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Deadwood Mine
Preliminary Assessment/Site Inspection Report
Valley County, Idaho

TDD: 00-02-0005

Contract: 68-W6-0008
December 2000

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Region 10

START

Superfund Technical Assessment and Response Team

Submitted To: Monica Tonel, Task Monitor
U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

DEADWOOD MINE
PRELIMINARY ASSESSMENT/SITE INSPECTION REPORT
VALLEY COUNTY, IDAHO

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LIST OF ACRONYMS

Acronym	Definition
bgs	below ground surface
cfs	cubic feet per second
CLP	Contract Laboratory Program
CRQL/CRDL	contract-required quantitation limit/contract-required detection limit
DQOs	data quality objectives
DLs	detection limits
Dup	duplicate
E & E	Ecology and Environment, Inc.
EPA	United States Environmental Protection Agency
gpm	gallons per minute
GPS	Global Positioning System
IGS	Idaho Geological Survey
IDW	investigation-derived waste
LCS	laboratory control sample
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MS	matrix spike
PA/SI	preliminary assessment/site inspection
PPE	probable point of entry
QA/QC	quality assurance/quality control
RPD	relative percent difference
SOP	standard operating procedure
SQAP	sampling and quality assurance plan
SQL	sample quantitation limit
START	Superfund Technical Assessment and Response Team
TAL	Target Analyte List
TM	task monitor
TDL	Target Distance Limit
USFS	United States Forest Service

DEADWOOD MINE
PRELIMINARY ASSESSMENT/SITE INSPECTION REPORT
VALLEY COUNTY, IDAHO

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) has tasked Ecology and Environment, Inc. (E & E) to provide technical support and to conduct a combined preliminary assessment/site inspection (PA/SI) at the Deadwood Mine site in Valley County, Idaho. E & E completed PA/SI activities under Technical Direction Document No. 00-02-0005, issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START) Contract No. 68-W6-0008.

The specific goals of this PA/SI were intended to address site assessment objectives and are presented below:

- Collect and analyze samples to characterize the potential sources discussed in Section 2.5;
- Determine off-site migration of contaminants;
- Provide the EPA with adequate information to determine whether the site is eligible for placement on the National Priorities List; and
- Document any threat or potential threat to public health or the environment posed by the site.

Completion of this PA/SI included reviewing site information, determining regional characteristics, collecting receptor information within the site's range of influence, conducting a site visit, executing a site-specific sampling plan, and producing this report.

This document includes site background information (Section 2), field sampling activities and analytical protocols (Section 3), quality assurance/quality control (QA/QC) criteria (Section 4), analytical results reporting and background sampling (Section 5), potential sources (Section 6), migration/exposure pathways and targets (Section 7), summary and conclusions (Section 8), and references (Section 9).

2. SITE BACKGROUND

This section describes the site location (Section 2.1), site description and ownership history (Section 2.2), site operations and waste characteristics (Section 2.3), site characterization (Section 2.4), and summary of PA/SI investigation locations (Section 2.5).

2.1 SITE LOCATION

Site Name:	Deadwood Mine
CERCLA ID No.:	IDSFN1002112
Location:	25 miles north of Lowman, Valley County, Idaho
Latitude:	44°28'15" N
Longitude:	115°34'53" W
Legal Description:	Section 11, Township 13N, Range 7E
Site Owners:	Robert H. Remaklus P.O. Box 759 Cascade, ID 83611
	Larry Remaklus 406 East Curling Drive Boise, ID 83702
Site Contacts:	Bruce A. Schuld Idaho Department of Environmental Quality 1410 North Hilton Boise, ID 83706 (208) 373-0554
	Pat Trainor United States Forest Service (USFS) Council Ranger District P.O. Box 567 Council, ID 83612 (208) 253-0176

2.2 SITE DESCRIPTION/OWNERSHIP HISTORY

Deadwood Mine is an inactive, underground gold and silver mine located near Deadwood River in the Boise National Forest in Valley County, Idaho (Figure 2-1). The site is located approximately

5,800 feet above sea level in a remote and mountainous area approximately 25 miles north of Lowman, Idaho (USGS 1988a; Figure 2-1). The site is not fenced or gated and is accessible through USFS Road 579, Landmark Stanley Road, near the west side of the property (Figure 2-2). The parcel is estimated to encompass approximately 100 acres and is surrounded on all sides by USFS land (USGS 1988a). During an October 1999 site visit conducted by the START, four buildings, in varying conditions, remained on site (E & E 2000b). These buildings consisted of a former mill, an office building, a bunkhouse, and a cabin (Figure 2-3). The mill building was burned in a fire and was severely dilapidated. Old crushing machinery and chemical processing equipment remained where a portion of the mill building once stood. The former office building, a three-story building, appeared to be in good condition. Based on the START's observations of this building, it may have housed a laboratory due to the presence of equipment and glassware typically associated with an assay laboratory. Inside the building was a boiler. Pipes associated with the boiler appeared to be insulated with a material resembling asbestos. Adjacent to the office was the former bunkhouse, a three-story building in fairly good condition. It appeared that this building also experienced fire damage. Upslope from the bunkhouse were two collapsed adits, the north adit and the south adit, and the cabin (Figures 2-3 and 2-4). Additionally, a large waste rock pile was present on site. Further, an unnamed creek flowed through the southern end of this crushed waste rock pile and beneath the southern portion of the bunkhouse, discharging into Deadwood River (Figure 2-3). (E & E 2000a, 2000b)

During the START's site visit in October 1999, the START also observed a large tailings pile north of the former mill building. The tailings pile appeared to have migrated west onto USFS land by erosion. Access to the tailings pile was unrestricted. The START observed tire tracks, which appeared to be from four-wheel-drive vehicles or motorcycles, on source tailings both on site and on USFS property. In the vicinity of the mine, land is used for recreational fishing, hunting, and backcountry travel (Rotthoff 1999).

The site is situated along the base of a steep hillside. The adits are located on the hillside approximately 100 feet above the valley floor. Waste rock has been deposited below the adits and along the hillside. Deep gullies have formed on the face of the waste rock pile, and the pile is actively eroding. The bunkhouse, mill building, and the tailings pile are located on the valley floor below the waste rock pile. The site slopes approximately 40 degrees toward USFS land to the west. Deadwood River is located west of the site, across the USFS road (Figure 2-3). The topography in the site area slopes gently from the road to the banks of the Deadwood River (USGS 1988a).

A portion of the site is currently owned by Robert and Larry Remaklus. The other portion is owned by USFS. Exact property boundaries have not been determined. Previous owners include Bunker Hill & Sullivan M & C Company, which acquired the mine from smaller holders in 1923 (Campbell 1931).

2.3 SITE OPERATIONS AND WASTE CHARACTERISTICS

The mine, which is currently inactive, operated from October 24, 1924, until the 1940s. The Bunker Hill & Sullivan M & C Company acquired the mine in 1923 and constructed a large, two-story boarding house, shops, a barn, and an outbuilding on site. Additionally, a hydroelectric power plant and compressor were installed at the site, and mining equipment was brought into place. Ore was crushed at the on-site mill and sent through three processes (i.e., circuits): the rougher circuit, the lead circuit, and the zinc circuit. Substances used in these circuits included zinc sulfate, cresylic acid (often called cresol), copper sulfate, and a floatation substance called Aerofloat™, which is a trademark name for aryl dithiophosphoric acid and acid salts (Campbell 1931).

As a result of the crushing, grinding, and floatation processes, mine tailings were created. Tailings are the finely ground sand and silt-sized materials that remain after target minerals have been separated during crushing, grinding, and floatation processes. These tailings were deposited in a large pile in the northwestern portion of the property and do not appear to have or have had any form of containment. The tailings have not re-vegetated, and appear to have been scattered by wind.

The on-site adits have collapsed, and there may be physical hazards associated with the collapsed openings. Discharge and an orange precipitate on wetted surfaces, apparently originating from the adits, also were noted on site (E & E 2000b). It has been estimated that approximately 53,338 cubic yards of tailings and approximately 8,149 cubic yards of waste rock are present at the site (USFS 1994). Contaminants of concern at the site include heavy metals and contaminated mine drainage discharging from the adits and potentially an on-site seep, which is located upgradient from the adits. Suspected contaminants include Target Analyte List (TAL) metals, including mercury and cyanide. Cyanide and mercury use is suspected due to mining practices that commonly were utilized during that time (IGS 1994).

2.4 SITE CHARACTERIZATION

This section describes previous investigations and the START site visit.

2.4.1 Previous Investigations

The Idaho Geological Survey (IGS) performed a site inspection at Deadwood Mine in June 1994 for the USFS during IGS's abandoned and inactive mine site discovery process. Physical hazards associated with the old structures and the abundance of waste rock and debris were noted by IGS. Also, a mine shaft, which appeared to be open partially and hidden by a pile of boards, was identified as a hazard. IGS inspectors reported that this shaft was too dangerous to approach for closer inspection. The investigation concluded that no major physical hazards or immediate chemical hazards were present at the site (IGS 1994).

On July 20, 1999, USFS conducted a site visit at Deadwood Mine, during which grab samples from the tailings and waste rock piles were collected and analyzed for TAL metals (EPA Method 200.7). The locations of the sample collection points were not available. Twenty metals were present above detection limits in the tailings pile sample, including arsenic (104 milligrams per kilogram [mg/kg]), barium (3.47 mg/kg), cadmium (30.3 mg/kg), copper (148 mg/kg), lead (859 mg/kg), mercury (1.26 mg/kg), selenium (126 mg/kg), and zinc (3,400 mg/kg; Analytical Laboratories, Inc. 1999). Twenty metals were present above detection limits in the waste rock sample, including arsenic (30.4 mg/kg), barium (42.6 mg/kg), cadmium (32.2 mg/kg), copper (156 mg/kg), lead (664 mg/kg), mercury (0.53 mg/kg), selenium (22.5 mg/kg), and zinc (3,460 mg/kg; Analytical Laboratories, Inc. 1999).

2.4.2 START PA/SI ACTIVITIES

The START conducted a site reconnaissance at Deadwood Mine on October 6, 1999. The START was accompanied by an EPA representative, David Tomten. The START observed several old buildings, two adits, and a large waste rock pile on site. The START did not observe any liquid discharging from the waste rock pile.

Further, a tailings pile was observed in the northwestern portion of the site. This deposit appeared to be eroding across USFS Road 579 onto USFS land to the north and west of the site. The START observed suspected wetland areas directly west of USFS Road 579 and across from the tailings pile; these suspected wetlands showed evidence of tailings deposition. The START did not observe tailings in Deadwood River.

The south adit was directly upgradient from the bunkhouse. The north adit was located approximately 100 feet northeast of the south adit (Figure 2-3). West of the north adit were the remains of a light gauge rail. The START observed discharge flowing from both adits. The discharge appeared to be fairly clear; however, the surfaces it wetted were covered with a bright-orange and red precipitate.

During the site visit, the START observed a seep south and upgradient from the south adit (Figure 2-3). This seep contained an orange precipitate, which was visible for a distance of approximately 50 feet from the seep's discharge point to its confluence with the main stem of the unnamed creek. Approximately 15 feet downgradient of the north adit, the START observed a discharge pipe protruding from the hillside over the unnamed creek. Water was not discharging from this pipe at the time of the site visit, and the purpose of the pipe is not known (E & E 2000b).

No other environmental concerns were noted by the START during the October 6, 1999 site reconnaissance.

On July 11, 2000, the START conducted sample collection activities at Deadwood Mine (E & E 2000a). During the sampling visit, the START observed the large tailings pile north of the former mill building that had migrated west onto USFS land (Figure 2-3). The pile was estimated to measure 600 feet in length, 400 feet in width, and about 6 feet in depth. The START also observed horse, deer, and tire tracks on source tailings. The tire tracks appeared to be from four-wheel-drive vehicles or motorcycles. Approximately 2 acres of wetlands, located west of the site (across USFS Road 579), were documented by the START.

The START also observed the on-site waste rock pile, located north of the former mill building and southeast of the tailings pile on a steep hillside. The pile can be described as two separate piles, one on each side of the former mill building, with waste rock connecting the two piles. The pile to the north of the former mill building is approximately 400 feet across the upper length and the pile to the south is approximately 200 feet across the upper length. Thickness, from face to hillside, varies from a minimum of 5 feet at the top of each pile (where tracks for the ore carts are located) to an unknown depth at the base of the hill. The depth at the base of the hill could range from a minimum of 20 feet up to 50 feet in some areas. On-site surface water appeared to drain west through the tailings pile, toward USFS land and Deadwood River.

The two adits, the north adit and the south adit, were observed on site (Figure 2-3). The START did not observe discharge flowing from either adit.

During the sampling visit, the START observed the on-site seep, located south and upgradient from the south adit. An orange precipitate, which was visible for a distance of approximately 50 feet

from the seep's discharge point through and over the south adit to its confluence with the main stem of the unnamed creek, was observed on wetted surfaces. Downgradient of the north adit, the START observed the discharge pipe protruding from the hillside over the unnamed creek. Water was not discharging from this pipe at the time of the sampling visit (E & E 2000a).

Further east and approximately 500 feet upgradient of the north adit, was the dilapidated cabin. Approximately 500 feet south of the cabin, was a 50-foot waterfall with standing water at the base (Figure 2-4). At the top of the waterfall was a cylindrical water tank approximately 12 feet in diameter and 6 feet in height. Adjacent to the water tank was a cast-iron drain pipe positioned downslope toward the mine site (Figure 2-4).

Additional evidence of human activity was documented in the vicinity of the mine and mainly consisted of debris, such as bottles, cans, cigarettes, and food containers. Land in the vicinity of the site is used for recreational fishing, hunting, and backcountry travel (Rotthoff 1999). No other environmental concerns were noted by the START during the site visit (E & E 2000a).

2.5 SUMMARY OF PA/SI SAMPLING LOCATIONS

Based on a review of historical and background information that was supplemented by the site reconnaissance, areas and features within the site were identified for investigation during the PA/SI as potential Comprehensive Environmental Response, Compensation, and Liability Act hazardous substance sources. In addition, on- and off-site locations were identified as possible receptors of contamination originating from these sources. These potential contaminant sources and receptors are listed below.

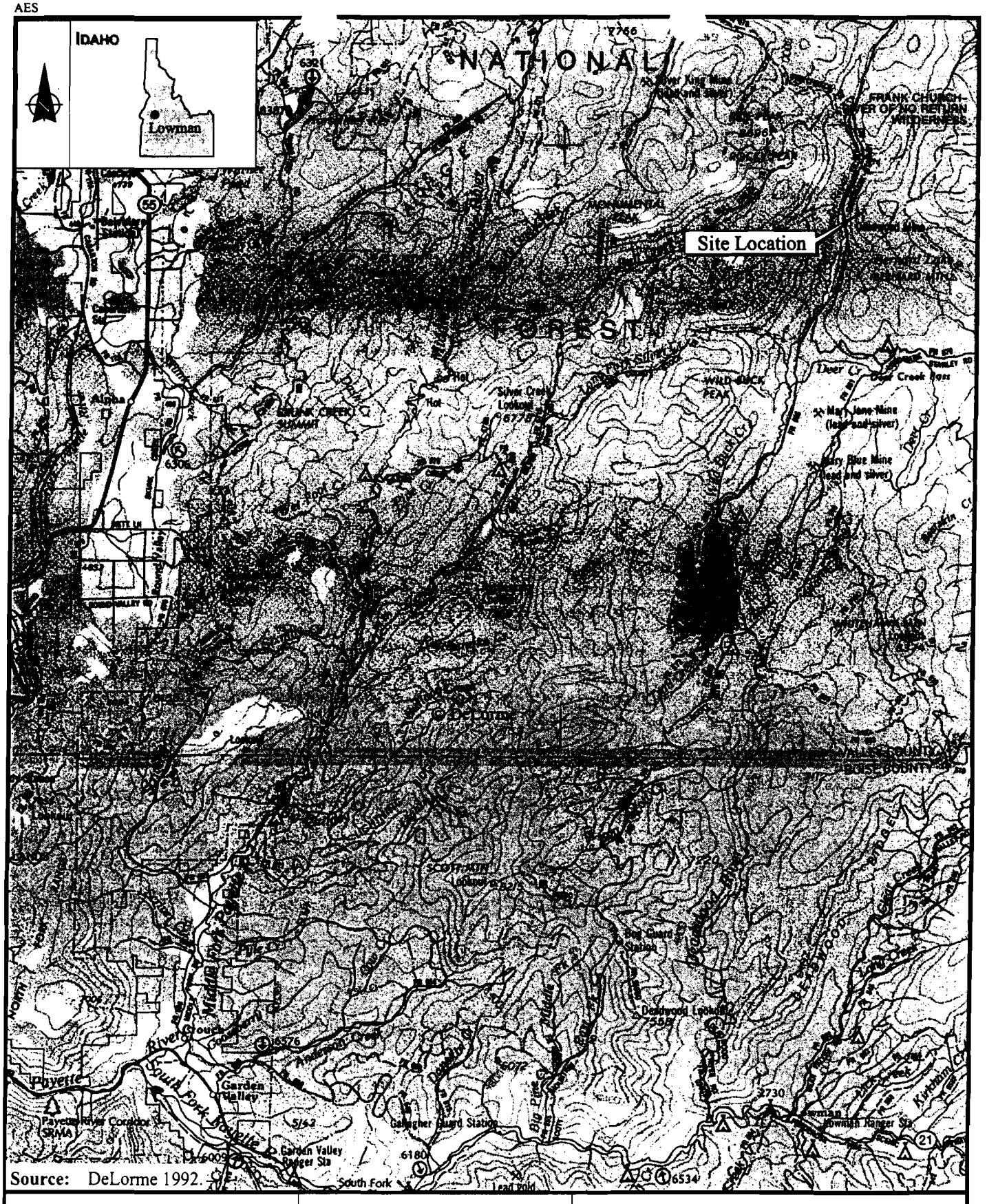
Potential Sources:

- **Tailings Pile.** Approximately 53,338 cubic yards of mine tailings were deposited in a large pile in the northwestern portion of the property and do not appear to have had any form of containment. Probable contaminants of concern are TAL metals, including mercury and cyanide, from mill operations.
- **Waste Rock Pile.** The on-site waste rock pile is estimated to measure approximately 400 feet across the upper length for the pile to the north, and the pile to the south is approximately 200 feet across the upper length. Thickness, from face to hillside, varies from a minimum of 5 feet at the top of each pile (where tracks for the ore carts are located) to an unknown depth at the base of the hill. The depth at the base of the hill could range from a minimum of 20 feet up to 50 feet in some areas. The volume was estimated to be 8,149 cubic yards. Probable contaminants of concern are TAL metals, including mercury.

