3-3). The EFSF Salmon River (source to mouth) has the following designated beneficial uses: domestic water supply, agricultural water supply, primary and secondary contact recreation, cold water biota, salmonid spawning, and special resource waters (Ref. 23, p. 3-3).

The 15-mile target distance limit extends to just beyond the town of Yellow Pine, Idaho as shown in Reference 4.

4.1.2.1 LIKELIHOOD OF RELEASE

4.1.2.1.1 Observed Release

An observed release to the surface water migration pathway is documented by direct observation and chemical analysis as described below.

Direct Observation

- Basis for Direct Observation

Tailings have been disposed of throughout the Meadow Creek Valley, including directly into the Meadow Creek channel, since at least the 1940s (Ref. 23, 1-2, Figure 4-1, Figure 4-2). Meadow Creek has been diverted from its natural channel throughout the valley to accommodate tailings disposal. While the site was idle between 1952 and 1978, diversions in both the upper and lower Meadow Creek Valley failed and Meadow Creek flowed directly through tailings (Ref. 30, pg. 52). The US Forest Service estimated that 10,000 tons of tailings washed downstream through Meadow Creek to the EFSF Salmon River during this time (Ref. 6, pg. 12).

Samples collected from tailings and neutralized ore in Source 1 in 1993 and 1997 document that they contain elevated concentrations of antimony, arsenic, cadmium, copper, lead, and mercury (Ref. 3, pp. 9, 97, 98, 99, 100, 101, 104, 105, 106, 107, 111; Ref. 23, pp. 8-74, 8-79 through 8-81, Table 8.4-3, Table 8.4-4, Figure 8.4-2). Cyanide is considered associated with Source 1 based on documentation of the use of cyanide in the heap leach operations prior to the disposal of the neutralized ore (Ref. 5, pg. 13). Reclamation activities conducted in between 1995 and 1997 resulted in tailings washing into Meadow Creek and streamflow being in direct contact with tailings and neutralized ore (Ref. 29, App. A, pp. 2, 4, 8). Photographs taken in 1998 document that tailings and neutralized ore are in direct contact with Meadow Creek diversions and, historically, were in direct contact with Meadow Creek Pond, which drained into Meadow Creek (Ref. 27, App. C, photos 1-9 through 1-16, 2-8, 2-9, 2-19, 2-10, 11-2 through 11-9; Ref. 28, pp. 6, 8). In the lower Meadow Creek Valley, approximately 360 feet (6 percent) of the right bank of the creek and 230 feet (4 percent) of the left bank are unstable and in tailings (Ref. 23, pg. 1-16, 1-18). Other discontinuous portions of the stream banks in tailings are currently stable, but susceptible to erosion. (Ref. 23, pg. 1-16).

In 1995, the former Meadow Creek Pond, which had formed behind the Bradley tailings/neutralized ore pile, was divided by a dike into upper and lower ponds (Ref. 23, pg. 3-2). After building the dike, the pond outlet channel that had eroded through the pile was backfilled with overburden (Ref. 23, pg. 4-8). The backfilling of the pond outlet channel resulted in the pond level rising to an all-time high during the spring of 1996 (Ref. 23, pg. 4-8). This resulted in the flooding of tailings and neutralized ore material in the Bradley tailings/neutralized ore pile (Source 1) and an increase in metals release to Meadow Creek (Ref. 23, pg. 4-8). This flooding of the Bradley tailings/neutralized ore pile also documents an observed release by direct observation.

- Hazardous Substances in the Release

Based on the above documentation, hazardous substances in the observed release by direct observation include antimony, arsenic, cadmium, copper, lead, mercury, and cyanide.

Chemical Analysis

In 1993, surface water and sediment samples were collected from Meadow Creek and the EFSF Salmon River as part of a PA/SI conducted by the Payette National Forest (Ref. 5, pg. 27). Samples were analyzed by an EPA-contract laboratory using CLP methodology, EPA level IV quality assurance/ quality control procedures, and EPA functional guidelines (Ref. 5, pg. 25, 27; Ref. 14). Samples were analyzed for the target analyte list of inorganics and weak and dissociable (WAD) cyanide (Ref. 3, pg. 10). All sediment samples were collected from a depth of zero to 6 inches with a stainless steel spoon (Ref. 3, pp. 44 through 50; Ref. 16). Surface water samples were reportedly collected from mid-stream directly into sample containers (Ref. 10, pg. 18). Surface water samples were collected from unspecified depths. The analytical results from the 1993 sampling document an observed release by chemical analysis as follows:

Background Samples

The first two characters of the following sample identification numbers represent the sample station identifier which corresponds to Reference 4 and Figure 6 of the 1993 PA/SI report (Ref. 5, pg. 28). Samples collected from sample locations A1, U1, and R1 document background concentrations of metals in Meadow Creek. Samples collected at sample location S1 document background concentrations of metals in the EFSF Salmon River. The highest concentration detected in any background sample was used for comparison with the concentrations in samples collected downstream in that surface water body to establish an observed release.