- **Mill Soil.** During its operational time, the mill housed crushing machinery and chemical processing equipment. Potential contaminants were added to the crushed rock to extract valuable metals. Probable contaminants of concern are TAL metals, including mercury and cyanide.

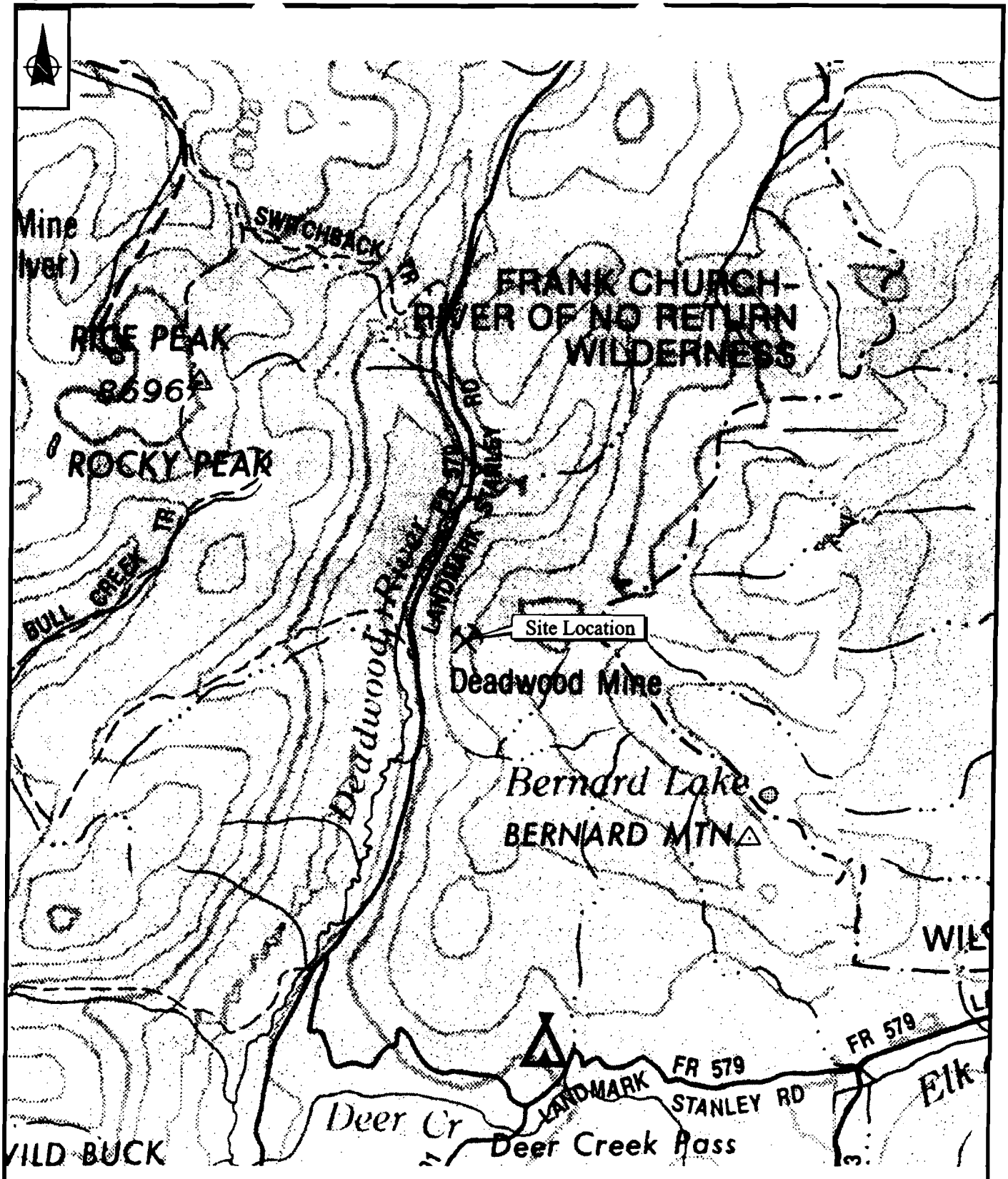
Potential Receptors:

- **Wetlands.** Tailings were observed in documented wetlands directly across from the on-site tailings pile and USFS Road 579. Additionally, contamination from potential sources at the site may be migrating from the site to these wetlands through air migration or surface water sheet flow across the USFS road. Probable contaminants of concern are TAL metals, including mercury and cyanide.
- **Deadwood River.** Discharge from the tailings and waste rock piles, unnamed creek, seep, and soil in the vicinity of the mill may be impacting surface water and sediments in Deadwood River. The bull trout (*Salvelinus confluentus*), which is a Federal listed threatened species, is known to be present in this river. Probable contaminants of concern are TAL metals, including mercury and cyanide.
- **Unnamed Creek.** Discharge from the waste rock pile and seep may be impacting surface water and sediments in the unnamed creek. Probable contaminants of concern are TAL metals, including mercury.
- **Seep.** A seep, south and upgradient from the south adit, was documented. The seep may be an expression of adit water or the waterfall located east and upgradient from the seep. The seep flow converges with the main stem of the unnamed creek. Probable contaminants of concern are TAL metals.



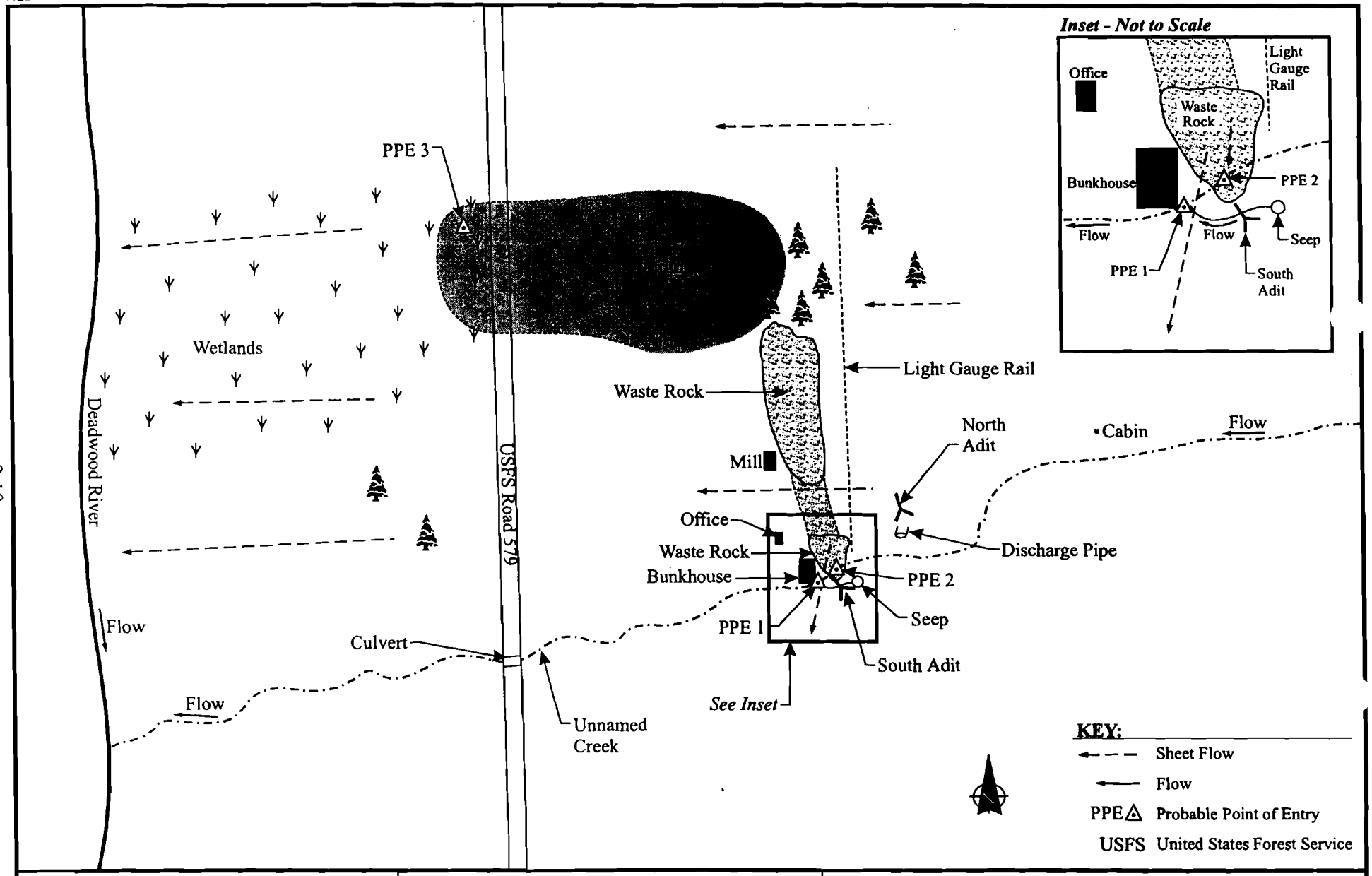
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	DEADWOOD MINE Valley County, Idaho	Figure 2-1 SITE VICINITY MAP				
	0 2 4 Approximate Scale in Miles	Date: 11-22-00	TDD No. 00-02-0005	PAN No. EB0501SIT0	Dwg. No. EB0501 2-1	Pubs. No. S555

AES



Source: DeLorme 1992.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	DEADWOOD MINE Valley County, Idaho	Figure 2-2 SITE LOCATION MAP				
	0 .5 1 Approximate Scale in Miles	Date: 11-22-00	TDD No. 00-02-0005	PAN No. EB0501SIT0	Dwg. No. EB0501 2-2	Pubs. No. S555



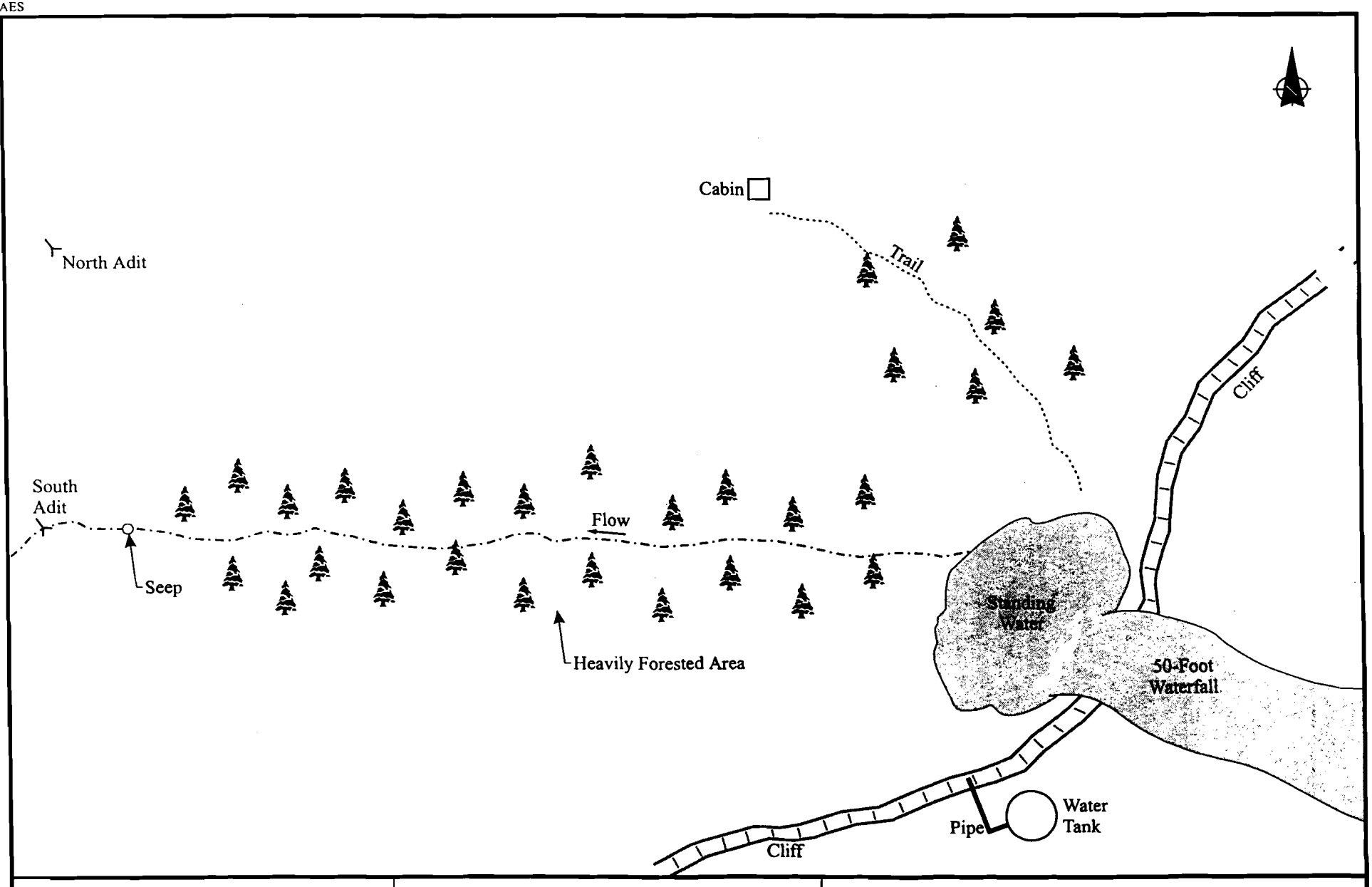
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

DEADWOOD MINE
Valley County, Idaho

0 250 500
Approximate Scale in Feet

Figure 2-3
SITE MAP

Date:	TDD No.	PAN No.	Dwg. No.	Pubs. No.
11/22/00	00-02-0005	EB0501SIT0	EB0501 2-3	S555



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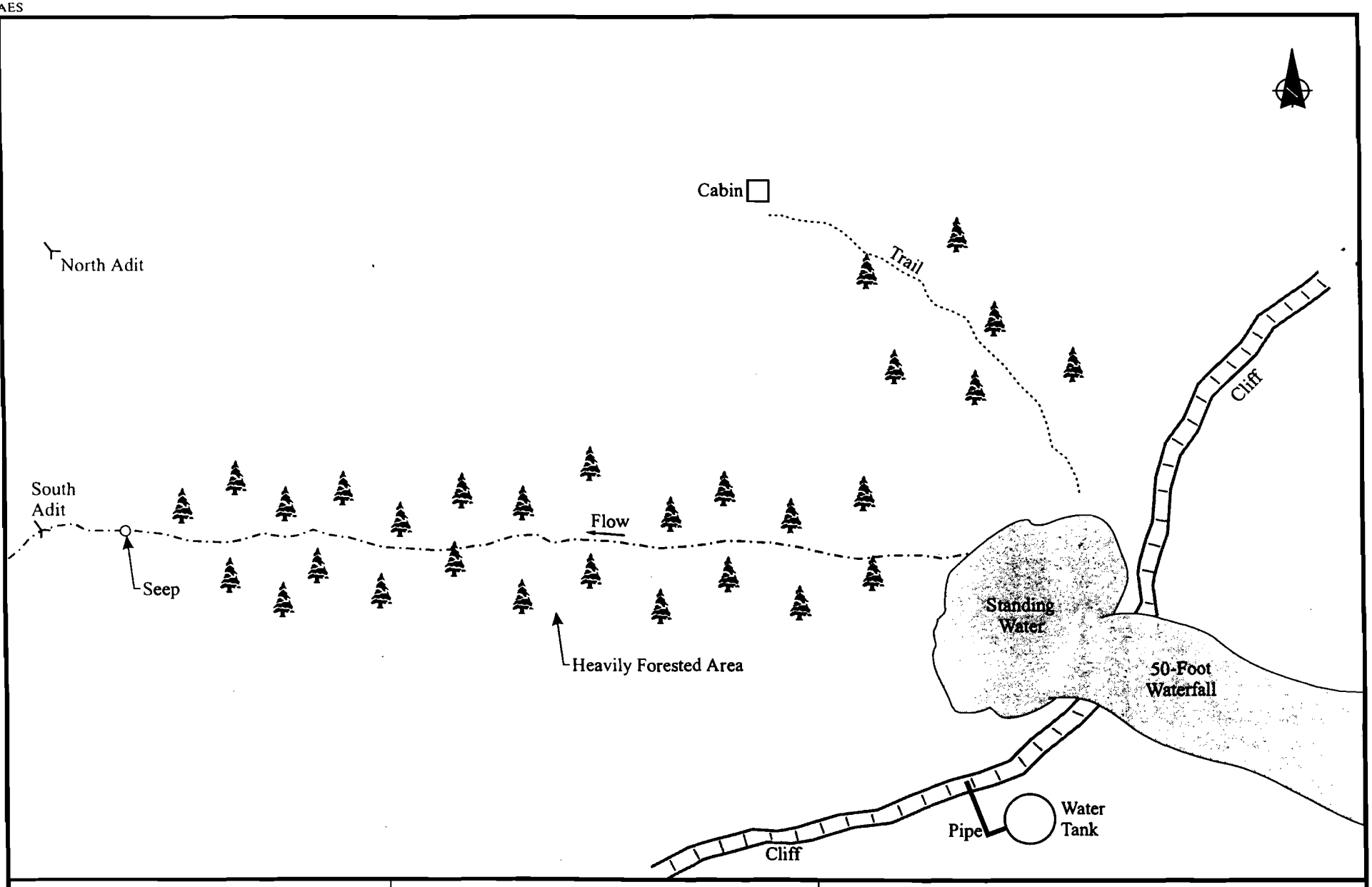
DEADWOOD MINE
Valley County, Idaho

0 50 100
Approximate Scale in Feet

Figure 2-4
SITE MAP (UPPER REGION)

Date:	TDD No.	PAN No.	Dwg. No.	Pubs. No.
11/22/00	00-02-0005	EB0501SIT0	EB0501 2-4	S555

AES



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	DEADWOOD MINE Valley County, Idaho	Figure 2-4 SITE MAP (UPPER REGION)				
	0 50 100 Approximate Scale in Feet	Date: 11/22/00	TDD No. 00-02-0005	PAN No. EB0501SIT0	Dwg. No. EB0501 2-4	Pubs. No. S555

3. FIELD SAMPLING ACTIVITIES AND ANALYTICAL PROTOCOLS

A sampling and quality assurance plan (SQAP) was developed by the START prior to field sampling (E & E 2000c). The SQAP was based upon a review of background information, interviews with site representatives, and a site reconnaissance by the START in October 1999. The SQAP describes the sampling strategy, sampling methodology, and analytical program to investigate potential hazardous substance sources and potential targets. With few exceptions, the PA/SI field activities were conducted in accordance with the approved SQAP. Deviations from the SQAP were approved by the EPA and are described when applicable in the sampling location discussions in Section 6 (source areas) and Section 7 (target areas).