Sample ID	Matrix	Sampling Location	Depth	Date	Reference
A1DTC	sediment	Meadow Creek, 800 feet upstream of confluence with unnamed creek	0 - 6 inches	07/13/93	Ref. 3, pp. 18, 44; Ref. 5, pp. 28, 30; Ref. 16
A1WTC	water		unspecified	07/13/93	Ref. 3, pp. 13, 44; Ref. 5, pp. 28, 30
U1DTC	sediment	Unnamed creek, 345 feet upstream of confluence with Meadow Creek	0 - 6 inches	07/15/93	Ref. 3, pp. 23, 52; Ref. 5, pp. 28, 29; Ref. 16
U1WTC	water		unspecified	07/15/93	Ref. 3, pp. 17, 52; Ref. 5, pp. 28, 29
R1DTC	sediment	Blowout Creek, 400 feet upstream of confluence with Meadow Creek	0 - 6 inches	07/14/93	Ref. 3, pp. 23, 48; Ref. 5, pp. 28, 29; Ref. 16
R1WTC	water		unspecified	07/14/93	Ref. 3, pp. 15, 49; Ref. 5, pp. 28, 29
S1DTC*	sediment	EFSFSR, 3,500 feet upstream of confluence with Meadow Creek	0 - 6 inches	07/14/93	Ref. 3, pp. 23, 47; Ref. 5, pp. 28, 29; Ref. 16
S1WTC*	water		unspecified	07/14/93	Ref. 3, pp. 16, 47; Ref. 5, pp. 28, 29

* Reference 3, pages 16 and 23 provide conflicting descriptions of co-located samples S1DTC and S1WTC. The location of sample S1DTC described as in the EFSF Salmon River above Meadow Creek and the location of S1WTC is described as in the EFSFSR above Midnight Creek. According to the sample location map (Ref. 3, Figure 2, pg. 6a), the samples were co-located at sampling point S1, which corresponds to the description for S1DTC. Also, the field log for the sampling event describes the sampling location as approximately ½ mile up from H1 (Ref. 3, pg.47). Sample location H1 is on the EFSF Salmon River near the confluence with Meadow Creek (Ref. 3, pp. 28, 47; Ref. 5, pg. 30, Figure 6). Therefore, it was ascertained that S1DTC and S1WTC were collected from EFSF Salmon River 3,500 feet upstream of its confluence with Meadow Creek, as shown on Figure 2 of Reference 3.

In the sample results that follow, the Sample Quantitation Limit (SQL) presented is the Contract Required Detection Limit (CRDL) adjusted as described below.

The CRDL for the sample designate group (FORM X - IN of the CLP data package) (reported in µg/L) is multiplied by the volume of the solute (FORM XIII - IN) (reported in mL) after the volume has been converted to liters by dividing by 1,000 and then divided by the sample weight (FORM XIII - IN) (reported in grams) (Ref. 3a; Ref. 20). The resulting number which is in units of µg/g (same as mg/kg) represents the wet weight CRDL for the soil or sediment sample. Because results are reported on a dry weight basis, the wet weight number is divided by the percent solids of the sample (FORM I - IN) to arrive at the final number. Equations used in calculating the SQL are presented below.

$$\frac{CRDL\ (\frac{\mu g}{L}) \times Volume\ of\ Solute\ (\frac{mL}{1}) \times Conversion\ Factor\ (\frac{1\ L}{1{,}000\ mL})}{Sample\ Weight\ (g)} = Wet\ Weight\ CRDL_{soil}\ (\frac{\mu g}{g})$$

$$Wet\ Weight\ CRDL\ (\frac{\mu g}{g}) \times (\frac{1{,}000}{1{,}000}) = Wet\ Weight\ CRDL\ (\frac{mg}{kg})$$

$$\frac{Wet\ Weight\ CRDL(\frac{mg}{kg})}{Percent\ Solids\ of\ Sample} = Dry\ Weight\ CRDL\ (\frac{mg}{kg})$$

For clarification, sample IDs are followed by their sample designation group (SDG) number. Appropriate forms from the complete raw analytical data package, which was included as Appendix IV of Reference 3, were copied and are presented as Reference 3a. The calculated adjustment of the CRDL for each constituent for each sample is presented in Reference 20.

Sediment Background Concentrations

Sample ID	Hazardous Substance	Concentration (mg/kg) *	SQL (mg/kg)	Reference
A1DTC (SDG A1DTC)	Arsenic Cadmium Lead	3.2 ND ND	2.1 1.1 0.67	Ref. 3, pp. 18, 94; Ref. 3a, pp. 4, 7 Ref. 3, pp. 18, 94; Ref. 3a, pp. 2, 6 Ref. 3, pp. 18, 94; Ref. 3a, pp. 3, 7
U1DTC (SDG K2DTC)	Arsenic Cadmium Lead	9.4 (5.4 J) ND 2.3 (1.6 J)	2.55 1.3 0.76	Ref. 3, pp. 23, 142; Ref. 3a, pp. 12, 15 Ref. 3, pp. 23, 142; Ref. 3a, pp. 10, 14 Ref. 3, pp. 23, 142; Ref. 3a, pp. 11, 15
R1DTC (SDG K2DTC)	Arsenic Cadmium Lead	14.4 (8.3 J) ND 2.4 (1.7 J)	2.4 1.2 0.71	Ref. 3, pp. 23, 140; Ref. 3a, pp. 12, 15 Ref. 3, pp. 23, 140; Ref. 3a, pp. 10, 14 Ref. 3, pp. 23, 140; Ref. 3a, pp. 11, 15

Sample ID	Hazardous Substance	Concentration (mg/kg) *	SQL (mg/kg)	Reference
S1DTC (SDG K2DTC)	Arsenic Cadmium Lead	51.9 (29.8 J) ND 4.0 (2.8 J)	2.6 1.3 0.78	Ref. 3, pp. 23, 141; Ref. 3a, pp. 12, 15 Ref. 3, pp. 23, 141; Ref. 3a, pp. 10, 14 Ref. 3, pp. 23, 141; Ref. 3a, pp. 11, 15

ND - Compound was not detected

J - SDG K2DTC

Arsenic - Sample results are estimated because duplicate sample precision criteria were not met (RPD = 38.5) (Ref. 3, pg. 131). The reported concentrations have unknown bias.

Lead - Sample results are estimated because pre-digestion matrix spike recovery criteria were not met (64 %R) (Ref. 3, pg. 131). The reported concentration for U1DTC is biased low. Samples results for R1DTC and S1DTC were also estimated because analytical matrix spike recovery were not met (147 %R and 137.5 %R respectively) (Ref. 3, pg. 131). Bias is unknown for these samples.