The PA/SI field sampling event was conducted from July 11 to 13, 2000. Including background samples, a total of 37 samples (15 subsurface soil, 11 surface water, and 11 sediment samples) were collected from on- and off-site locations. Sample types and the methods of collection are described below. A list of all samples collected for laboratory analysis under the PA/SI is contained in Table 3-1. Photographic documentation of PA/SI field activities is included as Appendix A.

In addition to the EPA-assigned regional tracking number, samples were tracked with a field sample code system designed to allow easy reference to the sample's origin and type. The field sample codes applied by the START to each sample location are used in this report. Table 3-2 summarizes the field sample codes. Sample locations are provided in Figures 3-1 through 3-3.

This section describes sampling methodology (Section 3.1), analytical protocol (Section 3.2), Global Positioning System (GPS; Section 3.3), and investigation-derived waste (IDW; Section 3.4).

3.1 SAMPLING METHODOLOGY

This section describes soil, surface water, and sediment sampling conducted during the PA/SI. Samples were collected in accordance with the standard operating procedures (SOPs) provided in the SQAP, except as noted. Grass, leaves, and other vegetative material; rocks; and other debris unsuitable for analysis were removed from samples before samples were placed into sample containers. In general, soil and sediment sample materials were homogenized in dedicated plastic bowls prior to containerization. Dedicated plastic scoops were used to extract, homogenize, and place sampled material

into sample containers. Decontamination of the shovels used for subsurface soil sample collection was not required as only dedicated sampling equipment was used to collect each sample. Samples were stored on ice in coolers continuously maintained under the custody of START personnel.

3.1.1 Subsurface Soil Samples

A total of 15 subsurface soil samples, including two background subsurface soil samples, were collected from the Deadwood Mine site. The soil samples were discrete-located grab samples collected from the potential on-site source areas. Subsurface soil samples were collected from 12 to 18 inches below ground surface (bgs). A shovel was used to remove the upper 12 inches of soil; dedicated plastic scoops were used to excavate the remaining soil and collect the samples. The sample materials then were transferred with the dedicated plastic scoops from the bottom of the holes to dedicated, plastic bowls for homogenization. Following homogenization, the samples were transferred into prelabeled sample containers with the dedicated plastic scoops. As approved by the EPA task monitor (TM), a rinsate sample was not collected from the shovel because the sample material only came in contact with the dedicated plastic scoop. All sample locations were backfilled with the soil cuttings following collection of the subsurface soil samples.

3.1.2 Surface Water Samples

A total of 11 surface water samples, including three background samples, were collected from Deadwood River, the unnamed creek, the seep, an upstream background location on Deadwood River, and an upgradient background location south of the site. These samples were co-located with their respective sediment samples. Water samples were collected by hand-dipping a 1-liter polyethylene sample container at least 6 inches below the surface of the water. The START obtained physical parameters for each surface water sample at each sample location with a water quality meter that measures pH, conductivity, dissolved oxygen, salinity, and temperature. Parameters were noted in the sampling logbook. It was not possible to measure the physical parameters at some locations due to malfunction of the water quality meter. All surface water samples requiring preservation were preserved immediately after sample collection according to the SOP. Treatment and preservation for cyanide analysis was performed immediately after surface water sample collection according to the SQAP.

3.1.3 Sediment Samples

A total of 11 sediment samples, including three background samples, were collected from Deadwood River, the unnamed creek, the seep, an upstream background location on Deadwood River, and an upgradient background location south of the site. These samples were co-located with their respective surface water samples. The sediment samples were collected at depths of 0 to 6 inches bgs. All sediment samples were homogenized in dedicated plastic bowls. Excess water was decanted off before the samples were placed into prelabeled sample containers with dedicated plastic scoops. The sediment samples were collected following the collection of co-located surface water samples to minimize potential impact of sediments on the surface water samples. Downstream sediment samples were collected before upstream samples to minimize potential cross-contamination of the downstream surface water and sediment samples by disturbed sediment.

3.2 ANALYTICAL PROTOCOL

Analytical methods applied to PA/SI samples include Contract Laboratory Program Analytical Services (CLPAS) Method ILM04.1 for TAL metals, including mercury and cyanide. This analytical suite, with the exception of cyanide, was applied to all samples based on the sample location and the expected contaminants at that location. Analysis of samples collected during the PA/SI were performed by the EPA Contract Laboratory Program (CLP) laboratory, Sentinel, Inc., in Huntsville, Alabama.

3.3 GLOBAL POSITIONING SYSTEM

A Trimble Pathfinder Professional GPS survey unit was used by the START personnel to approximate the sample location coordinates of the PA/SI subsurface soil and co-located surface water and sediment samples. GPS coordinates for the subsurface soil and co-located surface water and sediment samples (Figures 3-1 through 3-3) were plotted onto site maps. Recorded GPS coordinates by sample point, including horizontal precision in meters and position dilution of precision, are listed in Appendix B.

3.4 INVESTIGATION-DERIVED WASTE

IDW generated during the PA/SI sampling effort consisted of solid disposable sampling equipment. The IDW was disposed of as nonhazardous waste at a municipal landfill by the START. No IDW generated by the START remains at the site.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

EPA Sample Number	CLP Sample ID	START Sample ID	Matrix	Sample		Depth (inches bgs)	Analysis		Description
				Date	Time		Metals	CN	
00284101	MJ009R	BG01	SB	7/11/00	0730	12-18	X	X	Sandy loam; dry, no odor.
00284102	MJ009S	WP01	SB	7/11/00	0805	12-18	X		Gravel, waste rock; no odor.
00284103	MJ009T	WP02	SB	7/11/00	0815	12-18	X		Gravelly waste rock; dry, no odor.
00284104	MJ009W	WP03	SB	7/11/00	0830	12-18	X		Gravelly waste rock with wood debris; no odor.
00284105	MJ009X	WP04	SB	7/11/00	0845	12-18	X		Gravelly waste rock; no odor.
00284106	MJ009Y	ML01	SB	7/11/00	0910	12-18	X	X	Gravelly, sandy loam; no odor.
00284107	MJ009Z	ML02	SB	7/11/00	0925	12-18	X	X	Gravelly, silty sandy loam; no odor.
00284108	MJ00A0	ML03	SB	7/11/00	0950	12-18	X	X	Sandy loam; moist, no odor.
00284109	MJ00A1	TP01	SB	7/11/00	1015	12-18	X	X	Fine grain sand; no odor.
00284110	MJ00A2	TP02	SB	7/11/00	1041	12-18	X	X	Silty; no odor.
00284111	MJ00A3	TP03	SB	7/11/00	1110	12-18	X	X	Sandy; no odor.
00284112	MJ00A4	TP04	SB	7/11/00	1205	12-18	X	X	Four inches top soil, remainder tailings; sandy; no odor.
00284113	MJ00A5	WL01	SB	7/11/00	1217	12-18	X	X	Silty loam; no odor.
00284114	MJ00A6	WL02	SB	7/11/00	1230	12-18	X	X	Clay loam; moist, extremely organic, wood chips present, no odor.
00284115	MJ00A7	BG02	SB	7/11/00	1300	12-18	X	X	Slightly vegetated, moist, dark brown, background sample; no odor. (MS/Dup)
00284116	MJ00A9	DR01	SD	7/12/00	0805	0-6	X	X	Gravelly cobbles, not much soil; no odor.
00284117	MJ00A8	DR01	SW	7/12/00	0800	NA	X	X	Clear; no odor.
00284118	MJ00AC	DR02	SW	7/12/00	0930	NA	X	X	Clear; no odor.
00284119	MJ00AD	DR02	SD	7/12/00	0935	0-6	X	X	Gravel; no odor.
00284120	MJ00AE	DR03	SW	7/12/00	1000	NA	X	X	Clear; no odor.
00284121	MJ00AF	DR03	SD	7/12/00	1005	0-6	X	X	Sandy gravel; no odor.
00284122	MJ00AG	DR04	SW	7/12/00	1030	NA	X	X	Clear; no odor.
00284123	MJ00AH	DR04	SD	7/12/00	1035	0-6	X	X	Sandy gravel; no odor.
00284124	MJ00AJ	BG03	SW	7/12/00	1050	NA	X	X	Clear; no odor. (MS/Dup)
00284125	MJ00AK	BG03	SD	7/12/00	1055	0-6	X	X	Sandy gravel; no odor. (MS/Dup)
00284126	MJ00AA	UC01	SW	7/12/00	0810	NA	X		Clear; no odor.
00284127	MJ00AB	UC01	SD	7/12/00	0815	0-6	X		Sand; organic material present, no odor.
00284128	MJ00AQ	UC02	SW	7/12/00	1240	NA	X		Clear; no odor.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

EPA Sample Number	CLP Sample ID	START Sample ID	Matrix	Sample		Depth (inches bgs)	Analysis		Description
				Date	Time		Metals	CN	
00284129	MJ00AR	UC02	SD	7/12/00	1245	0-6	X		Gravelly sand; no odor.
00284130	MJ00AL	WL03	SW	7/12/00	1135	NA	X	X	Clear; no odor
00284131	MJ00AM	WL03	SD	7/12/00	1140	0-6	X	X	Mostly organic vegetation; no odor.
00284132	MJ00AN	BG02	SW	7/12/00	1215	NA	X	X	Clear; no odor.
00284133	MJ00AP	BG02	SD	7/12/00	1220	0-6	X	X	Silty loam; no odor.
00284134	MJ00AS	SP01	SW	7/12/00	1305	NA	X		Clear; no odor.
00284135	MJ00AT	SP01	SD	7/12/00	1310	0-6	X		Vegetation present, orange precipitate; no odor.
00284136	MJ00AW	BG04	SW	7/12/00	1335	0-6	X		Clear; no odor.
00284137	MJ00AX	BG04	SD	7/12/00	1340	0-6	X		Gravel.

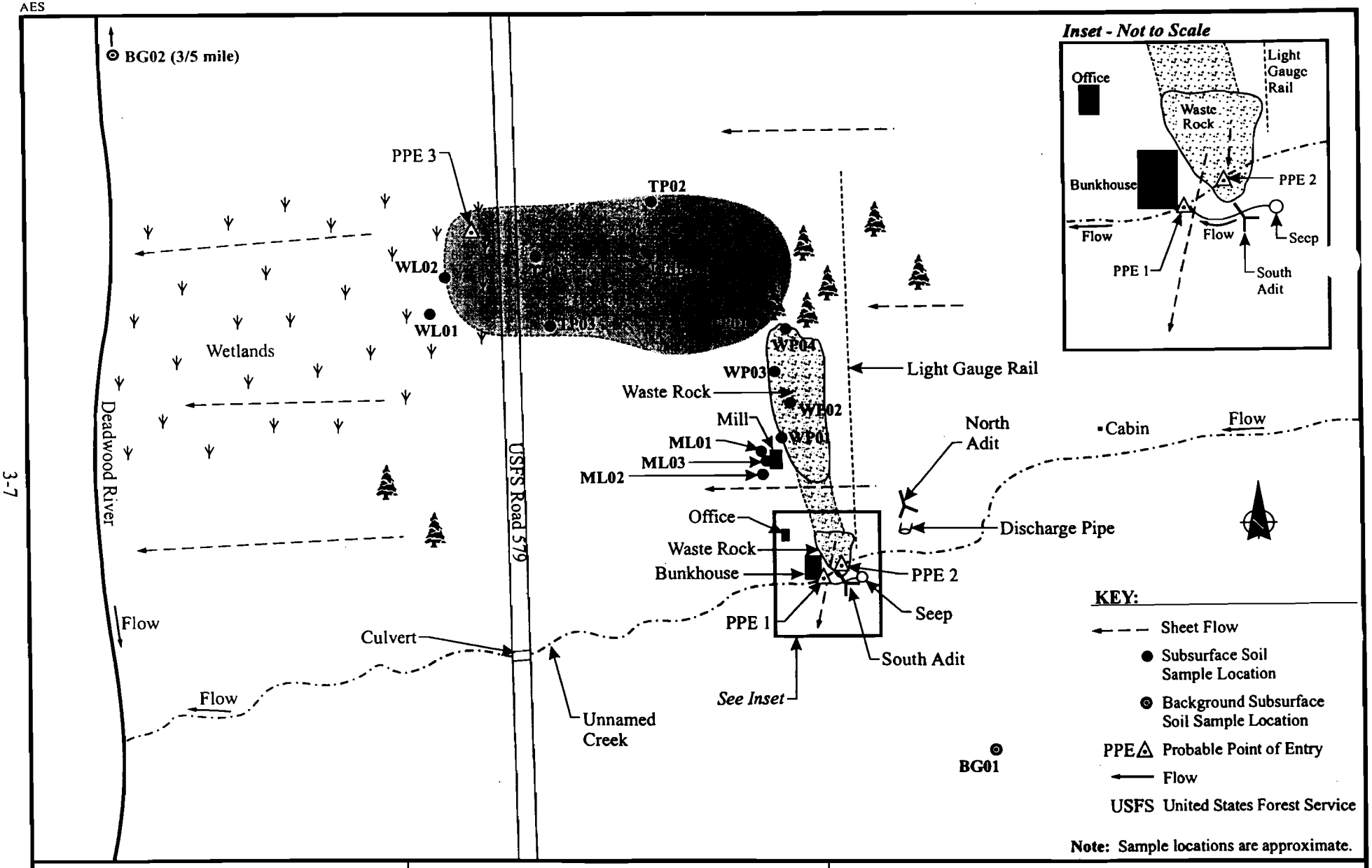
Key:

BG = Background.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
CN = Cyanide.
DR = Deadwood River.
EPA = United States Environmental Protection Agency.
ID = Identification.
ML = Mill soil.
MS/Dup = Matrix spike/duplicate.
NA = Not applicable.
SB = Subsurface soil.
SD = Sediment.
SP = Seep.
START = Superfund Technical Assessment and Response Team.
SW = Surface water.
TP = Tailings pile.
UC = Unnamed creek.
WL = Wetlands.
WP = Waste rock pile.

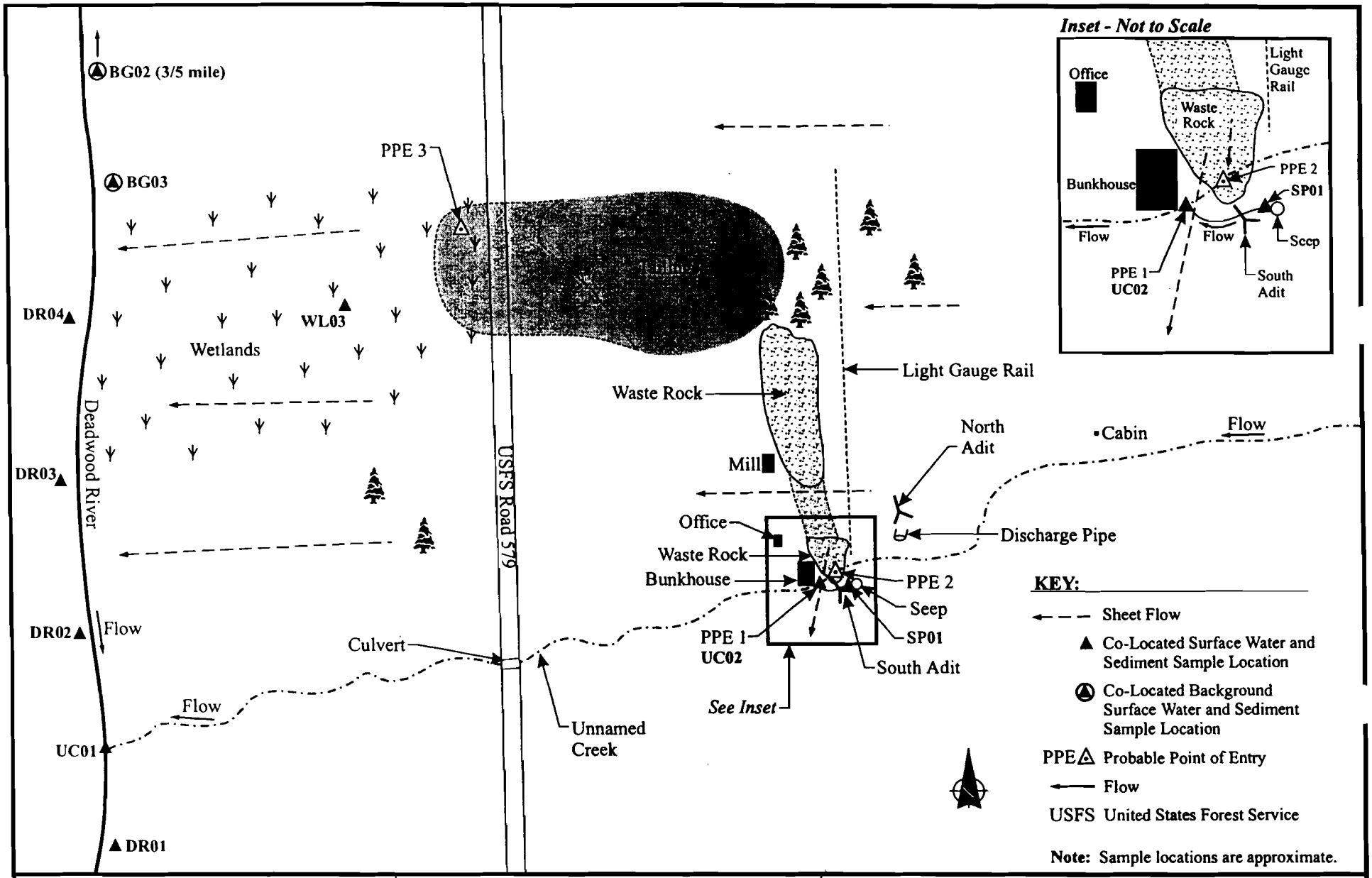
Table 3-2

SAMPLE CODING
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

Digits	Descriptions	Code Example
1,2	Source Code	BG (Background) DR (Deadwood River) ML (Mill Soil) SP (Seep) TP (Tailings Pile) UC (Unnamed Creek) WL (Wetlands) WP (Waste Pile)
3,4	Consecutive Sample Number	01 (First Sample of Source Code)
5,6	Matrix Code	SB (Subsurface Soil) SD (Sediment) SW (Surface Water)



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	DEADWOOD MINE Valley County, Idaho 0 250 500 Approximate Scale in Feet	Figure 3-1 SUBSURFACE SOIL SAMPLE COLLECTION MAP				
		Date: 11/22/00	TDD No. 00-02-0005	PAN No. EB0501SIT0	Dwg. No. EB0501 3-1	Pubs. No. S555