* - All qualified data have been adjusted according to the EPA factsheet, "Using Qualified Data to Document an Observed Release and Observed Contamination" (Ref. 22). The adjusted values are presented above with the qualified reported concentration shown in parentheses.

Surface Water Background Concentrations

Sample ID	Hazardous Substance	Concentration (µg/L)	SQL (µg/L)	References
A1WTC (SDG A1WTC)	Antimony Arsenic Mercury	ND ND ND	60.0 10.0 0.2	Ref. 3, pg. 76; Ref. 3a, pg. 19 Ref. 3, pg. 76; Ref. 3a, pg. 21 Ref. 3, pg. 76; Ref. 3a, pg. 22
U1WTC (SDG DSTF)	Antimony Arsenic Mercury	ND 1.4 ND	60.0 10.0 0.2	Ref. 3, pg. 128; Ref. 3a, pg. 24 Ref. 3, pg. 128; Ref. 3a, pg. 26 Ref. 3, pg. 128; Ref. 3a, pg. 27
R1WTC (SDG DSTF)	Antimony Arsenic Mercury	ND 3.0 ND	60.0 10.0 0.2	Ref. 3, pg. 125; Ref. 3a, pg. 24 Ref. 3, pg. 125; Ref. 3a, pg. 26 Ref. 3, pg. 125; Ref. 3a, pg. 27
S1WTC (SDG DSTF)	Antimony Arsenic Mercury	ND 4.6 ND	60.0 10.0 0.2	Ref. 3, pg. 126; Ref. 3a, pg. 24 Ref. 3, pg. 126; Ref. 3a, pg. 26 Ref. 3, pg. 126; Ref. 3a, pg. 27

ND - Compound was not detected

Release Samples

The first two characters of the following sample identification numbers represent the sample station identifier which corresponds to Reference 4 and Figure 6 of the 1993 PA/SI report (Ref. 5, pg. 28). Samples collected from sample locations C1, E1, F1, and Q1 document metals concentrations significantly greater than background levels in the surface water and sediments of Meadow Creek. A surface water sample collected at sample location I1 documents metals concentrations significantly greater than background levels in the EFSF Salmon River.

Sample ID	Matrix	Sampling Location	Depth	Date	Reference
C1DTC	sediment	1993 PPE into Meadow Creek Pond	0 - 6 inches	07/14/93	Ref. 3, pp. 18, 50; Ref. 5, pg. 28; Ref. 16
C1WTC	water		unspecified	07/14/93	Ref. 3, pp. 13, 49; Ref. 5, pg. 28
E1DTC	sediment	Meadow Creek, 1,200 feet downstream of the 1993 PPE	0 - 6 inches	07/14/93	Ref. 3, pp. 19, 49; Ref. 5, pg. 28; Ref 16
E1WTC	water		unspecified	07/14/93	Ref. 3, pp. 13, 49; Ref. 5, pg. 28
F1DTC	sediment	Meadow Creek, 2,800 feet downstream of the 1993 PPE	0 - 6 inches	07/14/93	Ref. 3, pp. 19, 49; Ref. 5, pg. 28; Ref. 16
F1WTC	water		unspecified	07/14/93	Ref. 3, pp. 13, 49; Ref. 5, pg. 28
Q1DTC	sediment	Meadow Creek, 7,500 feet downstream of the 1993 PPE	0 - 6 inches	07/14/93	Ref. 3, pp. 23, 47; Ref. 5, pg. 28; Ref 16
Q1WTC	water		unspecified	07/14/93	Ref. 3, pp. 15, 47; Ref. 5, pg. 28
I1WTC	water	EFSF Salmon River, 8,000 feet downstream of the 1993 PPE	0 - 2 inches	07/14/93	Ref. 3, pp. 14, 47; Ref. 5, pg. 28

Sediment Release Samples

Sample ID	Hazardous Substance	Concentration (mg/kg)	SQL (mg/kg)	Background Concentration (mg/kg)	Reference
C1DTC (SDG A1DTC)	Arsenic Cadmium Lead	2,220 6.6 721	4.1 2.0 1.2	14.4 (8.3 J) ND 2.4	Ref. 3, pg. 96; Ref. 3a, pp. 2, 7 Ref. 3, pg. 96; Ref. 3a, pp. 2, 6 Ref. 3, pg. 96; Ref. 3a, pp. 2, 7
E1DTC (SDG A1DTC)	Arsenic Cadmium Lead	948 2.1 64.7	3.3 1.7 1.0	14.4 (8.3 J) ND 2.4	Ref. 3, pg. 102; Ref. 3a, pp. 2, 7 Ref. 3, pg. 102; Ref. 3a, pp. 2, 6 Ref. 3, pg. 102; Ref. 3a, pp. 3, 7
F1DTC (SDG A1DTC)	Arsenic Cadmium Lead	1,230 3.0 22.4	2.4 1.2 0.71	14.4 (8.3 J) ND 2.4	Ref. 3, pg. 103; Ref. 3a, pp. 2, 7 Ref. 3, pg. 103; Ref. 3a, pp. 2, 6 Ref. 3, pg. 103; Ref. 3a, pp. 3, 7

Surface Water Release Samples

Sample ID	Hazardous Substance	Concentration (µg/L)	SQL (µg/L)	Background Concentration (µg/L)	References
C1WTC (SDG A1WTC)	Antimony Arsenic Mercury	339 426 4.6	60 10 0.2	ND 3.0 ND	Ref. 3, pg. 78; Ref. 3a, pg. 19 Ref. 3, pg. 78; Ref. 3a, pg. 21 Ref. 3, pg. 78; Ref. 3a, pg. 22
E1WTC (SDG A1WTC)	Antimony Arsenic Mercury	250 294 0.96	60 10 0.2	ND 3.0 ND	Ref. 3, pg. 79; Ref. 3a, pg. 19 Ref. 3, pg. 79; Ref. 3a, pg. 21 Ref. 3, pg. 79; Ref. 3a, pg. 22
F1WTC (SDG A1WTC)	Antimony Arsenic Mercury	205 399 1.7	60 10 0.2	ND 3.0 ND	Ref. 3, pg. 80; Ref. 3a, pg. 19 Ref. 3, pg. 80; Ref. 3a, pg. 21 Ref. 3, pg. 80; Ref. 3a, pg. 22
Q1WTC (SDG A1WTC)	Arsenic	35.8	10	3.0	Ref. 3, pg. 90; Ref. 3a, pg. 21
I1WTC (SDG A1WTC)	Arsenic	25.3	10	4.6	Ref. 3, pg. 83; Ref. 3a, pg. 21

In 1997, surface water samples were collected for a Site Characterization from the EFSF Salmon River and its tributaries, including Meadow Creek (Ref. 23, pg. 6-5). Three rounds of sampling were performed in 1997 (in June, August, and October) to correspond approximately with seasonal high, medium, and low flows (Ref. 23, pg. 6-5). Samples were collected from Meadow Creek at an upstream, background location (sample location 2040320) and from locations along the creek downstream of Source 1 to the confluence with the EFSF Salmon River (sample locations MC-2A, MC-2B, 2040368, 2040322, and 2040319) (Ref. 23, pp. 8-3, 8-4). Corresponding sample identification numbers are listed below:

Sample Location 2040320
(Background)
- SWT0001 - 6/29/97
- SWT0041 - 8/21/97
- SWT0312 - 10/30/97

(Ref. 23, pp. A-4, A-5, A-6)

Sample Location 2040368
(Release)
- SWT0033 - 6/29/97
- SWT0073 - 8/21/97
- SWT0316 - 10/28/97

(Ref. 23, pp. A-10, A-11, A-12)

Sample Location 2040322
(Release)
- SWT0002 - 6/29/97
- SWT0042 - 8/21/97
- SWT0314 - 10/28/97

(Ref. 23, pp. A-7, A-8, A-9)

Sample Location 2040319
(Release)
- SWT0006 - 6/29/97
- SWT0046 - 8/21/97
- SWT0311 - 10/28/97

(Ref. 23, pp. A-1, A-2, A-3)

Sample Location MC-2A
(Release)
- SWT0004 - 6/29/97
- SWT0044 - 8/21/97
- SWT0328 - 10/28/97

(Ref. 23, pp. A-19, A-20, A-21)

Sample Location MC-2B
(Release)
- SWT0005 - 6/29/97
- SWT0045 - 8/21/97
- SWT0329 - 10/28/97

(Ref. 23, pp. A-22, A-23, A-24)

Samples were also collected from the EFSF Salmon River at an upstream, background location (sample location EF-2) and a location downstream of the confluence with Meadow Creek (sample location 2040313) (Ref. 23, pg. 8-16). Corresponding sample identification numbers are listed below:

Sample Location EF-2
(Background)
- SWT0008 - 6/28/97
- SWT0048 - 8/21/97
- SWT0321 - 10/30/97
(Ref. 23, pp. A-16, A-17, A-18)

Sample Location 2040313
(Release)
- SWT0026 - 7/8/97
- SWT0049 - 8/21/97
- SWT0305 - 10/30/97
(Ref. 23, pp. A-25, A-26, A-27)

Analytical results from these sampling events support the documentation of the observed release by chemical analysis of metals, such as antimony, arsenic, copper, lead, and mercury, to both Meadow Creek and the EFSF Salmon River established by the 1993 PA/SI data (Ref. 23, pp. D-1 through D-30).

Attribution:

According to SMI's 1992 environmental monitoring report, arsenic is common in the ground water and surface water of the Stibnite area because of the presence of arsenic sulfides in the parent rock material (Ref. 13, pg. 12). It can be assumed that other metals are also naturally present in local rock material as evidenced by the historical mining activities in the area. In order to distinguish between the presence of naturally-occurring metals concentrations and elevated metals concentrations in surface water and sediments, and to isolate sources of metals contamination related to mining activities, samples were collected upstream and upgradient of areas of past mining activities (background), from sources of contamination (tailings and spent ore piles), and from surface water and sediments downstream and downgradient of sources of contamination (releases). Background sample locations were also collected to exclude the possibility of impact to the environment from non-site related sources of contamination. Multiple sampling events, most recently in 1997, document a continuing presence of metals, such as antimony, arsenic, cadmium, lead, and mercury, at concentrations significantly above background levels in the surface water and sediments of Meadow Creek and surface water in the EFSF Salmon River.

Additional evidence of releases of arsenic to surface water in Meadow Creek and the EFSF Salmon River is established by the following analytical data obtained from surface water samples collected in 1992 and 1993 (Ref. 13, Appendix C, pp. 2 through 8; Ref. 18, pp. 1-10, Figure 2a). Environmental monitoring data collected by SMI in May 1992 indicate a release of arsenic to Meadow Creek and the EFSF Salmon River. Subsequent monitoring data collected by SMI in September 1992 indicate a continued release of arsenic to Meadow Creek (Ref. 13, pg. 8, App.C, pp. 2, 3, 5, 6). Surface water data contained in EPA's STORET System, a database of sampling sites and their associated data, indicate ongoing releases of arsenic to Meadow Creek since the late 1970s (Ref. 18, pp. 1-10, Figure 2a, Attachment, pg. 2). The data for total arsenic concentrations detected in February and September 1992 and October 1993 are presented below.