3-8

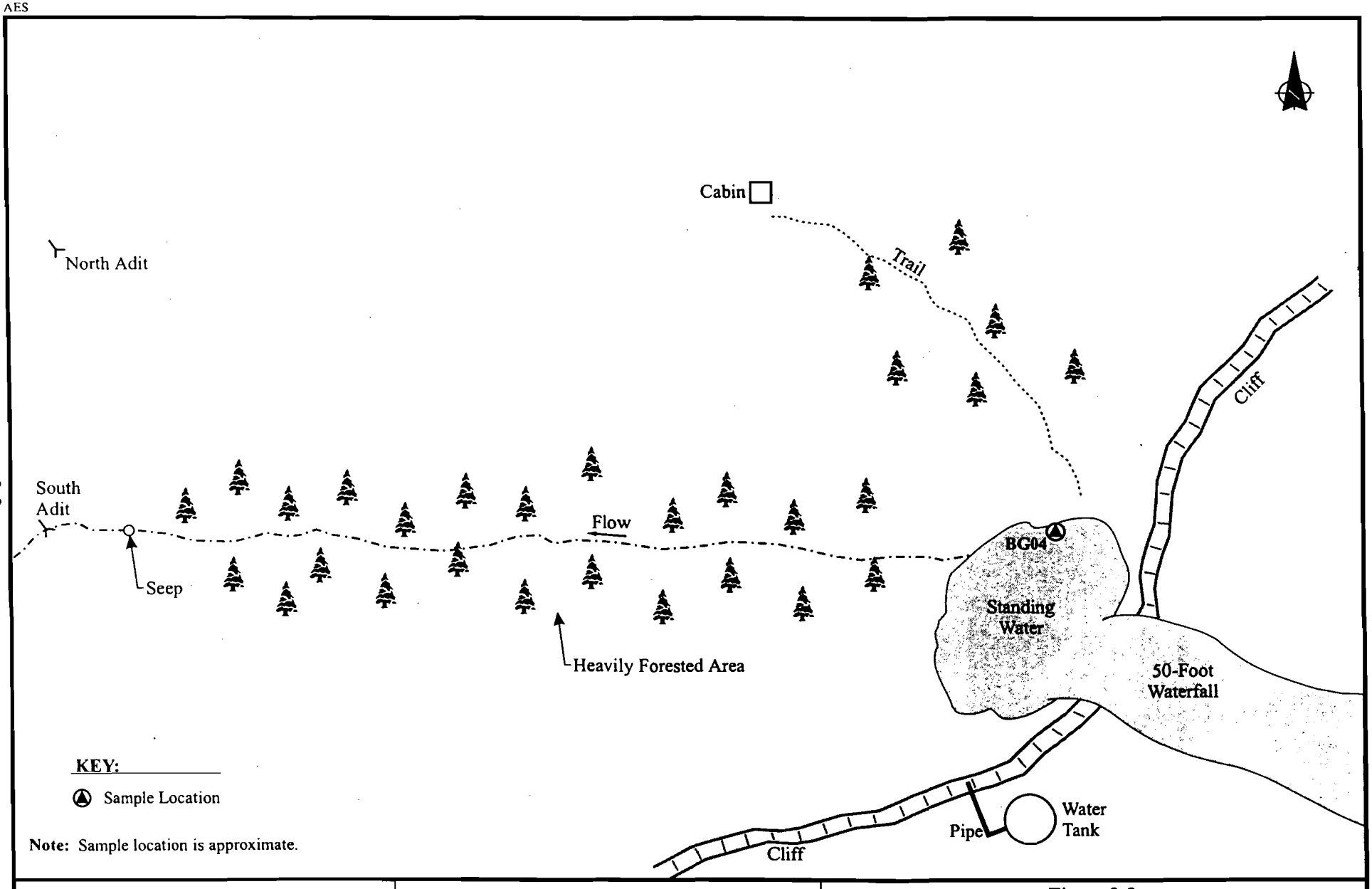
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

DEADWOOD MINE
Valley County, Idaho

0 250 500
Approximate Scale in Feet

Figure 3-2
CO-LOCATED SURFACE WATER AND SEDIMENT SAMPLE COLLECTION MAP

Date:	TDD No.	PAN No.	Dwg. No.	Pubs. No.
11/22/00	00-02-0005	EB0501SIT0	EB0501 3-2	S555



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	DEADWOOD MINE Valley County, Idaho	Figure 3-3 CO-LOCATED SW AND SD SAMPLE COLLECTION MAP (UPPER REGION)			
	0 50 100 Approximate Scale in Feet	Date: 11/22/00	TDD No. 00-02-0005	PAN No. EB0501SIT0	Dwg. No. EB0501 3-3	Pubs. No. S555

4. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware, and reagents. Specific QC requirements for laboratory analyses are incorporated in the *USEPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-Media, Multi-Concentration* (EPA 2000). These QC requirements or equivalent requirements were followed for analytical work on the Deadwood Mine PA/SI. This section describes the QA/QC measures taken for the PA/SI and provides an evaluation of the usability of data presented in this report.

All samples were collected following the guidance of the SQAP (E & E 2000c) for the field activities. Soil and water inorganic analyses were performed by Sentinel, Inc., a CLP laboratory in Huntsville, Alabama, following the *USEPA Contract Laboratory Program Statement of Work for Inorganic Analyses, Multi-Media, Multi-Concentration* (EPA 2000).

All data from analyses performed at the CLP laboratory were reviewed and validated by EPA Environmental Services Assistance Team chemists. Data qualifiers were applied as necessary according to the following EPA (1994) guidance:

- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.*

Copies of the data QA memoranda are included in Appendix C.

4.1 SATISFACTION OF DATA QUALITY OBJECTIVES

The following EPA (1993) guidance document was used to establish data quality objectives (DQOs) for this PA/SI:

- *Data Quality Objectives Process for Superfund, Interim Final Guidance,* EPA 540-R-93-071.

The EPA TM determined that definitive data without error and bias determination would be used for the sampling and analyses conducted during the field activities. The data quality achieved during the fieldwork produced sufficient data that meet the DQOs stated in the SQAP (E & E 2000c).

A detailed discussion of the PA/SI objectives that were accomplished are presented in later sections.

4.2 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

QA samples (trip blanks and rinsate blanks) were not collected for this project. Trip blanks are not required for inorganic analyses. Dedicated sample collection equipment was used; therefore, rinsate blanks were not required.

QC samples included matrix spike (MS), laboratory control sample (LCS), and duplicate (Dup) samples at a rate of one MS, LCS, and Dup per 20 samples per matrix.

4.3 PROJECT-SPECIFIC DATA QUALITY OBJECTIVES

The laboratory data were reviewed to ensure that DQOs for the project were met. The following describes the laboratory's ability to meet project DQOs for precision, accuracy, and completeness and the field team's ability to meet project DQOs for representativeness and comparability. The laboratory and the field team were able to meet DQOs for the project.

4.3.1 Precision

Precision measures the reproducibility of the sampling and analytical methodology. Laboratory and field precision are defined as the relative percent difference (RPD) between duplicate sample analyses. The laboratory duplicate samples measure the precision of the analytical method.

The RPD values were reviewed for all laboratory duplicate samples. Twenty-two sample results (2.5%) were qualified as estimated quantities (J) based on duplicate QC outliers. The DQO for precision was met.

4.3.2 Accuracy

Accuracy measures the reproducibility of the sampling and analytical methodology. Laboratory accuracy is defined as the MS and LCS percent recoveries. Thirty-four results (3.9%) were qualified as estimated quantities (J) based on MS and LCS recovery outliers. Overall, the project DQO for accuracy was met.

4.3.3 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All laboratory data were reviewed for usability, and all data (100%) were determined to be usable. The project DQO for completeness of 90% was met.

4.3.4 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental condition. Two planned samples were not collected at the mine adits, and one planned sample was not collected at the discharge pipe due to the absence of water. One planned sample was not collected from Deadwood River; instead, a sample was collected at the unnamed creek. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices. The DQOs for representativeness were met.

4.3.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this site followed applicable field sampling techniques and specific analytical methodology. The DQOs for comparability were met.

4.4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PARAMETERS

The laboratory data also were reviewed for holding times, laboratory blank samples, and serial dilution samples. These QA/QC parameters are summarized below. In general, the laboratory QA/QC parameters were considered acceptable.

4.4.1 Holding Times

All samples were analyzed within holding time limits.

4.4.2 Laboratory Blanks

All laboratory blanks met the frequency criteria. The following contaminants of concern were detected in the laboratory blanks:

- Beryllium, lead, and thallium.

Any associated sample result less than five times the blank contamination was qualified as not detected (U). Associated sample results were qualified as estimated quantities (J or UJ) if the sample result was less than five times the absolute value of the negative blank concentration. See the data QA memoranda (Appendix C) for sample results that were qualified based on blank contamination.

4.4.3 Serial Dilution

All serial dilution analyses met the frequency criteria. The following analyte exceeded serial dilution QC limits:

- Magnesium.

Associated sample results (1.3%) were qualified as estimated quantities (J).

5. ANALYTICAL RESULTS REPORTING AND BACKGROUND SAMPLING

This section describes the reporting and methods applied to analytical results presented in Sections 6 and 7 of this report and discusses background locations and sample results. Table 3-1 lists all samples collected for laboratory analyses.

5.1 ANALYTICAL RESULTS EVALUATION CRITERIA

Analytical results presented in the summary tables in Sections 6 and 7 show all compounds detected above laboratory detection limits (DLs) in bold type. Analytical results indicating significant concentrations of contaminants in source samples (Section 6) with respect to background concentrations are shown underlined and in bold type. Similarly, analytical results indicating elevated concentrations of contaminants in target samples (Section 7) with respect to background concentrations also are shown underlined and in bold type. For the purposes of this investigation, significant/elevated concentrations are those concentrations that are:

- Equal to or greater than the sample's contract-required quantitation limit/contract-required detection limit (CRQL/CRDL) or the sample quantitation limit (SQL) when a non-CLP laboratory was used; and
- Equal to or greater than the background sample's CRQL/CRDL or SQL when the background concentration is below DLs; or
- At least three times greater than the background concentration when the background concentration equals or exceeds the DLs.

The analytical summary tables present all detected compounds, but only those analytes detected at potential sources or in targets meeting the significant/elevated concentration criteria are discussed in the report text. Although tailings and waste rock are not considered naturally occurring media, analytical results of the samples collected from these potential sources were compared to the results for background subsurface soil, consisting of native soil, for reporting purposes. All detected concentrations are discussed for background samples, including those concentrations that were qualified as estimated

because they were detected below the SQL (BJ). However, although these detected concentrations are presented in this section, only those results detected above the SQL are used for PA/SI evaluation purposes.

For analytical results that are qualified as estimated, the sample concentrations were adjusted as described in *Using Qualified Data to Document an Observed Release and Observed Contamination* (EPA 1996) before determination of whether the concentrations were significant or elevated. The tables in Sections 6 and 7 provide adjusted concentrations in parentheses. For target locations, only those analytes that also were detected in a source at the site were evaluated to determine whether their concentrations were elevated. All hazardous substances detected at target locations and meeting evaluation criteria can be used to document an observed release from the site to a target.

5.1.1 Sample Results Reporting

This section describes the criteria used to report analytical results in Sections 6 and 7. When a given analyte was detected at significant/elevated concentrations in four or more samples, the number of samples and the concentration ranges are reported. When an analyte was detected at significant/elevated concentrations in three or fewer samples, the concentrations of the analyte for each sample are reported. Analytical results summary tables in each section list the detected analytes and their concentrations. Based on EPA, Region 10, policy, evaluation of aluminum, calcium, iron, magnesium, potassium, and sodium (common earth crust elements) generally is employed only in water mass tracing, which is beyond the scope of this report. For this reason, these elements will not be discussed in the text.

5.2 BACKGROUND SAMPLES

Background samples were collected from each of the naturally occurring media from which PA/SI samples were collected. These media are subsurface soil, surface water, and sediment. Results for the appropriate background sample(s) are shown in the first column(s) in the analytical results summary tables in Sections 6 and 7 for comparison against source or target results.

5.2.1 Background Subsurface Soil

5.2.1.1 Sample Locations

Two off-site background subsurface soil samples (BG01SB, BG02SB) were collected 12 to 18 inches bgs. Background subsurface soil sample locations are illustrated in Figure 3-1. The matrix of the background samples matched the matrix of subsurface samples collected on site. Sample BG01SB

was collected approximately 120 feet east of the bunkhouse and 75 feet southeast of the adits and seep. Sample BG02SB was collected approximately 3,000 feet north of the site and 100 feet west of USFS Road 579. All background subsurface soil samples were collected from locations believed to be outside the influence of known potential source areas.

5.2.1.2 Sample Results

Analytical results of background subsurface soil samples are presented in Tables 6-1 and 7-6. Analytes detected in sample BG01SB include arsenic, barium, beryllium, chromium, cobalt, copper, lead, manganese, nickel, selenium, vanadium, and zinc. Analytes detected in BG02SB include arsenic, barium, beryllium, chromium, cobalt, copper, lead, manganese, nickel, selenium, vanadium, and zinc.

5.2.2 Background Surface Water

5.2.2.1 Sample Locations

Three background surface water samples (BG02SW, BG03SW, and BG04SW) were collected in the wetlands, Deadwood River, and the unnamed waterfall. Background water samples were co-located with background sediment samples BG02SD, BG03SD, and BG04SD, respectively (Figures 3-2 and 3-3). BG02SW, the background sample for wetland sample (WL03SW), was collected approximately 3,000 feet north of the site and 100 feet west of USFS Road 579. BG03SW, the background sample for the Deadwood River samples, was collected approximately 70 to 100 feet upgradient from and west of the site. BG04SW, the background sample for the unnamed creek and seep samples, was collected approximately 700 feet east and upgradient from the site.

5.2.2.2 Sample Results

Analytical results of background surface water samples are presented in Tables 7-1, 7-2, and 7-4. Analytes detected in BG02SW include barium, lead, manganese, and zinc. Analytes detected in BG03SW include barium, lead, manganese, thallium, and zinc. Analytes detected in BG04SW include arsenic, barium, lead, manganese, and zinc.

5.2.3 Background Sediment

5.2.3.1 Sample Locations

Three background sediment samples (BG02SD, BG03SD, and BG04SD) were collected from depths of 0 to 6 inches bgs from the wetlands, Deadwood River, and the unnamed waterfall. Background

sediment samples were co-located with background surface water samples BG02SW, BG03SW, and BG04SW, respectively (Figures 3-2 and 3-3). The matrix of the background sediment samples matched the matrix of the sediment samples collected on site and in target areas. BG02SD, the background sample for the wetland sample, was collected approximately 3,000 feet north of the site and 100 feet west of USFS Road 579. BG03SD, the background sample for the Deadwood River samples, was collected approximately 70 to 100 feet upgradient from and west of the site. BG04SD, the background sample for the unnamed creek and seep samples, was collected approximately 700 feet east and upgradient from the site. The background sample matrices were similar in composition to the samples collected near and downstream from the site.

5.2.3.2 Sample Results

Analytical results of background sediment samples are presented in Tables 7-1, 7-3, and 7-5. Analytes detected in BG02SD include arsenic, barium, beryllium, chromium, cobalt, copper, lead, manganese, nickel, selenium, vanadium, and zinc. Analytes detected in BG03SD include arsenic, barium, chromium, cobalt, copper, lead, manganese, selenium, vanadium, and zinc. Analytes detected in BG04SD include arsenic, barium, chromium, cobalt, copper, lead, manganese, nickel, vanadium, and zinc.

6. POTENTIAL SOURCES

This section describes sample locations and analytical results of PA/SI samples obtained from potential sources. The sampling locations, sampling rationale, and analytical results are summarized in the following sections; Table 6-1 summarizes analytes detected at each potential source location investigated. Laboratory data sheets of analytical results for all samples are in Appendix C.

6.1 TAILINGS PILE

6.1.1 Sample Locations

Four subsurface soil samples (TP01SB, TP02SB, TP03SB, and TP04SB) were collected from the tailings pile located in the northwestern portion of the property to determine potential contaminants associated with this source. The samples were collected where the lowest depth was achieved, between 12 to 18 inches bgs (Figure 3-1). The subsurface soil appeared to be silty, fine-grained sand. No soil odor, staining, or stressed vegetation were noted during sample collection (Table 3-1).

6.1.2 Sample Results

The sample results are summarized in Table 6-1. Antimony was detected at significant concentrations in all samples at concentrations ranging from 25.0 mg/kg (estimated low) to 64.0 mg/kg. Arsenic was detected at significant concentrations in all samples at concentrations ranging from 73.0 mg/kg to 211 mg/kg. Cadmium was detected at significant concentrations in all samples at concentrations ranging from 7.1 mg/kg to 39.2 mg/kg. Copper was detected at significant concentrations in all samples at concentrations ranging from 143 mg/kg to 303 mg/kg. Cyanide was detected at a significant concentration in TP02SB at 0.70 mg/kg. Lead was detected at significant concentrations in all samples at concentrations ranging from 676 mg/kg to 1,020 mg/kg. Manganese was detected at significant concentrations in all samples at concentrations ranging from 2,640 mg/kg to 6,920 mg/kg. Mercury was detected at significant concentrations in all samples at concentrations ranging from 0.78 mg/kg to 5.0 mg/kg. Selenium was detected at significant concentrations in all samples at concentrations ranging from 2.5 mg/kg to 3.6 mg/kg. Silver was detected at significant concentrations in

all samples at concentrations ranging from 8.1 mg/kg to 25.8 mg/kg. Zinc was detected at significant concentrations in all samples at concentrations ranging from 1,520 mg/kg to 3,310 mg/kg.

6.2 WASTE ROCK PILE

6.2.1 Sample Locations

Four subsurface soil samples (WP01SB, WP02SB, WP03SB, and WP04SB) were collected from the waste rock pile area located north of the former mill foundation (Figure 3-1). The samples were collected within the overland routes identified by the START. The samples were collected to determine potential contaminants associated with this source. The samples appeared to consist of a gravelly sand with loam. No odor was noted during sample collection (Table 3-1).