Sample ID	**Matrix**	**Sampling Location**	**Depth**	**Date**	**Reference**
Upstream					
2040320	water	Meadow Creek, upstream of the 1993 PPE	unspecified	02/06/92 09/23/92 10/25/93 05/19/92 09/15/92	Ref. 18, pp. 1-4, Fig. 2a Ref. 13, pg. 8, App. C, pg. 6
2040315	water	EFSF Salmon River, upstream of confluence with Meadow Creek	unspecified	05/19/92 09/15/92	Ref. 13, App. C, pg. 3
Downstream					
2040368	water	Meadow Creek, 3,400 feet (0.64 mile) downstream of the 1993 PPE	unspecified	09/23/92 10/25/93	Ref. 18, pp. 5, 6, Fig. 2a
2040322	water	Meadow Creek, 4,000 feet (0.76 mile) downstream of the 1993 PPE	unspecified	02/06/92 09/23/92 10/25/93	Ref. 18, pp. 7, 8, Fig. 2a
2040319	water	Meadow Creek, 7,500 feet (1.42 miles) downstream of the 1993 PPE	unspecified	05/19/92 09/15/92 10/25/93	Ref. 13, App. C, pg. 5 Ref. 18, pp. 9, 10, Fig. 2a

Sample ID	Matrix	Sampling Location	Depth	Date	Reference
2040365	water	EFSF Salmon River, 9,700 feet (1.84 miles) downstream of the 1993 PPE	unspecified	05/20/92	Ref. 13, App. C, pg. 7
2040313	water	EFSF Salmon River, 10,300 feet (1.95 miles) downstream of the 1993 PPE	unspecified	05/20/92	Ref. 13, App. C, pg. 2

Upstream Concentrations

Sample ID	Hazardous Substance (date collected)	Concentration (µg/L)	SQL (µg/L)	References
Meadow Creek				
2040320	Arsenic (05/19/92) Arsenic (09/15/92) Arsenic (02/06/92) Arsenic (09/23/92) Arsenic (10/25/93)	ND ND ND ND ND	5 5 10 10 10	Ref. 13, App. C, pg. 6 Ref. 13, App. C, pg. 6 Ref. 18, pp. 2, Fig. 2a, Att., p. 2 Ref. 18, pp. 2, Fig. 2a, Att., p. 2 Ref. 18, pp. 2, Fig. 2a, Att., p. 2
EFSF Salmon River				
2040315	Arsenic (05/19/92)	ND	5	Ref. 13, App. C, pg. 3

Downstream Concentrations

Sample ID	Hazardous Substance (date collected)	Concentration (µg/L)	SQL (µg/L)	References
Meadow Creek				
2040368	Arsenic (09/23/92) Arsenic (10/25/93)	240 150	10 10	Ref. 18, pp. 5, Fig. 2a, Att., p. 2 Ref. 18, pp. 5, Fig. 2a, Att., p. 2
2040322	Arsenic (02/06/92) Arsenic (09/23/93) Arsenic (10/25/93)	46 64 42	1 10 10	Ref. 18, pp. 7, Fig. 2a, Att., p. 2 Ref. 18, pp. 7, Fig. 2a, Att., p. 2 Ref. 18, pp. 7, Fig. 2a, Att., p. 2
2040319	Arsenic (05/19/92) Arsenic (09/15/92) Arsenic (10/25/93)	20 45 46	5 5 10	Ref. 13, App. C, pp. 5 Ref. 13, App. C, pp. 5 Ref. 18, pp. 9, Fig. 2a, Att., p. 2
EFSF Salmon River				
2040365	Arsenic (05/20/92)	12	5	Ref. 13, App. C, pg. 7

Sample ID	Hazardous Substance (date collected)	Concentration (µg/L)	SQL (µg/L)	References
2040313	Arsenic (05/20/92)	16	5	Ref. 13, App. C, pg. 2

Analytical results of samples collected from neutralized ore and tailings in Source 1 document the presence of elevated concentrations of numerous metals, including arsenic, antimony, cadmium, copper, lead, and mercury. (Ref. 3, pp. 9, 97, 98, 99, 100, 101, 104, 105, 106, 107, 111; Ref. 23, pp. 8-74, 8-79 through 8-81, Table 8.4-3, Table 8.4-4, Figure 8.4-2). It is documented that portions of Meadow Creek are, and historically have been, in direct contact with contaminated tailings and neutralized ore throughout the Meadow Creek Valley, both at the Bradley tailings/neutralized ore pile and at locations in the lower valley.

There has also been mining-related activity upstream on Blowout Creek, which flows into Meadow Creek just downstream of the keyway, and in 1958 a dam on Blowout Creek failed, releasing tailings and sediment into Meadow Creek and downstream (Ref. 4; Ref. 23, pg. 4-5). Sediment and surface water samples were collected from Blowout Creek in 1993 during the PA/SI sampling event (sample location R1) and surface water samples were collected from Blowout Creek in 1997 during the site characterization sampling event (sample location BL-1) (Ref. 3, pg. 29; Ref. 4; Ref. 23, pg. 8-4). The concentrations of metals detected in the samples collected from Blowout Creek are comparable to the concentrations detected in the Meadow Creek background samples. Therefore, the concentrations of metals detected in the release samples of each sampling event were also significantly greater than those detected in the respective samples collected from Blowout Creek (Ref. 3, pp. 125, 140; Ref. 5, pp. 39, 43; Ref. 23, pp. A-13, A-14, A-15, D-3, D-11, D-22).

Based on observed release by direct observation and the locations of the background and release samples in the observed releases by chemical analysis, the significant increase in the concentrations of metals downstream in Meadow Creek and the EFSF Salmon River can be attributed to the Stibnite/Yellow Pine Mining Area site.

<u>Hazardous Substances Released:</u>

Antimony	Cyanide
Arsenic	Lead
Cadmium	Mercury
Copper	

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Observed Release Factor Value: 550

4.2.3.2 Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Source Number/ Observed Release	Toxicity Factor Value	Persistence Factor Value[1]	Bioaccum-ulation Value[2]	Toxicity/Persistence/ Bioaccumulation Factor Value (Ref. 1, Table 4-16)	Reference
Arsenic	1, OR	10,000	1	5	5×10^4	2, p. B-2; 5, pp. 28, 42; 3, p. 104
Antimony	1, OR	10,000	1	0.5	5×10^3	2, p. B-2; 5, pp. 28, 42; 3, p. 104
Cadmium	1, OR	10,000	1	5,000	5×10^7	2, p. B-4; 5, pp. 28, 42; 3, p. 104
Copper	1, OR	NA	1	50,000	NA	2, p. B-6; 5, pp. 28, 42; 3, p. 105
Lead	1, OR	10,000	1	50	5×10^5	2, p. B-13; 5, pp. 28, 42; 3, p. 107
Mercury	1, OR	10,000	0.4	50,000	2×10^8	2, p. B-13; 5, pp. 28, 42; 3, p. 104
Cyanide	1, OR	100	0.4	0.5	20	2, p. B-6; 5, pp. 13, 28, 42, 87

1 - River persistence factor values were used from SCDM, Reference 2.
2 - Freshwater bioaccumulation factor values were used from SCDM, Reference 2.
NA - No value presented in SCDM, Reference 2.

The hazardous substance with the highest toxicity/persistence/bioaccumulation factor value is mercury, with a value of 2×10^8.

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Toxicity/Persistence/Bioaccumulation Factor Value: 2×10^8

4.1.3.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (yes/no)
1	3,040,000	No
Sum of values: 3,040,000		

4.1.3.2.3 Waste Characteristics Factor Category Value

A waste characteristics value is calculated by multiplying the toxicity/persistence factor value by the hazardous waste quantity factor value (the product of which is subject to a maximum of 1×10^8) and then multiplying that value by the bioaccumulation potential factor value. This product (subject to a maximum of 1×10^{12}) is then entered into Table 2-7 of the HRS to obtain a waste characteristics factor category value (Ref. 1, pg. 51592).

Toxicity/persistence factor value
X hazardous waste quantity factor value: 1×10^8
($10{,}000 \times 1{,}000{,}000 = 1 \times 10^{10}$)

(Toxicity/persistence x hazardous waste quantity)
X bioaccumulation potential factor value: 1×10^{12}
($100{,}000{,}000 \times 50{,}000 = 5 \times 10^{12}$)

===

Hazardous Waste Quantity Assigned Value: 1,000,000
Waste Characteristics Factor Category Value: 1,000

4.1.3.3 Human Food Chain Threat-Targets

According to the Idaho Department of Fish and Game (IDFG), the primary fish species present at the site include chinook salmon (*Oncorhychus tshawytscha*), steelhead (*Salmo mykiss*) (an anadromous form of rainbow trout), and bull trout (*Salvelinus confluentus*) (Ref. 23, p. 3-3). The chinook salmon and the steelhead are migratory, while the cutthroat trout, rainbow trout, and bull trout are resident species (Ref. 23, p. 3-3). Other species occurring in the area are shorhead sculpin (*Cottus confusus*) and mountain whitefish (*Prospuim williansomi*). Fish surveys within the site show that bull trout and rainbow trout are relatively abundant in the area (Ref. 23, p. 3-3). Recreational visitors include hunters, fishermen, or day hikers who pass through the site; these activities usually occur between July and November (Ref. 23, p. 3-5).

Idaho 2000 and 2001 Fishing Season Rules restrict fishing of trout as catch and release only on the EFSF Salmon River and its tributaries (Ref. 32, pp. 36 and 42). However, whitefish may be taken during the general stream season, which begins the Saturday before Memorial Day and concludes November 30 (Ref. 32, pp. 6, 42). Based on information from Idaho Fish and Game, fishing occurs downstream of the confluence of Midnight Creek and the EFSF Salmon River (Ref. 25). According to the State of Idaho, fishing for consumptive purposes generally occurs in the Glory Hole (which is downstream of the confluence of Midnight Creek and the EFSF Salmon River; Ref. 4; Ref. 33). Mountain whitefish could be fished for consumptive purposes downstream of the confluence of Midnight Creek and the EFSR Salmon River (Ref. 33). In addition, there have been reports of anglers fishing, catching, and consuming steelhead smolts, which are approximately ¼ - ½ pound and 8 to 10 inches long (Ref. 33).

In 1992, the U.S. Fish and Wildlife Service collected tissue samples from mountain whitefish and steelhead trout below the mining area (Ref. 5, pp. 15, 17, 18). Steelhead trout sampled below Sugar Creek showed arsenic levels more than three times the levels for steelhead in the control stream identified as Profile Creek (Ref. 5, pg. 15). Arsenic was reported at a maximum concentration of 6.38 μg/g (6.38 mg/kg) (Ref. 5, pg. 254). The reference dose screening concentration for arsenic in food is 0.41 mg/kg and the cancer risk screening concentration is 0.0021 mg/kg (Ref. 2, pg. B-44). These Level I concentrations in fish were not scored in this document because the fish were not known to be collected in a documented zone of actual contamination and the quality of the data are unknown.

Potential human food chain contamination has been established due to the presence a hazardous substance with a bioaccumulation factor value of 500 or greater in an observed release and a fishery within the target distance limit. The following table illustrates those hazardous substances with a bioaccumulation factor value of 500 or greater in the observed releases documented in Section 4.1.2.1.1 of this document.

Sample ID	Distance from Probable Point of Entry	Hazardous Substance	Bioaccumulation Potential Factor Value[1]
Observed Release by Direct Observation	0 feet	Cadmium Copper Mercury	5,000 50,000 50,000
C1DTC C1WTC	0 feet	Cadmium Mercury	5,000 50,000
E1DTC E1WTC	1,200 feet	Cadmium Mercury	5,000 50,000

Sample ID	Distance from Probable Point of Entry	Hazardous Substance	Bioaccumulation Potential Factor Value[1]
F1DTC F1WTC	2,800 feet	Cadmium Mercury	5,000 50,000

1 - Reference 2, pp. B-4, B-13

4.1.3.3.1 Food Chain Individual

A food chain individual factor value of 20 is assigned based on observed releases of hazardous substances with a bioaccumulation factor value greater than 500 to Meadow Creek and the presence of a fishery within the 15-mile target distance limit (Ref. 1, pg. 51620; Ref. 5, pg. 296; Figure 6, pg. 28).