6.2.2 Sample Results

Sample results are summarized in Table 6-1. Antimony was detected at significant concentrations in all samples at concentrations ranging from 21.8 mg/kg (estimated low) to 46.9 mg/kg (estimated low). Arsenic was detected at significant concentrations in all samples at concentrations ranging from 137 mg/kg to 239 mg/kg. Cadmium was detected at significant concentrations in all samples at concentrations ranging from 28.4 mg/kg to 42.2 mg/kg. Copper was detected at significant concentrations in all samples at concentrations ranging from 153 mg/kg to 278 mg/kg. Lead was detected at significant concentrations in all samples at concentrations ranging from 931 mg/kg to 1,810 mg/kg. Mercury was detected at significant concentrations in all samples at concentrations ranging from 1.4 mg/kg to 2.2 mg/kg. Selenium was detected at significant concentrations in all samples at concentrations ranging from 2.0 mg/kg to 2.8 mg/kg. Silver was detected at significant concentrations in all samples at concentrations ranging from 13.0 mg/kg to 55.0 mg/kg. Zinc was detected at significant concentrations in all samples at concentrations ranging from 3,000 mg/kg to 5,920 mg/kg.

6.3 MILL SOIL

6.3.1 Sample Locations

Three subsurface soil samples (ML01SB, ML02SB, and ML03SB) were collected from soil in front of the former mill foundation and two terraces (Figure 3-1). The samples were collected to determine if TAL metals, including mercury and cyanide, are associated with this source. The subsurface soils appeared to consist of gravelly sand with loam. No odor was noted during sample collection (Table 3-1).

6.3.2 Sample Results

Sample results are summarized in Table 6-1. The following analytes were detected at significant concentrations in ML01SB: antimony (55.1 mg/kg, estimated low), arsenic (114 mg/kg), cadmium (50.3 mg/kg), cobalt (18.3 mg/kg), copper (492 mg/kg), lead (997 mg/kg), mercury (6.6 mg/kg), selenium (1.5 mg/kg), silver (22.5 mg/kg), and zinc (3,140 mg/kg). The following analytes were detected at significant concentrations in ML02SB: antimony (122 mg/kg, estimated low), arsenic (100 mg/kg), cadmium (90.1 mg/kg), copper (409 mg/kg), lead (16,800 mg/kg), mercury (10.1 mg/kg), selenium (11.0 mg/kg), silver (76.3 mg/kg), and zinc (9,510 mg/kg). The following analytes were detected at significant concentrations in ML03SB: antimony (45.0 mg/kg, estimated low), arsenic (76.4 mg/kg), cadmium (46.8 mg/kg), copper (988 mg/kg), lead (1,200 mg/kg), mercury (19.5 mg/kg), selenium (1.8 mg/kg), silver (30.6 mg/kg), and zinc (11,200 mg/kg).

Table 6-1

SOURCE MINE TAILINGS, WASTE ROCK, AND MILL SUBSURFACE SOIL SAMPLES
ANALYTICAL RESULTS SUMMARY
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

CLP Number	MJ009R	MJ00A1	MJ00A2	MJ00A3	MJ00A4	MJ009S	MJ009T	MJ009W	MJ009X	MJ009Y	MJ009Z	MJ00A0
EPA Sample Number	00284101	00284109	00284110	00284111	00284112	00284102	00284103	00284104	00284105	00284106	00284107	00284108
Sample Location	BG01SB	TP01SB	TP02SB	TP03SB	TP04SB	WP01SB	WP02SB	WP03SB	WP04SB	ML01SB	ML02SB	ML03SB
Depth (inches bgs)	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18
Description	BACKGROUND	TAILINGS PILE				WASTE ROCK PILE				MILL		
Metals (mg/kg)												
Aluminum	7920	542	719	637	309	2550	3340	2500	2540	4850	2800	5840
Antimony	1.3 UJK (3 UAC)	64	26.8	25.0 JL	31.3 JL	46.9 JL	44.0 JL	31.7 JL	21.8 JL	55.1 JL	122 JL	45.0 JL
Arsenic	4.3	73	187	127	211	137	239	144	145	114	100	76.4
Barium	111	5.1 JB	24.3 JB	6.1 JB	9.2 JB	50.1	56.2	49.9	71.4	68.4	40.8 JB	55.2
Beryllium	1.2	1.2	0.60 JB	0.61 JB	0.66 JB	0.38 JB	0.46 JB	0.26 JB	0.31 JB	0.61 JB	0.41 JB	0.67 JB
Cadmium	0.48 U	7.1	37.1	38.9	39.2	36.5	42.2	34.3	28.4	50.3	90.1	46.8
Calcium	3500	1300	3750	3110	1210	2310	3840	3540	9590	866 JB	615 JB	684 JB
Chromium	7.1	1.2 JB	3.5	2.7	0.71 JB	2.3	6.5	2.7	3.4	3.1	2.6	4
Cobalt	5.8 JB SQL = 10.53 U	10.1 JB	5.3 JB	7.6 JB	5.6 JB	4.2 JB	7.7 JB	3.9 JB	5.0 JB	18.3	3.6 JB	4.9 JB
Copper	8.9	303	256	186	143	236	278	206	153	492	409	988
Cyanide	0.13 UJK (0.2 UAC)	0.13 U	0.7	0.25 JB	0.15 UJK (0.1 UAC)	NA	NA	NA	NA	0.14 UJK (0.1 UAC)	0.13 UJK (0.1 UAC)	0.23 JB
Iron	9360	125000	53200	60500	67300	16900	26400	14300	15700	9850	12400	11100
Lead	16.1	697	820	676	1020	1810	1430	1190	931	997	16800	1200
Magnesium	3830	2650	3630	3940	3590	1700	2970	2040	4460	1430	960 JB	1360
Manganese	383	6920	2640	3160	3410	745	1000	532	694	813	155	246
Mercury	0.05 U	0.78	1.2	1.5	5	1.7	2.2	1.4	1.5	6.6	10.1	19.5
Nickel	10.9	12.3	7.6 JB	9.5	6.0 JB	9.4	30.4	11.3	14.2	3.2 JB	2.5 JB	5.0 JB
Potassium	1510	133 JB	344 JB	326 JB	197 JB	705 JB	739 JB	688 JB	739 JB	1250	892 JB	1390
Selenium	0.42 JB SQL = 1.05 U	3.6	2.8	2.5	2.6	2.2	2.8	2	2.1	1.5	11	1.8
Silver	0.65 U	25.8	8.1	11.2	14.1	55	31.4	22.2	13	22.5	76.3	30.6

Table 6-1

SOURCE MINE TAILINGS, WASTE ROCK, AND MILL SUBSURFACE SOIL SAMPLES
ANALYTICAL RESULTS SUMMARY
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

CLP Number	MJ009R	MJ00A1	MJ00A2	MJ00A3	MJ00A4	MJ009S	MJ009T	MJ009W	MJ009X	MJ009Y	MJ009Z	MJ00A0
EPA Sample Number	00284101	00284109	00284110	00284111	00284112	00284102	00284103	00284104	00284105	00284106	00284107	00284108
Sample Location	BG01SB	TP01SB	TP02SB	TP03SB	TP04SB	WP01SB	WP02SB	WP03SB	WP04SB	ML01SB	ML02SB	ML03SB
Depth (inches bgs)	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18
Description	**BACKGROUND**	**TAILINGS PILE**				**WASTE ROCK PILE**				**MILL**		
Sodium	**319 JB**	**815 JB**	**991 JB**	**1480 JH**	**1490 JH**	**2040 JH**	**2550 JH**	**1820 JH**	**1310 JH**	**1490 JH**	**4450 JH**	**5190 JH**
Vanadium	**15.4**	**24.5**	**13.4**	**14.3**	**16**	**10.1 JB**	**14.4**	**9.2 JB**	**10.9**	**12.3**	**7.5 JB**	**10.2 JB**
Zinc	**84.7**	**1520**	**2180**	**3230**	**3310**	**4540**	**5920**	**4170**	**3000**	**3140**	**9510**	**11200**

Note: Bold type indicates that sample concentration is above the detection limit.
Underlined type indicates that the sample result is significant as defined in Section 5.

Key:

AC = Adjusted concentration.
B = Associated sample result is greater than the instrument detection limit, but less than the sample quantitation limit.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
H = High bias.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
L = Low bias.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
SQL = Sample quantitation limit.
U = The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

7. MIGRATION/EXPOSURE PATHWAYS AND TARGETS

The following sections describe migration/exposure pathways and potential targets within the site's range of influence (Figure 7-1). Analytical results are summarized in Tables 7-1 through 7-6. Analytical data QA forms from laboratory analyses are in Appendix C. This section discusses the groundwater migration pathway (Section 7.1), the surface water migration pathway (Section 7.2), the soil exposure pathway (Section 7.3), and the air migration pathway (Section 7.4).

7.1 GROUNDWATER MIGRATION PATHWAY

Surficial deposits at the Deadwood Mine site were determined using the closest available soil survey for an area with similar topography, located 4 miles east of the site. Surface soils in the area consist of Koppes-Coski-type soils, which consist of moderately coarse to coarse-textured soils found on dissected crests and the sides of ridges. This is a well-drained soil, which ranges from sandy loam to a soil containing more gravel and cobbles (SCS 1976). The Idaho batholith, consisting of Cretaceous intrusive biotite granodiorite, forms the bedrock in the site vicinity (USGS 1992).

The aquifer beneath Deadwood Mine consists of undifferentiated volcanic rocks; undifferentiated, consolidated sedimentary rocks; and undifferentiated igneous and metamorphic rocks that are distributed throughout the region. Groundwater is present primarily in solution cavities and joints in carbonate rocks (USGS 1994).

Information regarding net precipitation in the immediate area of Deadwood Mine is not available. The annual net precipitation factor value reported for the Deadwood Mine site is between 15 and 30 inches (WRCC 1999a). The mean annual precipitation for 1998 at Lowman was 26.42 inches (WRCC 1999a). The two-year, 24-hour rainfall event for the site is 2 inches (WRCC 1999b).

No drinking water wells are known to exist within a 4-mile radius of the site (Figure 7-1; EPA 1999). Deadwood Outfitters, a business with an office located 0.5 mile south of the site, uses a spring upgradient of the site for drinking water purposes (Carter 1999). Groundwater in the area is usable for drinking water purposes. Additionally, the site does not lie within a wellhead protection area (EPA 1999).

7.2 SURFACE WATER MIGRATION PATHWAY

This section presents the pathway description, targets, sample locations, and sample results for the surface water migration pathway.

7.2.1 Pathway Description

Surface water drains southwest from the southern end of the waste rock pile overland by sheet flow and through small channels approximately 1,000 feet downslope into the unnamed creek (probable point of entry [PPE] 1). This creek discharges into Deadwood River approximately 0.5 mile west-southwest of the site. The discharge rate of the adits, estimated by the START, is 2 gallons per minute. The unnamed creek also flows through the south end of the waste rock pile and is expected to be a perennial stream because it was flowing during low flow conditions in early fall 1999. Water from the seep flows downgradient through a small channel over and through the south adit into the unnamed creek approximately 50 feet from its discharge point (PPE 2). Surface water runoff from the tailings and the northern portion of the waste rock pile also may drain by sheet flow into the documented wetlands adjacent to Deadwood River. The wetlands are approximately 12 miles from the river's discharge point into Deadwood Reservoir (PPE 3; Figure 7-1). The 15-mile Target Distance Limit (TDL) extends from PPEs 1 and 2 on the unnamed creek to Deadwood River, then extends from PPE 3 in the wetlands adjacent to Deadwood River for 12 miles to the river's discharge point into Deadwood Reservoir, and then extends for 3 miles in the reservoir (Figure 7-1; USGS 1988a; USGS 1988b, USGS 1988c).

Flood frequency data are not available for this area, although it appears possible that Deadwood River may flood its banks and the adjacent USFS road during high flow, based on its shallow banks (approximately 5 feet maximum in height) and the relatively flat terrain between the river and the road. As stated previously, the area consists of Koppes-Coski-type soils, which consist of moderately coarse to coarse-textured soils found on dissected crests and the sides of ridges. This is a well-drained soil, which ranges from a sandy loam to a soil containing more gravel and cobbles (SCS 1976). The upland drainage area of the site, estimated from a topographic map, is 320 acres (USGS 1988a).

Flow rate data for Deadwood River are not available; however, based on visual observations the flow was estimated to be greater than 100 cubic feet per second (cfs) and less than 1,000 cfs during low flow. The flow rate of the unnamed creek is estimated to be less than 10 cfs based on visual observations. There are no surface water intakes for drinking water or irrigation purposes within the 15-mile TDL.

7.2.2 Targets

Deadwood River is not used for domestic drinking water within the 15-mile TDL. Local residents outside of the 4-mile radius use drinking water either from groundwater or springs (IDWR 1999). Occasionally, campers or hunters may obtain drinking water from the unnamed creek (E & E 2000a). Transient population values are not known. No known commercial or subsistence fisheries exist within the unnamed creek, Deadwood River, or Deadwood Reservoir within the 15-mile TDL (IDFG 1999b). There is sport fishing on both Deadwood River and Deadwood Reservoir (Grunder 1999); however, fish catch data are not available.

The Idaho Department of Fish and Game indicated that the Inland Columbia Basin redband trout (*Oncorhynchus mykiss gairdneri*) and the Westslope cutthroat trout (*Oncorhynchus clarki lewisi*), both State and Federal species of concern, and bull trout (*Salvelinus confluentus*), a Federal listed threatened species, reside in Deadwood River and Deadwood Reservoir within the 15-mile TDL (IDFG 1999a, 1999b). Additionally, a nesting area for a bald eagle (*Haliaeetus leucocephalus*), a Federal listed threatened species, has been reported near the southern end of Deadwood Reservoir (Grunder 1999). There are no anadromous fish residing or migrating in the reaches of Deadwood River or Deadwood Reservoir within the 15-mile TDL (IDFG 1999a, 1999b). The spotted frog (*Rana pretiosa*), which is a USFS sensitive species, resides in the wetland and river areas near the site (Zurstadt 1999).

There is a boat ramp at Deadwood Reservoir, indicating that the reservoir is used for recreational boating (DeLorme 1992). Deadwood Outfitters operates a charter boat on Deadwood Reservoir for fishing and indicated that its clients practice catch and release techniques (Rotthoff 1999). There are no wetland maps available for areas within the 15-mile TDL; however, approximately 2 acres of wetlands were documented by the START wetland specialist along Deadwood River at PPE 3 (USFWS 1991, 1992).

7.2.3 Sample Locations

Seven co-located surface water and sediment samples were collected in wetlands documented by the START wetland specialist, Deadwood River, the unnamed creek, and a seep (Figures 3-1 and 3-2). Two subsurface soil samples were collected from wetlands. The samples were collected from locations downstream, adjacent to, and upstream from Deadwood Mine in wetlands, Deadwood River, an unnamed creek, and a seep. The samples collected in the wetlands were obtained where the appropriate sample volume could be acquired. The Deadwood River sediment samples were collected on the depositional

side of the river. The samples collected in the unnamed creek and the seep were collected in the center of the water pathway.

7.2.4 Surface Water Sample Results

Sample results are summarized in Tables 7-1, 7-2, and 7-4. Zinc was detected at an elevated concentration in WL03SW (31.8 micrograms per liter [µg/L]; Table 7-1). The following analytes were detected at elevated concentrations in UC02SW: arsenic (22.4 µg/L) and zinc (455 µg/L; Table 7-4). The following analytes were detected at elevated concentrations in SP01SW: arsenic (176 µg/L), manganese (617 µg/L), and zinc (2,380 µg/L; Table 7-4). No other surface water samples contained elevated concentrations of inorganics.

7.2.5 Sediment Sample Results

Sample results are summarized in Tables 7-1, 7-3, and 7-5. The following analytes were detected at elevated concentrations in WL03SD: arsenic (66.1 mg/kg), cadmium (17.3 mg/kg), copper (95.3 mg/kg), lead (299 mg/kg), and zinc (1,100 mg/kg; Table 7-1). Arsenic was detected at an elevated concentration in DR02SD at 13.9 mg/kg (Table 7-3). The following analytes were detected at elevated concentrations in SP01SD: antimony (151 mg/kg), arsenic (11,600 mg/kg), manganese (550 mg/kg, adjusted concentration), and zinc (21,100 mg/kg; Table 7-5). No other sediment samples contained elevated concentrations of inorganics.

7.2.6 Sample Locations

Two subsurface soil samples were collected from wetlands documented by the START wetland specialist. The samples were considered soil and not sediments due to the absence of standing water; however, the wetland specialist designated the sample collection area as wetlands. The samples were collected adjacent to the site. WL01SB was collected approximately 35 feet west of USFS Road 579. WL02SB was collected approximately 100 feet west of USFS Road 579. The presence of tailings was noted at both sample locations.

7.2.7 Subsurface Sample Results

Sample results are summarized in Table 7-6. The following analytes were detected at elevated concentrations in WL01SB: arsenic (116 mg/kg), cadmium (119 mg/kg), copper (215 mg/kg), lead (1,140 mg/kg), manganese (3,040 mg/kg), mercury (3.9 mg/kg), selenium (2.6 mg/kg), silver

(11.8 mg/kg), and zinc (10,800 mg/kg). The following analytes were detected at elevated concentrations in WL02SB: arsenic (74.5 mg/kg), cadmium (17.7 mg/kg), copper (206 mg/kg), lead (582 mg/kg), manganese (1,620 mg/kg), mercury (0.69 mg/kg), silver (7.5 mg/kg), and zinc (2,070 mg/kg).

7.3 SOIL EXPOSURE PATHWAY

Access to Deadwood Mine is unrestricted, and tire tracks, indicative of four-wheel-drive vehicle or motorcycle use, were observed on the tailings pile at the site. The tailings pile is poorly vegetated, and because of the tailings' fine-grained nature, they are transported easily by wind and water. There are no permanent residences within 200 feet of a potential source. Deadwood Outfitters operates a hunting and fishing guide service approximately 0.5 mile south of the site. Up to eight seasonal staff reside on its premises from approximately June through November, and up to two staff reside there during the remaining months (Carter 1999). There are no known schools or day-care facilities within 200 feet of the site. No commercial agriculture, silviculture, or livestock production or grazing occurs within an area of potential contamination (Wilson 1999). Also, there are no terrestrial, sensitive environments located on a potential source (IDFG 1999a).

7.4 AIR MIGRATION PATHWAY

As described previously, there are no permanent residences located within 4 miles of the site (EPA 1999; USCB 1990). The tailings are poorly vegetated, and because of their fine-grained nature they are transported easily by wind and water. Deadwood Outfitters is located approximately 0.5 mile south of the mine site. Up to eight seasonal workers reside at the facility during various times of the year. It appears that the site is used moderately for recreation. No anadromous fish use the watershed for spawning, feeding habitat, or migration within the TDL. As mentioned above, the bull trout (*Salvelinus confluentus*), which is a Federal listed threatened species, is known to exist in Deadwood River, which flows within 0.5 mile of the site (IDFG 1999a, 1999b). The Frank Church-River of No Return Federal Wilderness Area is located within 2 miles east of the site (USGS 1988a). There is no agriculture or silviculture within 0.5 mile of the site (Wilson 1999). Wetland inventory maps were not available for areas within 4 miles of the site; however, the acreage of the suspected wetlands, located adjacent to the site along Deadwood River, is estimated from field observations and topographic map review to be 2 acres (E & E 2000a).