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Food Chain Individual Factor Value: 20

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

No fisheries subject to Level I concentrations have been identified.

4.1.3.3.2.2 Level II Concentrations

Level II concentrations of contaminants have been detected in sediment and surface water samples collected downstream of a source at the Stibnite/Yellow Pine Mining Area site as documented in Section 4.1.2.1.1 of this report. However, the presence of a fishery within the zone of Level II concentrations could not be established.

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Level I Concentrations Factor Value: 0
Level II Concentrations Factor Value: 0

4.1.3.3.2.3 Potential Human Food Chain Contamination

The EFSF Salmon River is a fishery for mountain whitefish and steelhead smolts downstream of its confluence with Midnight Creek (which flows into EFSF Salmon River approximately 1.7 miles downstream of EFSF Salmon River's confluence with Meadow Creek) (Ref. 33).

Potential human food chain contamination has been established due to the presence a hazardous substance with a bioaccumulation factor value of 500 or greater in observed releases to Meadow Creek and the presence of a fishery within 15 miles downstream. Although the annual production of the fishery is not known, it can be assumed to be greater than zero.

Fishery	**Estimated Annual Production (lbs)**	**Human Food Chain Population Value**[1]	**Dilution Weight**[2]	**Reference**
EFSFSR, downstream of the confluence of Midnight Creek	Unknown, but greater than 0	0.03	0.1	Ref. 25; Ref. 31

1 Population Value derived from HRS Table 4-18 (Ref. 1, p. 51621)
2 Dilution weight assigned from HRS Table 4-13 (Ref. 1, p. 51613)

Potential Human Food Chain Contamination Factor Value = (Human Food Chain Population Value x Dilution Weight)/10

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Potential Human Food Chain Contamination Factor Value: 0.0003
(0.03 x 0.1) / 10
Reference: 1, Section 4.1.3.3.2.3, p. 51621

4.1.4.2 WASTE CHARACTERISTICS

4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

Hazardous Substance	Source Number/ Observed Release	Ecosystem Toxicity Factor Value[1]	Persistence Factor Value[2]	Ecosystem Toxicity/ Persistence Factor Value (Ref. 1, Table 4-20)	Reference
Antimony	1, OR	100	1.0	100	Ref. 2, pg. B-2; Ref. 3, pg. 104; Ref. 5, pg. 28
Arsenic	1, OR	10	1.0	10	Ref. 2, pg. B-2; Ref. 3, pg. 100; Ref. 5, pg. 28
Cadmium	1, OR	1,000	1.0	1,000	Ref. 2, pg. B-4; Ref. 3, pg. 105; Ref. 5, pg. 28
Copper	1, OR	100	1.0	100	Ref. 2, pg. B-6; Ref. 3, pg. 107; Ref. 5, pg. 28
Lead	1, OR	1,000	1.0	1,000	Ref. 2, pg. B-13; Ref. 3, pg. 107; Ref. 5, pg. 28
Mercury	1, OR	10,000	0.4	4,000	Ref. 2, pg. B-13; Ref. 3, pg. 100; Ref. 5, pg. 28
Cyanide	1, OR	1,000	0.4	400	Ref. 2, pg. B-6; 5, pp. 13, 87

1 - Freshwater ecotoxicity factor values were used from SCDM, Reference 2.
2 - River persistence factor values were used from SCDM, Reference 2.
NA - No value presented in SCDM, Reference 2.

Hazardous Substance	Ecosystem Toxicity/ Persistence Factor Value	Environmental Bioaccumulation Factor Value[1]	Reference	Ecosystem Toxicity/Persistence/ Bioaccumulation Factor Value (Ref. 1, Table 4-21)
Antimony	100	5.0	2, p.B-2	500
Arsenic	10	50	2, p. B-2	500
Cadmium	1,000	5,000	2, p. B-4	5×10^6
Copper	100	50,000	2, p. B-5	5×10^6
Lead	1,000	5,000	2, p. B-11	5×10^6
Mercury	10,000	50,000	2, p. B-11	2×10^8
Cyanide	400	0.5	2, p. B-6	200

1 - Freshwater environmental bioaccumulation factor values were used from SCDM, Reference 2.

The hazardous substance with the highest ecosystem toxicity/persistence/bioaccumulation factor value is mercury, with a value of 2×10^8.

===

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 2×10^8

4.1.4.2.2 Hazardous Waste Quantity

Source Number	Source Hazardous Waste Quantity Value (Section 2.4.2.1.5)	Is Source Hazardous Constituent Quantity Data Complete? (yes/no)
1	3,040,000	No

Sum of values: 3,040,000

4.1.4.2.3 Waste Characteristics Factor Category Value

A waste characteristics value is calculated by multiplying the ecosystem toxicity/persistence factor value by the hazardous waste quantity factor value (the product of which is subject to a maximum of 1×10^8) and then multiplying that value by the environmental bioaccumulation potential factor value. This product (subject to a maximum of 1×10^{12}) is then entered into Table 2-7 of the HRS to obtain a waste characteristics factor category value (Ref. 1, p. 51592).

Ecosystem toxicity/persistence factor value
X hazardous waste quantity factor value: 1×10^8
($10,000 \times 1,000,000 = 1 \times 10^{10}$)

(Ecosystem toxicity/persistence X hazardous waste quantity)
X bioaccumulation potential factor value: 1×10^{12}
$1 \times 10^8 \times 50,000 = 5 \times 10^{12}$
($100,000,000 \times 50,000 = 5 \times 10^{12}$)

===

Hazardous Waste Quantity Factor Value: 1,000,000
Waste Characteristics Factor Category Value: 1,000

4.1.4.3 ENVIRONMENTAL THREAT - TARGETS

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

No sensitive environments or wetlands subject to Level I concentrations have been identified.

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Level I Concentrations Factor Value: 0

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

The EFSF Salmon River is habitat for the Snake River spring/summer chinook salmon, a Federal designated threatened species (Ref. 12, pg. 68544). Numerous hydrologic units in the Snake River Basin have been classified as critical habitat for the endangered salmon (Ref. 12, pp. 68552 through 68554). The U.S. Geological Survey gaging station 1,200 feet downstream from Meadow Creek is in hydrologic unit 17060208 (Ref. 7, pg. 222). The boundaries of this unit are shown on Reference 21. This unit is a designated critical habitat spring/summer chinook salmon (Ref. 12, pg. 68553; Ref. 5, pg. 26). In 1999, bull trout (*Salvelinus confluentus*) was listed as threatened throughout its entire range in the conterminous United States (Ref. 31). According to the Idaho Department of Fish and Game (IDFG), bull trout is a resident species at the site (Ref. 23, p. 3-3). Level II samples C1WTC, E1WTC, F1WTC, Q1WTC, Q1DTC, and I1WTC were collected from within this unit.

The South Fork Salmon River drainage, which includes the EFSF Salmon River, has historically contained one of Idaho's largest salmon runs. On the basis of redd counts, the South Fork is considered one of the single most important summer chinook spawning streams in Idaho (Ref. 23, p. 3-3).

Sensitive Environment	Distance from Probable Point of Entry to Nearest Point of Sensitive Environment	Reference	Sensitive Environment Value(s)
Snake River spring/summer chinook salmon critical habitat (federal designated threatened species)	1.53 mile	Ref. 5, pg. 26; Ref. 12, pp. 68552 - 68554; Ref. 7, pg. 222; Ref. 1, pg. 51624; Ref. 21	100
Spawning area critical for the maintenance of summer chinook	1.53 mile	Ref. 23, p. 3-3	75
Bull Trout habitat (federal designated threatened species)	1.53 mile	Ref. 23, p. 3-3; Ref. 31	75

Sum of Sensitive Environment Values: 250

Wetlands

Below the keyway dam is an area of emergent wetlands and in Meadow Creek are scrub-shrub wetlands (Ref. 19, Figure 4-1, pg. 4-8). To determine where the farthest downgradient Level II sample (F1WTC) is with respect to the wetlands, Figure 4-1 was enlarged 175% to be the same size as the sample location map (Figure 6) of the PA/SI report and an acetate overlay was made of the wetlands (Ref. 5, pg. 28; Ref. 19a). When the overlay is compared to the sample location map, sample F1WTC was measured to be 1,200 feet below where the wetland starts. Therefore, a total of 2,400 feet (0.45 mile) of wetland frontage are subject to level II concentrations.

The area along Meadow Creek from sample F1WTC to the confluence with the EFSF Salmon River includes both riverine and palustrine systems associated with perennial flowing streams (Ref. 5, pg. 299). Figure 4-1 of Reference 19, page 4-8, indicates this area is all scrub-shrub wetland. The total length of this section is 1.6 miles (Ref. 5, pg. 28). Level II contamination is documented for this section by samples F1DTC, Q1WTC, Q1DTC, and I1WTC.

Wetland	Wetland Frontage	Reference
Meadow Creek, below the tailings pile to the confluence with the EFSF Salmon River	3.2 miles	Ref. 19, Figure 4-1, pg. 4-8; Ref. 5, pp. 28, 299; Ref. 19a; Ref. 23, pg. 3-3
Emergent wetland below keyway	0.45 mile	Ref. 19, Figure 4-1, pg. 4-8; Ref. 5, pg. 28; Ref. 23, pg. 3-3

Total Wetland Frontage: 3.65 miles

Wetland Value: 100
Reference: 1, Table 4-24; 19

Sum of Sensitive Environments Value + Wetland Value: 350

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Level II Concentrations Factor Value: 350

4.1.4.3.1.3 Potential Contamination

Sensitive Environments

No sensitive environments meeting the definitions in Table 4-23 of the HRS subject to Level II concentrations have been identified.

Wetlands

The EFSF Salmon River from Meadow Creek to Sugar Creek is classified as perennial and is about 2.5 miles long (Ref. 5, pg. 28). Except where mining has occurred at the lower end, the river is classified as scrub-shrub wetland (Ref. 5, pg. 26). Reference 19, Figure 4-1, pg. 4-8 indicates the entire stretch is a scrub-shrub wetlands area.

The EFSF Salmon River to Yellow Pine was not evaluated for the PA/SI, however it would be consistent with the vegetative types found on the upper end of Sugar Creek and the remaining 10.4 miles would probably be classified as wetlands. This segment was not included in the scoring due to lack of documentation. Only the 2.5 miles of the EFSF Salmon River from Meadow Creek to Sugar Creek was evaluated for potential contamination. Both sides of the river were considered to yield a total of 5 miles.

Wetland	Wetland Frontage	Reference
EFSF Salmon River, from Meadow Creek to Sugar Creek.	5 miles	Ref. 19, Figure 4-1, pg. 4-8

Type of Surface Water Body (Ref. 1, Table 4-13)	Sum of Sensitive Environment Values (S_j)	Wetland Frontage Value (W_j) (Ref. 1, Table 4-24)	Dilution Weight (D_j) (Ref. 1, Table 4-13)	$D_j(W_j + S_j)$
Small to moderate stream	0	150	0.1	15

Sum of $D_j(W_j + S_j)$: 15
(Sum of $D_j(W_j + S_j)$)/10: 1.5

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Potential Contamination Factor Value: 1.5