Table 7-1

TARGET WETLAND SURFACE WATER AND SEDIMENT SAMPLES ANALYTICAL RESULTS SUMMARY DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION VALLEY COUNTY, IDAHO

CLP Number	MJ00AN	MJ00AP	MJ00AL	MJ00AM
EPA Sample Number	00284132	00284133	00284130	00284131
Sample Location	BG02SW	BG02SD	WL03SW	WL03SD
Depth (inches bgs)	NA	0-6	NA	0-6
Description	BACKGROUND		WETLANDS	
Aluminum	83.6 U	**11200**	83.6 U	**3170**
Arsenic	1.7 U	**4**	**2.3 JB**	**66.1**
Barium	**15.4 JB** SQL = 200 U	**121**	**17.2 JB**	**81.5 JB**
Beryllium	0.80 U	**1.3 JB** SQL = 1.3 U	0.80 U	1.5 U
Cadmium	2.3 U	0.86 U	2.3 U	**17.3**
Calcium	**11600**	**3290**	**14100**	**5140 JB**
Chromium	1.9 U	**5.6**	1.9 U	3.7 U
Cobalt	3.0 U	**3.5 JB** SQL = 18.66 U	3.0 U	5.8 U
Copper	3.6 U	**10.7**	3.6 U	**95.3**
Iron	**59.9 JB**	**11500**	**569**	**31500**
Lead	**5.0 JK (7.2 AC)**	**10.7**	**7.8 JK (5.9 AC)**	**292**
Magnesium	**1050 JB**	**2440**	**1380 JB**	**1510 JB**
Manganese	**2.7 JB** SQ L= 15 U	**237**	**35.8**	**682 JK (550 AC)**
Nickel	3.1 U	**3.1 JB** SQL = 14.93 U	3.1 U	6.0 U
Potassium	**615 JB**	**1510 JB**	**1070 JB**	**1100 JB**
Selenium	1.3 U	**0.63 JB** SQL = 1.87 U	1.3 U	**3.3 JB**
Sodium	**2080 JB**	**481 JB**	**2330 JB**	1070 U
Vanadium	2.7 U	**15.0 JB** SQL = 18.66 U	2.7 U	**10.4 JB**
Zinc	**15.6 JB** SQL = 20 U	**66.3**	**31.8**	**1100**

Note: Bold type indicates that the sample concentration is above the detection limit.
Underlined type indicates that the sample result is elevated as defined in Section 5.

Key:

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B = Associated sample result is greater than the instrument detection limit, but less than the sample quantitation limit.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
µg/L = Micrograms per liter.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
SQL = Sample quantitation limit.
U = The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

Table 7-2

TARGET DEADWOOD RIVER SURFACE WATER SAMPLES
ANALYTICAL RESULTS SUMMARY
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

CLP Number	MJ00AJ	MJ00A8	MJ00AC	MJ00AE	MJ00AG
EPA Sample Number	00284124	00284117	00284118	00284120	00284122
Sample Location	BG03SW	DR01SW	DR02SW	DR03SW	DR04SW
Description	BACKGROUND	DEADWOOD RIVER			
Barium	16.2 JB SQL= 200 U	13.4 JB	15.7 JB	15.2 JB	15.6 JB
Calcium	12600	10400	11400	11100	11500
Iron	43.6 JB	42.7 JB	44.6 JB	74.7 JB	44.8 JB
Lead	7.7 JK (10 AC)	2.6 JB	4.8 JK (3.6 AC)	7.2 JK (5.4 AC)	2.8 JB
Magnesium	1060 JB	948 JB	1050 JB	1000 JB	1050 JB
Manganese	3.0 JB SQL= 15 U	2.2 JB	2.2 JB	2.3 JB	1.9 JB
Potassium	596 JB	540 JB	721 JB	584 JB	612 JB
Sodium	1940 JB	1890 JB	2190 JB	1880 JB	1980 JB
Thallium	2.3 JB SQL= 10 U	2.0 U	2.0 U	2.6 U	2.2 U
Zinc	26	14.8 JB	27.7	22.8	12.2 JB

Note: Bold type indicates that the sample concentration is above the detection limit.
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Key:

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bgs = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
µg/L = Micrograms per liter.
SQL = Sample quantitation limit.
U = The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

Table 7-3

TARGET DEADWOOD RIVER SEDIMENT SAMPLES
ANALYTICAL RESULTS SUMMARY
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

CLP Number	MJ00AK	MJ00A9	MJ00AD	MJ00AF	MJ00AH
EPA Sample Number	00284125	00284116	00284119	00284121	00284123
Sample Location	BG03SD	DR01SD	DR02SD	DR03SD	DR04SD
Depth (inches bgs)	0-6	0-6	0-6	0-6	0-6
Description	BACKGROUND	DEADWOOD RIVER			
Aluminum	2740	2060	2220	2970	4890
Arsenic	2.7	1.9 JB	13.9	1.5 JB	2.7
Barium	34.4 JB SQL = 51.28 U	28.3 JB	29.8 JB	32.5 JB	62.3
Calcium	892 JB	777 JB	775 JB	832 JB	1540
Chromium	1.2 JB SQL = 2.56 U	0.43 U	1.4 JB	0.73 JB	1.5 JB
Cobalt	0.87 JB SQL = 12.82 U	0.68 U	0.87 JB	0.98 JB	1.9 JB
Copper	5.1 JB SQL = 6.41 U	1.2 JB	1.7 JB	1.8 JB	3.0 JB
Iron	4880	4430	6160	5510	8140
Lead	2.5	3.8	4.3	2.8	4.5
Magnesium	931 JB	533 JB	695 JB	1080 JB	1690 JL
Manganese	77.2 JK (95.7 AC)	85.2 JK (68.7 AC)	76.5 JK (61.7 AC)	69.4 JK (55.9 AC)	134 JK (108 AC)
Potassium	732 JB	543 JB	621 JB	848 JB	1210 JB
Selenium	0.67 JB SQL = 1.28 U	0.45 JB	0.41 JB	0.32 JB	0.33 U
Sodium	249 JB	272 JB	127 U	135 U	424 JB
Vanadium	4.5 JB SQL = 12.82 U	2.8 JB	4.8 JB	4.7 JB	8.1 JB
Zinc	26.7	22.6	28.3	39.3	46

Note: Bold type indicates that the sample concentration is above the detection limit.
Underlined type indicates that the sample result is elevated as defined in Section 5.

Key:

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B = Associated sample result is greater than the instrument detection limit, but less than the sample quantitation limit.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
L = Low bias.
mg/kg = Milligrams per kilogram.
SQL = Sample quantitation limit.
U = The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

Table 7-4

TARGET UNNAMED CREEK AND SEEP SURFACE WATER SAMPLES ANALYTICAL RESULTS SUMMARY DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION VALLEY COUNTY, IDAHO

CLP Number	MJ00AW	MJ00AA	MJ00AQ	MJ00AS
EPA Sample Number	00284136	00284126	00284128	00284134
Sample Location	BG04SW	UC01SW	UC02SW	SP01SW
Description	BACKGROUND	UNNAMED CREEK		SEEP
Aluminum	**359**	83.6 U	83.6 U	**93.4 JB**
Arsenic	**7.0 JB** SQL = 10 U	**2.2 JB**	**22.4**	**176**
Barium	**10.4 JB** SQL = 200 U	**12.2 JB**	**5.7 JB**	**16.0 JB**
Calcium	**4680 JB**	**10200**	**10700**	**36000**
Cobalt	3.0 U	3.0 U	3.0 U	**3.0 JB**
Iron	**320**	**82.6 JB**	**449**	**3310**
Lead	**16.9 JK (22.1 AC)**	**4.3 JK (3.2 AC)**	**2.6 JB**	**3.8 JK (2.9 AC)**
Magnesium	**560 JB**	**989 JB**	**2010 JB**	**8160**
Manganese	**39.4**	**10.2 JB**	**112**	**617**
Nickel	3.1 U	3.1 U	3.1 U	**5.7 JB**
Potassium	**683 JB**	**553 JB**	**767 JB**	**1550 JB**
Sodium	**2370 JB**	**2140 JB**	**2970 JB**	**5980**
Zinc	**32.9**	**40.7**	**455**	**2380**

Note: Bold type indicates that the sample concentration is above the detection limit.
Underlined type indicates that the sample result is elevated as defined in Section 5.

Key:

AC = Adjusted concentration.
B = Associated sample result is greater than the instrument detection limit, but less than the sample quantitation limit.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
µg/L = Micrograms per liter.
SQL = Sample quantitation limit.
U = The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

Table 7-5

TARGET UNNAMED CREEK AND SEEP SEDIMENT SAMPLES ANALYTICAL RESULTS SUMMARY DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION VALLEY COUNTY, IDAHO

CLP Number	MJ00AX	MJ00AB	MJ00AR	MJ00AT
EPA Sample Number	00284137	00284127	00284129	00284135
Sample Location	BG04SD	UC01SD	UC02SD	SP01SD
Depth (inches bgs)	0-6	0-6	0-6	0-6
Description	BACKGROUND	UNNAMED CREEK		SEEP
Aluminum	**2450**	**6070**	**2240**	**802**
Antimony	1.5 U	1.7 U	1.6 U	**151**
Arsenic	**15.1**	**10.1**	**18.5**	**11600**
Barium	**26.1 JB SQL = 45.82 U**	**64.5**	**24.7 JB**	**64 JB**
Beryllium	0.39 U	1 U	**0.45 JB**	2.6 U
Calcium	**938 JB**	**1760**	**596 JB**	**6070 JB**
Chromium	**1.5 JB SQL = 2.29 U**	**2.3 JB**	**1.3 JB**	4.1 U
Cobalt	**0.8 JB SQL = 11.45 U**	**3.1 JB**	**0.97 JB**	**12.8 JB**
Copper	**3.9 JB SQL = 5.73 U**	**3.8 JB**	**5.2 JB**	**14.4 JB**
Iron	**3990**	**9980**	**3830**	**185000**
Lead	**26.8**	**8.3**	**34.5**	**23.9**
Magnesium	**990 JB**	**2270 JL**	**896 JB**	**877 JB**
Manganese	**68.8 JK (85.3 AC)**	**215 JK (173 AC)**	**163**	**678 JK (550 AC)**
Nickel	**1.7 JB SQL = 9.16 U**	**1.3 JB**	**0.95 JB**	**16.3 JB**
Potassium	**722 JB**	**1640**	**907 JB**	**1110 JB**
Selenium	0.3 U	**0.42 JB**	**0.37 JB**	**10 JB**
Sodium	127 U	**339 JB**	138 U	**7450 JB**
Vanadium	**4.6 JB SQL = 11.45 U**	**10.4 JB**	**5.8 JB**	**11.8 JB**
Zinc	**47.8**	**110**	**133**	**21100**

Note: Bold type indicates that the sample concentration is above the detection limit.
Underlined type indicates that the sample result is elevated as defined in Section 5.

Key:

AC = Adjusted concentration.
B = Associated sample result is greater than the instrument detection limit, but less than the sample quantitation limit.
BGS = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
L = Low bias.
mg/kg = Milligrams per kilogram.
SQL = Sample quantitation limit.
U = The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

Table 7-6

TARGET WETLAND SUBSURFACE SOIL SAMPLES
ANALYTICAL RESULTS SUMMARY
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

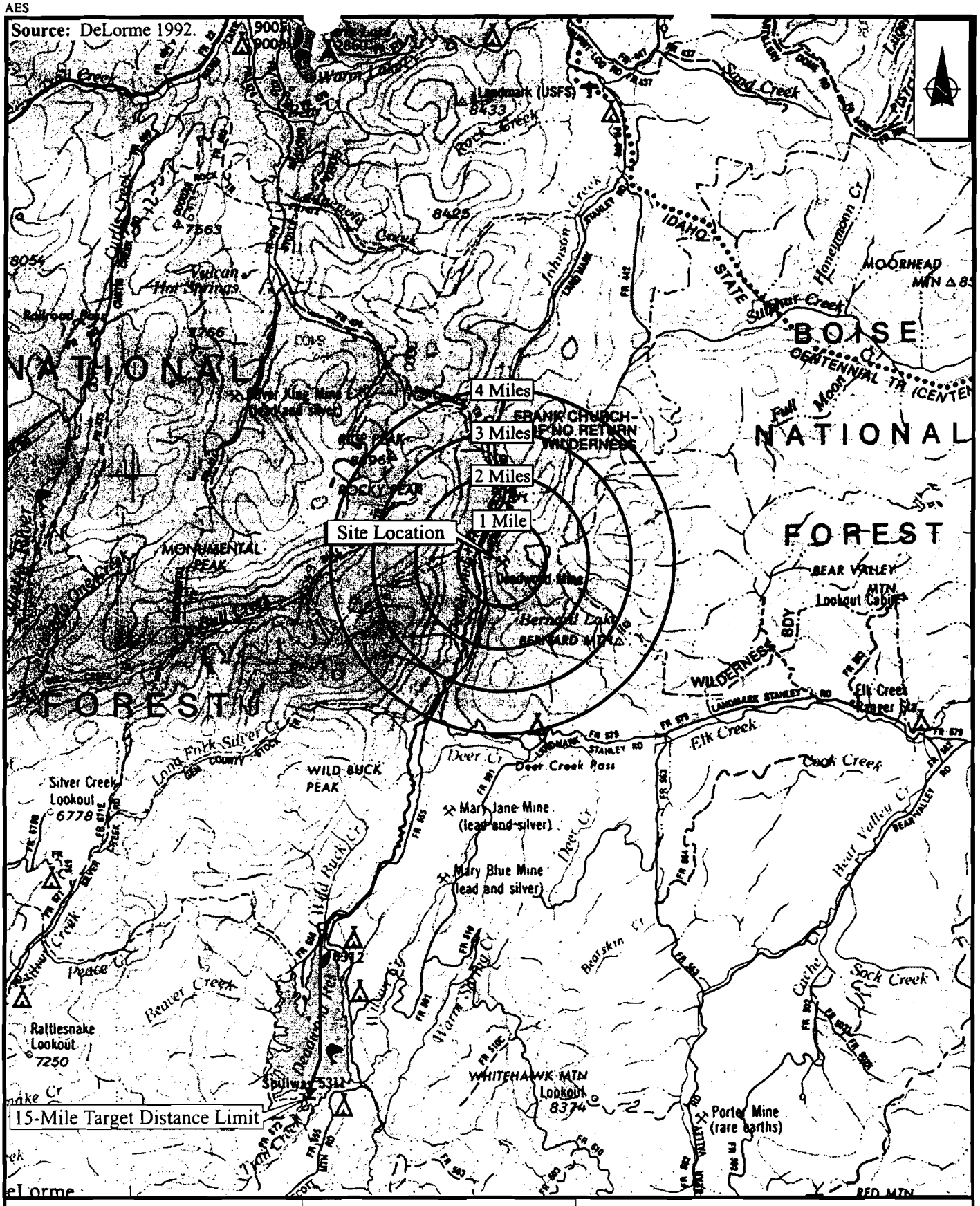
CLP Number	MJ00A7	MJ00A5	MJ00A6
EPA Sample Number	00284115	00284113	00284114
Sample Location	BG02SB	WL01SB	WL02SB
Depth (inches bgs)	12-18	12-18	12-18
Description	BACKGROUND	WETLANDS	
Aluminum	14400	645	1130
Antimony	2.8 UJK (5.5 UAC)	39.7 JL	14.1 JB
Arsenic	5.7	116	74.5
Barium	179	4.0 JB	13.5 JB
Beryllium	1.4 JB SQL = 2.21 U	0.66 JB	0.44 JB
Cadmium	1.0 U	119	17.7
Calcium	4810	1840	1150 JB
Chromium	8.5	3.3	3.2
Cobalt	4.8 JB SQL = 22.08 U	7.7 JB	3.3 JB
Copper	20.3	215	206
Iron	14500	61300	34000
Lead	17.6	1140	582
Magnesium	3100	3760	2030
Manganese	275	3040	1620
Mercury	0.11 U	3.9	0.69
Nickel	4.5 JB SQL = 17.66 U	8.3 JB	6.1 JB
Potassium	1620 JB	213 JB	303 JB
Selenium	1.1 JB SQL = 2.21 U	2.6	1.6
Silver	1.4 U	11.8	7.5
Sodium	712 JB	4940 JH	875 JB
Vanadium	21.2 JB SQL = 22.08 U	15	9.7 JB
Zinc	104	10800	2070

Note: Bold type indicates that the sample concentration is above the detection limit.
Underlined type indicates that the sample result is elevated as defined in Section 5.

Key:

AC = Adjusted concentration.
B = Associated sample result is greater than the instrument detection limit, but less than the sample quantitation limit.
bgs = Below ground surface.
CLP = Contract Laboratory Program.
EPA = United States Environmental Protection Agency.
H = High bias.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
L = Low bias.
mg/kg = Milligrams per kilogram.
SQL = Sample quantitation limit.
U = The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.

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International Specialists in the Environment
Seattle, Washington

DEADWOOD MINE
Valley County, Idaho

Figure 7-1
4-MILE RADIUS AND
15-MILE DOWNSTREAM MAP

0 2 4
Approximate Scale in Miles

Date:	TDD No.	PAN No.	Dwg. No.	Pubs. No.
11-22-00	00-02-0005	EB0501SIT0	EB0501 7-1	S555

8. SUMMARY AND CONCLUSIONS

In July 2000, the START conducted PA/SI sampling activities at the Deadwood Mine site in Valley County, Idaho.

The PA/SI involved the collection of samples from potential hazardous substance sources on site and from target areas potentially impacted through contaminant migration. A total of 37 samples were collected for the PA/SI, including background samples. Samples were collected from on-site soil and from surface water, sediments, and soil in target areas. Samples were analyzed by Sentinel, Inc. Section 8.1 summarizes the potential source analytical sample results for the soil exposure pathway. Section 8.2 summarizes the target analytical sample results for the surface water pathway. Section 8.3 presents the conclusions of the PA/SI.

8.1 SOURCES

Samples were collected from three on-site soil source areas including the tailings pile, waste rock pile, and soil surrounding the former mill foundation. Areas were identified for sampling based on the potential presence of hazardous substances or contaminants.

The on-site subsurface soil samples contained significant concentrations of inorganics. The tailings pile contained significant concentrations of antimony (64.0 mg/kg), arsenic (211 mg/kg), cadmium (39.2 mg/kg), copper (303 mg/kg), lead (1,020 mg/kg), manganese (6,920 mg/kg), mercury (5.0 mg/kg), selenium (3.6 mg/kg), silver (25.8 mg/kg), and zinc (3,310 mg/kg).

The waste rock pile samples contained significant concentrations of antimony (46.9 mg/kg, estimated low), arsenic (239 mg/kg), cadmium (42.2 mg/kg), copper (278 mg/kg), lead (1,810 mg/kg), mercury (2.2 mg/kg), selenium (2.8 mg/kg), silver (55.0 mg/kg), and zinc (5,920 mg/kg).

The mill soil samples contained significant concentrations of antimony (122 mg/kg, estimated low), arsenic (114 mg/kg), cadmium (90.1 mg/kg), cobalt (18.3 mg/kg), copper (988 mg/kg), lead (16,800 mg/kg), mercury (19.5 mg/kg), selenium (11.0 mg/kg), silver (76.3 mg/kg), and zinc (11,200 mg/kg).

8.2 TARGETS

This section addresses the sample results as they relate to the surface water migration pathway. Samples were collected from suspected targets along potential surface water migration pathways which included Deadwood River, the unnamed creek, and a seep.

Elevated concentrations were detected in the co-located surface water and sediment samples WL03SW and WL03SD. Zinc was detected at an elevated concentration in WL03SW (31.8 µg/L). The following inorganic analytes were detected at elevated concentrations in WL03SD: arsenic (66.1 mg/kg), cadmium (17.3 mg/kg), copper (95.3 mg/kg), lead (299 mg/kg), and zinc (1,100 mg/kg).

No elevated concentrations were detected in the Deadwood River surface water samples. Arsenic (13.9 mg/kg) was the only analyte detected at an elevated concentration in one co-located sediment sample (DR02SD).

The following inorganics were detected at elevated concentrations in one co-located surface water sample collected from the unnamed creek (UC02SW): arsenic (22.4 µg/L) and zinc (455 µg/L). No other analytes were detected at an elevated concentration in the co-located surface water and sediment samples collected from the unnamed creek.

Elevated concentrations of inorganics were detected in the co-located surface water and sediment samples collected from the mouth of the seep (SP01SW and SP01SD). Arsenic (176 µg/L), manganese (617 µg/L), and zinc (2,380 µg/L) were detected in SP01SW. Antimony (151 mg/kg), arsenic (11,600 mg/kg), manganese (550 mg/kg, adjusted concentration), and zinc (21,100 mg/kg) were detected in SP01SD.

Elevated concentrations of inorganics were detected in the subsurface soil samples collected from the wetlands (WL01SB and WL02SB) documented by the START west of USFS Road 579. The following analytes were detected at elevated concentrations in WL01SB: arsenic (116 mg/kg), cadmium (119 mg/kg), copper (215 mg/kg), lead (1,140 mg/kg), manganese (3,040 mg/kg), mercury (3.9 mg/kg), selenium (2.6 mg/kg), silver (11.8 mg/kg), and zinc (10,800 mg/kg). The following analytes were detected at elevated concentrations in WL02SB: arsenic (74.5 mg/kg), cadmium (17.7 mg/kg), copper (206 mg/kg), lead (582 mg/kg), manganese (1,620 mg/kg), mercury (0.69 mg/kg), silver (7.5 mg/kg), and zinc (2,070 mg/kg).

8.3 CONCLUSIONS

Results of the PA/SI indicate that Deadwood Mine is a source of antimony, arsenic, cadmium, copper, lead, manganese, mercury, selenium, silver, and zinc contamination. All of these analytes were detected at significant concentrations in on-site source samples including the tailings and waste rock piles and the soil in the vicinity of the mill. Of these analytes, arsenic, cadmium, copper, lead, manganese, mercury, selenium, silver, and zinc were detected at elevated concentrations in the wetland subsurface soil samples. Arsenic, cadmium, copper, lead, and zinc were detected at elevated concentrations in the wetland co-located surface water and sediment sample. None of the analytes detected at significant concentrations in on-site source samples were detected in the co-located Deadwood River surface water samples. Arsenic was detected at an elevated concentration in one co-located Deadwood River sediment sample. Arsenic and zinc were detected at elevated concentrations in the unnamed creek. Arsenic, manganese, and zinc were detected at elevated concentrations in the seep. Based on the findings of the PA/SI, further investigation and follow-up action at the Deadwood Mine site is recommended.

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APPENDIX A
PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No.: 4176236 **TDD No.: 00-02-0005**
Lens Type: PENTAX Zoom 90-WR **Site Name: Deadwood Mine**

Photo	Date	Time	By	Direction	Description
1-17	7/11/00	0940	LD	SW	View of upper terrace area where trenches or a vat system remained. Wooden debris and waste rock were present in the trenches, which were most likely lined with concrete. Evidence of pipes was visible throughout the concrete structures. There was no area to collect a subsurface soil sample.
1-18	7/11/00	0943	LD	Down	Close-up view of trench filled with wooden debris and waste rock. Note opening in wall for possible water flow when mill was operational.
1-19	7/11/00	0945	LD	Down	View of pipe system throughout trenches. There was no area to collect a subsurface soil sample. The START decided to collect a sample from beneath the trenches from outside the terrace.
1-20	7/11/00	0950	LD	S	Location ML03SB (sample 00284108); mill area sample was collected from the center of the terrace, approximately 15 feet south of the northwest mill wall.
1-21	7/11/00	0955	LD	E	Close-up view of location ML03SB (sample 00284108). Note pipes extending out from underneath the trenches.
1-22	7/11/00	1015	LD	N	Location TP01SB (sample 00284109); southeast side of tailings pile.
1-23	7/11/00	1040	LD	SE	Edge of northeast side of tailings pile.
1-24	7/11/00	1041	LD	NW	Location TP02SB (sample 00284110); northeast side of tailings pile located in the center of the surface water drainage.
2-1	7/11/00	1110	LD	SE	Location TP03SB (sample 00284111), tailings pile located approximately 15 feet southeast of the USFS road.
2-2	7/11/00	1205	LD	NE	Location TP04SB (sample 00284112) at the toe of the tailings pile and PPE3 leading north to established wetlands.
2-3	7/11/00	1207	LD	N	View of location TP04SB and PPE3 directly behind YJ. Top layer was soil (approximately 4 inches) with tailings beneath. Behind trees were the wetlands. The START noticed dust from the tailings pile migrating toward the wetlands from winds traveling north-northeast at approximately 7 to 10 miles per hour.
2-4	7/11/00	1215	LD	SE	View from wetland location WL01SB (sample 0028411), approximately 35 feet north of USFS Road 579.
2-5	7/11/00	1217	LD	Down	Location WL01SB (sample 00284113), in wetlands. Note stained soil and presence of tailings.
2-6	7/11/00	1220	LD	W	View of migrating tailings located on the west side of USFS Road 579. Note lack of vegetation. The START also noted horse tracks and droppings.
2-7	7/11/00	1230	LD	N	Sample 00284114, location WL02SB, in wetlands approximately 100 feet downgradient and north of the tailings pile. YJ noted the presence of wood chips and extremely organic soil. Water was present at 12 inches below ground surface.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No.: 4176236 **TDD No.: 00-02-0005**
Lens Type: PENTAX Zoom 90-WR **Site Name: Deadwood Mine**

Photo	Date	Time	By	Direction	Description
1-1	7/11/00	0730	LD	E	Location BG01SB (sample 00284101); background subsurface soil sample location approximately 120 feet east of the bunkhouse and 75 feet southeast of the adits and seep.
1-2	7/11/00	0732	LD	E	Another view of background sample location BG01SB, with the south side of the bunkhouse in view for perspective.
1-3	7/11/00	0805	LD	NW	Location WP01SB (sample 00284102); view of waste rock pile at farthest southeast side that is located within 18 inches of a stormwater runoff drainage. The drainage is located southeast of WP01SB.
1-4	7/11/00	0815	LD	N	Location WP02SB (sample 00284103); view of waste rock pile approximately 18 inches to the north of the stormwater runoff drainage and approximately 70 feet north of WP01SB.
1-5	7/11/00	0830	LD	NE	Location WP03SB (sample 00284104); view of waste rock pile approximately 60 feet north of WP02SB and approximately 6 inches north of the stormwater runoff drainage. Rock is coarser in this location than in locations WP01 and WP02.
1-6	7/11/00	0835	LD	NE	Panoramic view of Deadwood Mine.
1-7	7/11/00	0836	LD	NE	Panoramic view of Deadwood Mine.
1-8	7/11/00	0837	LD	N	Panoramic view of Deadwood Mine.
1-9	7/11/00	0838	LD	W	Panoramic view of Deadwood Mine.
1-10	7/11/00	0839	LD	SW	Panoramic view of Deadwood Mine.
1-11	7/11/00	0840	LD	S	Panoramic view of Deadwood Mine.
1-12	7/11/00	0841	LD	SW	Panoramic view of Deadwood Mine.
1-13	7/11/00	0845	LD	N	Location WP04SB (sample 00284105); view of waste rock pile approximately 70 feet north of WP03SB and within 18 inches of the stormwater runoff drainage.
1-14	7/11/00	0900	LD	NE	View of mill area and drainage flowing south to north in front of the mill. The START observed a wooden floor approximately 2 inches beneath a clay layer. Farther north, the wooden floor was exposed in the first suspected floatation tank area or offloading area. Three main terraces were observed at the mill.
1-15	7/11/00	0910	LD	NE	Location ML01SB (sample 00284106); collected from mill area on the lower terrace level under the exposed wooden floor approximately 100 feet south of WP01SB on the northwest side of the mill.
1-16	7/11/00	0925	LD	NE	Location ML02SB (sample 00284107); sample was collected from mill area on the second terrace level. No wooden floor was observed on the southwest side of the mill.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No.: 4176236 **TDD No.: 00-02-0005**
Lens Type: PENTAX Zoom 90-WR **Site Name: Deadwood Mine**

Photo	Date	Time	By	Direction	Description
2-8	7/11/00	1300	LD	Down	Sample 00284115, location BG02SB; background wetland subsurface soil sample collected approximately 100 feet north of USFS Road 579. Soil was moist with some vegetation.
2-9	7/11/00	1305	LD	SW	View downstream from the background wetland sample location BG02SB. Picture taken directly uphill from BG02SB, 100 feet west of USFS Road 579. The sample location was approximately 0.6 mile north of the site, upstream on the east side of Deadwood River (depositional side).
2-10	7/12/00	0800	LD	SW	Location DR01SW (sample 00284116) on Deadwood River, located approximately 200 feet downgradient from the site.
2-11	7/12/00	0805	LD	SW	Location DR01SD (sample 00284117) on Deadwood River, located approximately 200 feet downgradient from the site.
2-12	7/12/00	0810	LD	N	Location UC01SW (sample 00284126) on the unnamed creek where it joins Deadwood River. The START traveled approximately 800 to 1,000 feet in a northwest direction toward Deadwood River from USFS Road 579.
2-13	7/12/00	0815	LD	Down	Sample 00284127, location UC01SD, collected in the unnamed creek where it joins Deadwood River. The START traveled approximately 800 to 1,000 feet in a northwest direction toward Deadwood River from USFS Road 579.
2-14	7/12/00	0930	LD	NE	Locations DR02SW and DR02SD (samples 00284118 and 00284119, respectively) on Deadwood River across from the on-site office and bunkhouse area.
2-15	7/12/00	1000	LD	N	Location DR03SW (sample 00284120) on Deadwood River, approximately 800 to 1,000 feet northwest of the on-site waste rock pile and mill area. The START noted a drainage path to the sample location. The origin is unknown.
2-16	7/12/00	1005	LD	Down	Sample 00284121, location DR03SD, collected in Deadwood River approximately 800 to 1,000 feet northwest of the on-site waste rock pile and mill area.
2-17	7/12/00	1030	LD	SW	Location DR04SW (sample 00284122) on Deadwood River, approximately 800 to 1,000 feet northwest of the on-site tailings pile.
2-18	7/12/00	1035	LD	Down	Sample 00284123, location DR04SD, collected in Deadwood River approximately 800 to 1,000 feet northwest of the on-site tailings pile.
2-19	7/12/00	1050	LD	SE	Location BG03SW (sample 00284124); background sample location for Deadwood River, approximately 200 to 300 yards upgradient from the site.
2-20	7/12/00	1055	LD	Down	Sample 00284125, location BG03SD; background sample for Deadwood River collected approximately 200 to 300 yards upgradient from the site.
2-21	7/12/00	1057	LD	S	View across from location BG03 to the Deadwood Mine site.
2-22	7/12/00	1058	LD	S	View across from location BG03 to the Deadwood Mine site.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No.: 4176236 **TDD No.: 00-02-0005**
Lens Type: PENTAX Zoom 90-WR **Site Name: Deadwood Mine**

Photo	Date	Time	By	Direction	Description
2-23	7/12/00	1130	LD	NW	View from USFS Road 579 to the wetlands located behind the trees.
3-1	7/12/00	1135	LD	N	Location WL03SW (sample 00284130); wetlands approximately 100 feet north and downgradient from the on-site tailings pile.
3-2	7/12/00	1140	LD	Down	Sample 00284131, location WL03SD; wetland sample collected approximately 100 feet north and downgradient from the on-site tailings pile.
3-3	7/12/00	1215	LD	S	Location BG02SW (sample 00284132); background wetland surface water sample location.
3-4	7/12/00	1220	LD	Down	Sample 00284133, location BG02SD; background wetland sediment sample.
3-5	7/12/00	1240	LD	SE	Location UC02SW (sample 00284128) on the unnamed creek where the seep and the unnamed creek join. Discharge from the seep and the south adit converged in this location.
3-6	7/12/00	1245	LD	SE	Sample 00284129, location UC02SD, on the unnamed creek where the seep and the unnamed creek join. Discharge from the seep and the south adit converged in this location.
3-7	7/12/00	1305	LD	Down	Sample 00284134 (location SP01SW) at the mouth of the seep.
3-8	7/12/00	1306	LD	SW	View from the seep looking toward the bunkhouse. Note stained orange soil around the south adit.
3-9	7/12/00	1310	LD	Down	Sample 00284135 (location SP01SD) collected at the mouth of the seep. Note stained orange soil.
3-10	7/12/00	1314	LD	SW	View of the south adit and drainage from the seep flowing over the adit.
3-11	7/12/00	1315	LD	S	View from the south adit downgradient from the seep. Note orange precipitate. No discharge was observed from the south adit.
3-12	7/12/00	1320	LD	S	Protruding pipe with no discharge.
3-13	7/12/00	1325	LD	NE	View of burned and collapsed north adit. No discharge water was observed.
3-14	7/12/00	1330	LD	SE	View of source of the unnamed creek. Background sample location BG04 for the unnamed creek.
3-15	7/12/00	1331	LD	NW	View from background sample location BG04 (for unnamed creek) of cabin upgradient of the north adit.
3-16	7/12/00	1335	LD	SE	Location BG04SW (sample 00284136); background sample location for the unnamed creek; upgradient from the site (approximately 700 feet from the adits).
3-17	7/12/00	1340	LD	Down	Sample 002874137, location BG04SD; background sample for the unnamed creek collected upgradient of the site approximately 700 feet from the adits. Here there were three routes where the water flowed to the unnamed creek and eventually into Deadwood River.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No.: 4176236 **TDD No.: 00-02-0005**
Lens Type: PENTAX Zoom 90-WR **Site Name: Deadwood Mine**

Photo	Date	Time	By	Direction	Description
3-18	7/12/00	1345	YJ	NW	View of LD at background location BG04.
3-19	7/12/00	1348	YJ	E	View of cast-iron drain pipe going down the hillside. A water tank, approximately 12 feet in diameter and 6 feet in height, also was noted adjacent to the pipe.
3-20	7/12/00	1355	LD	E	View of cabin and waterfall in background, located 500 feet upgradient of the north adit.
3-21	7/12/00	1356	LD	NW	Another view of the collapsed north adit (downgradient from the cabin and waterfall and upgradient from the bunkhouse and office building).
3-22	7/12/00	1400	LD	Down	View looking down at the waste rock pile and surface water drainage paths.
3-23	7/12/00	1415	LD	SE	View of the site from USFS Road 579.
3-24	7/12/00	1416	LD	E	View of waste rock pile.

Key:

E = East.
LD = Leatta Dahlhoff.
N = North.
NE = Northeast.
No. = Number.
NW = Northwest.
S = South.
SE = Southeast.
SW = Southwest.
TDD = Technical Direction Document.
USFS = United States Forest Service.
W = West.
YJ = York Johnson.


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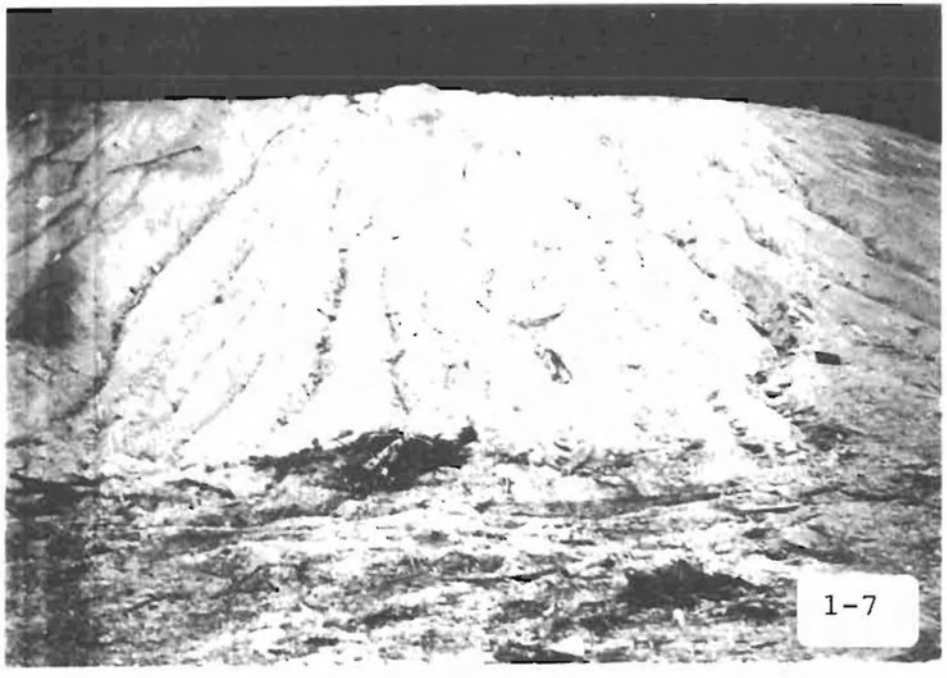

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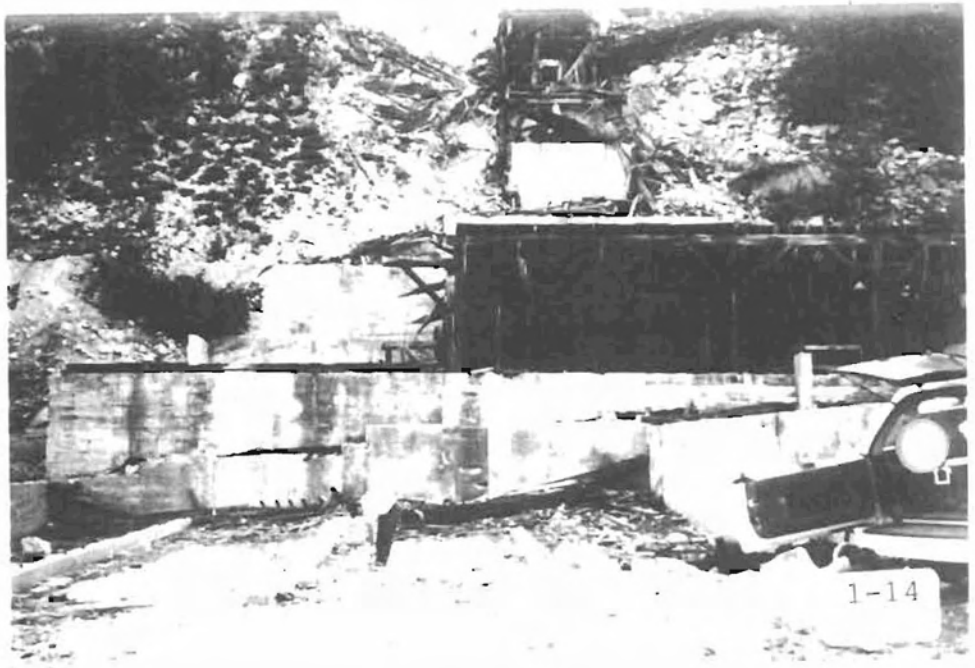

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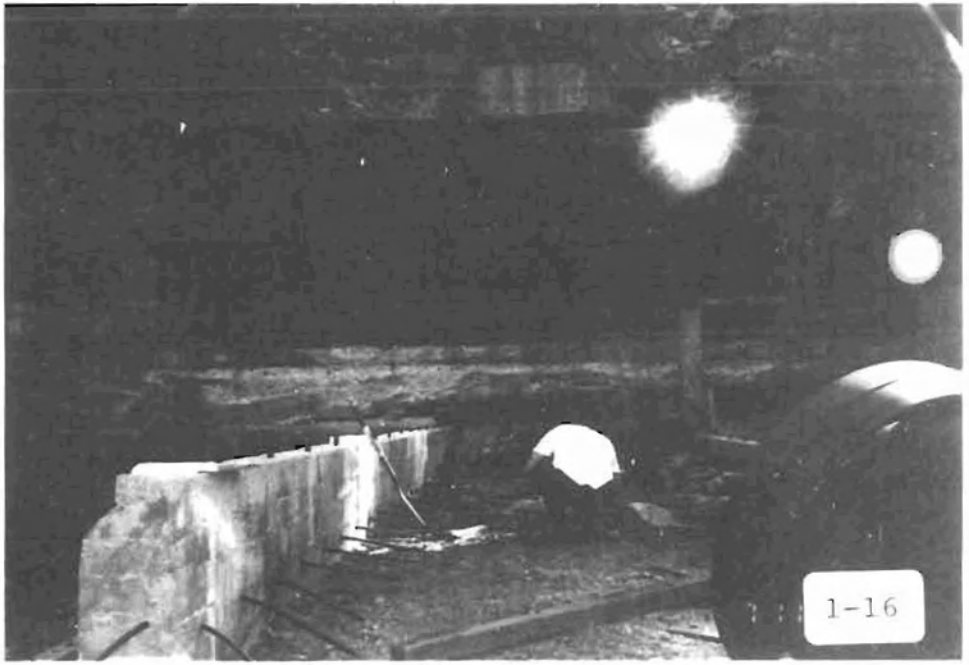

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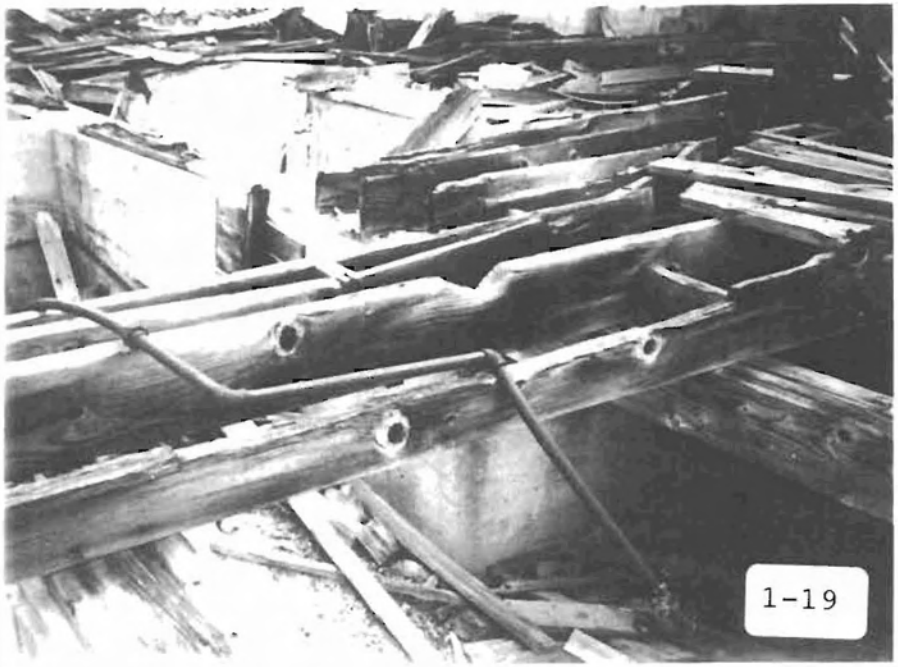

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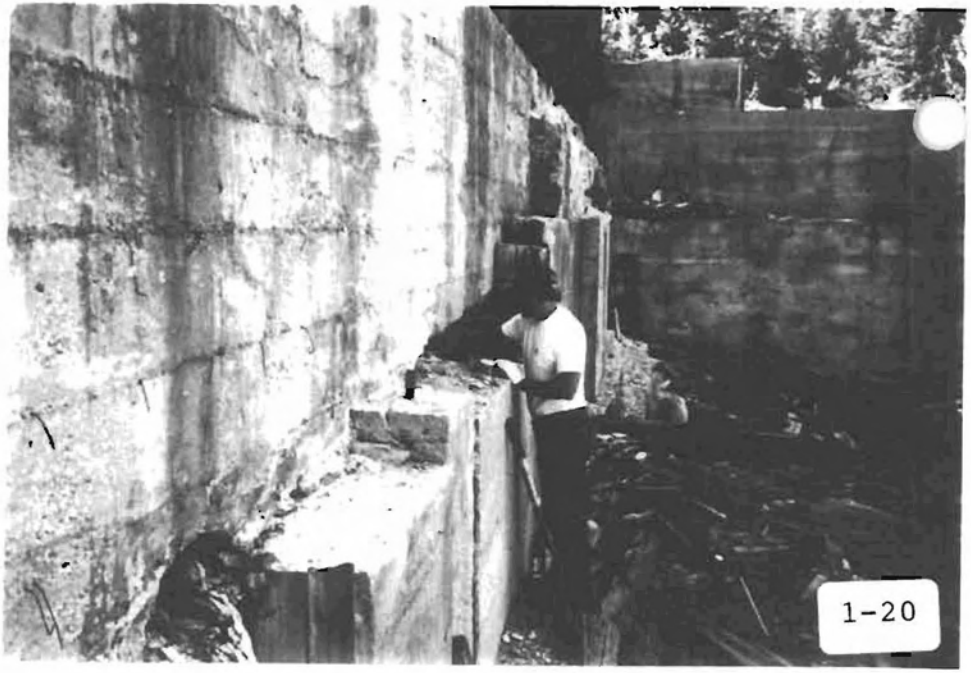

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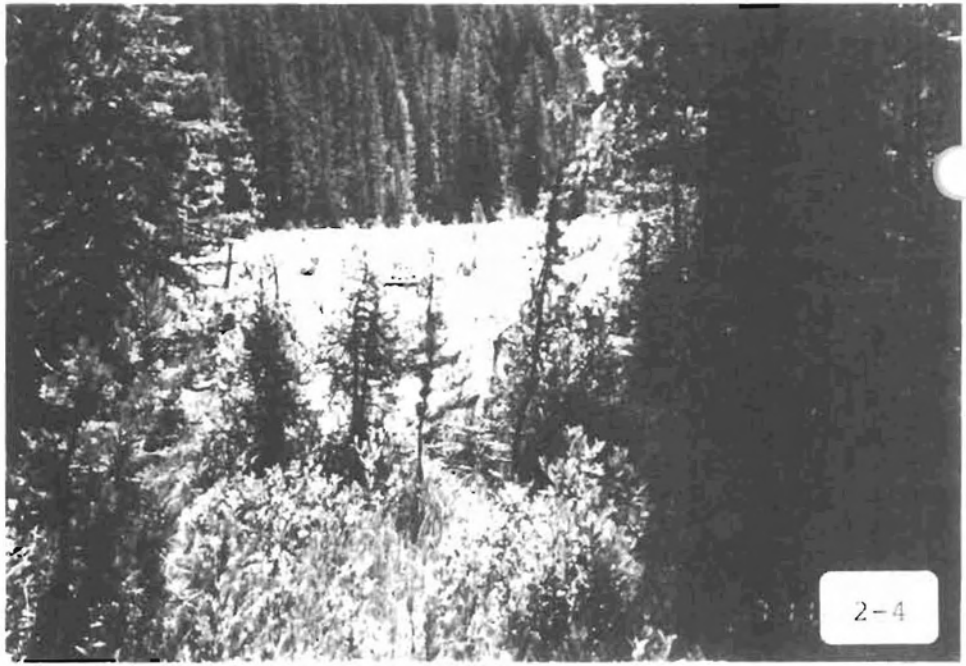
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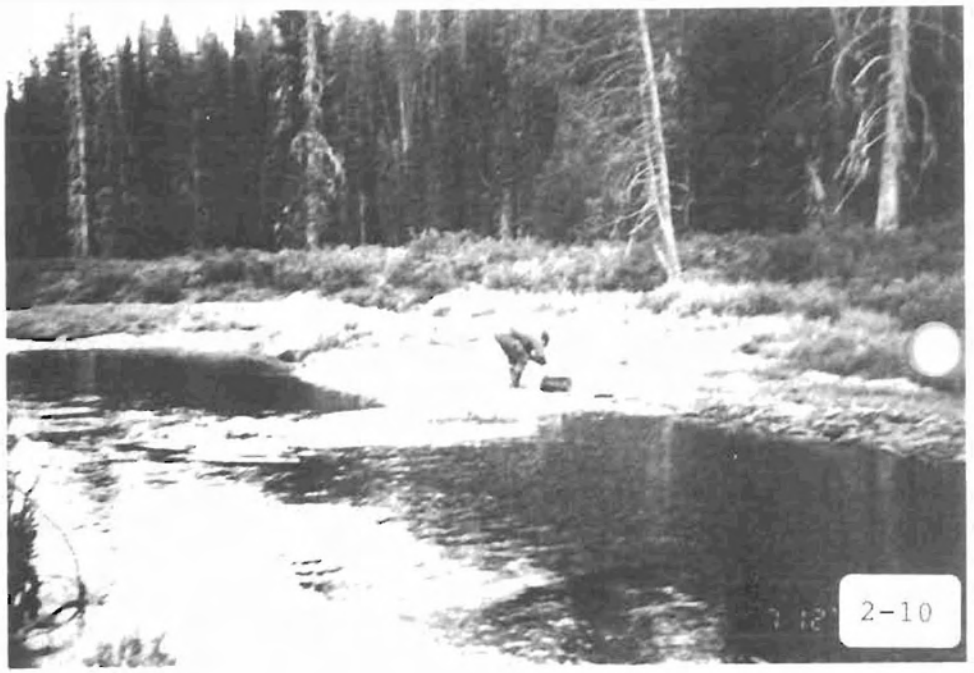

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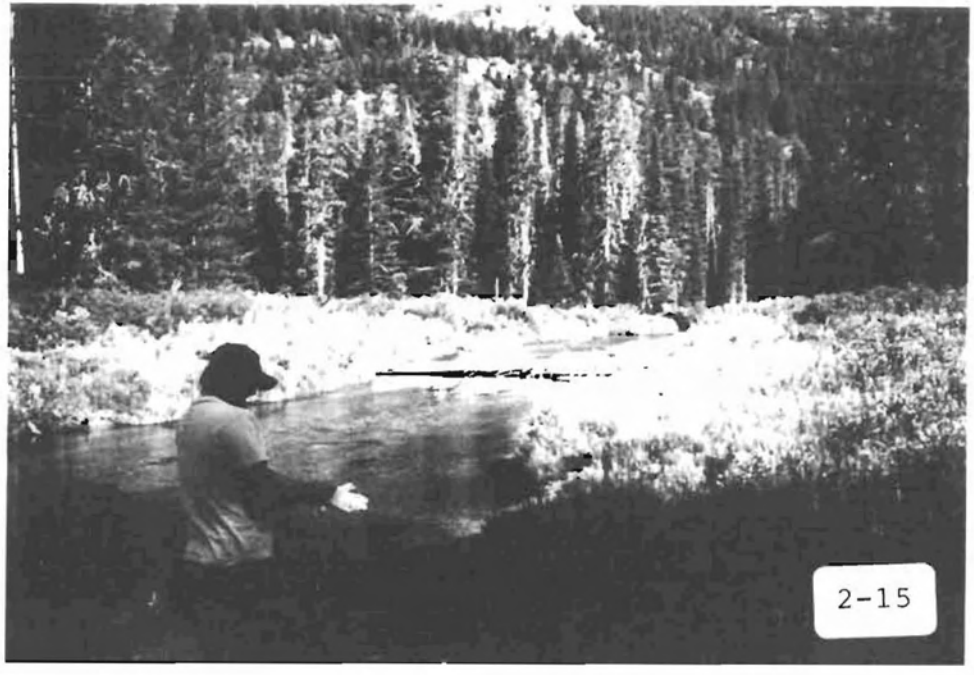

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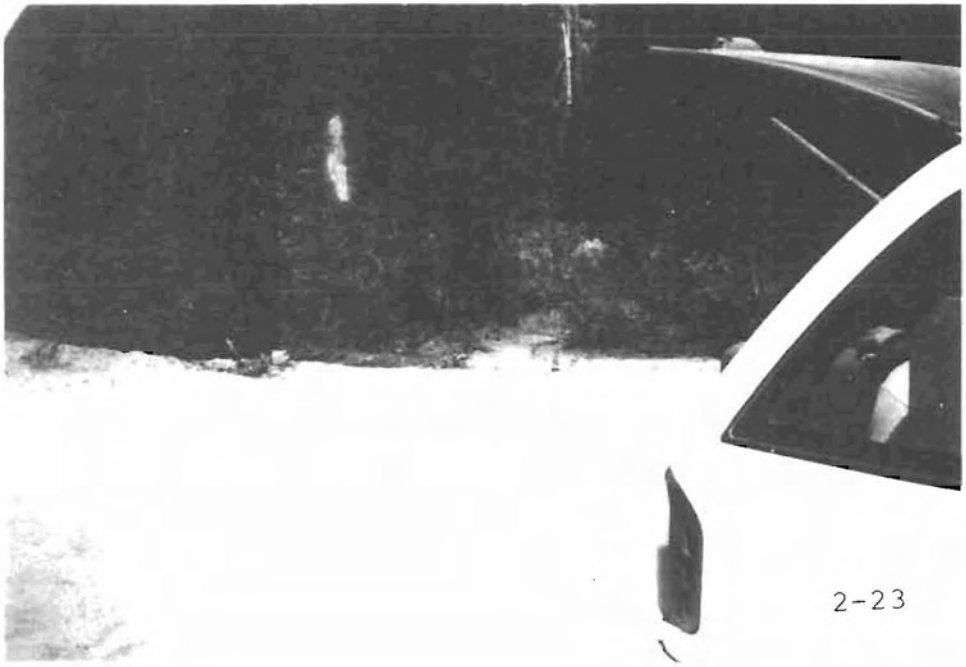

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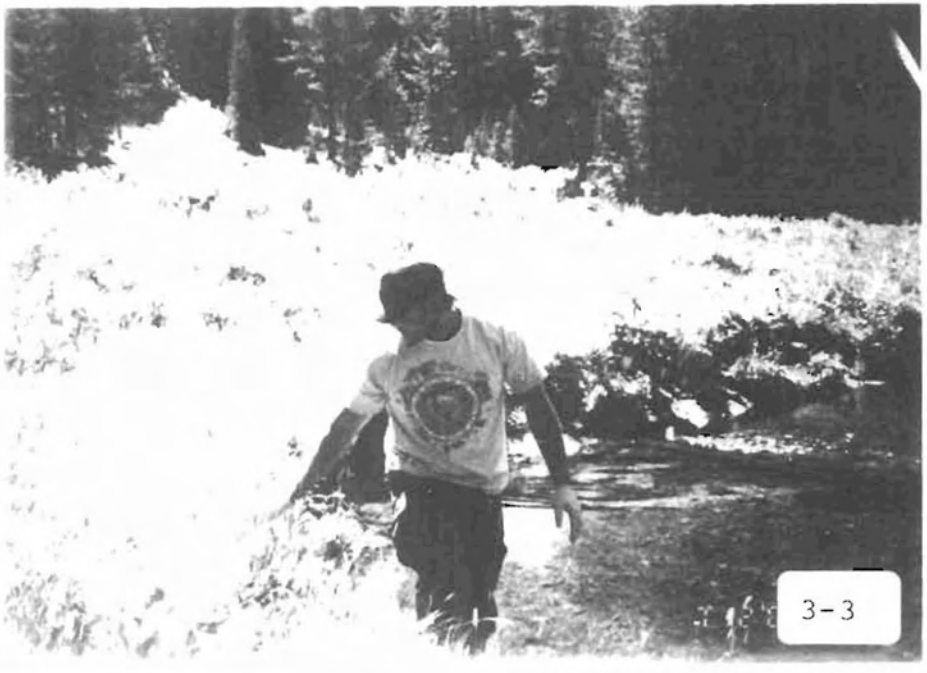

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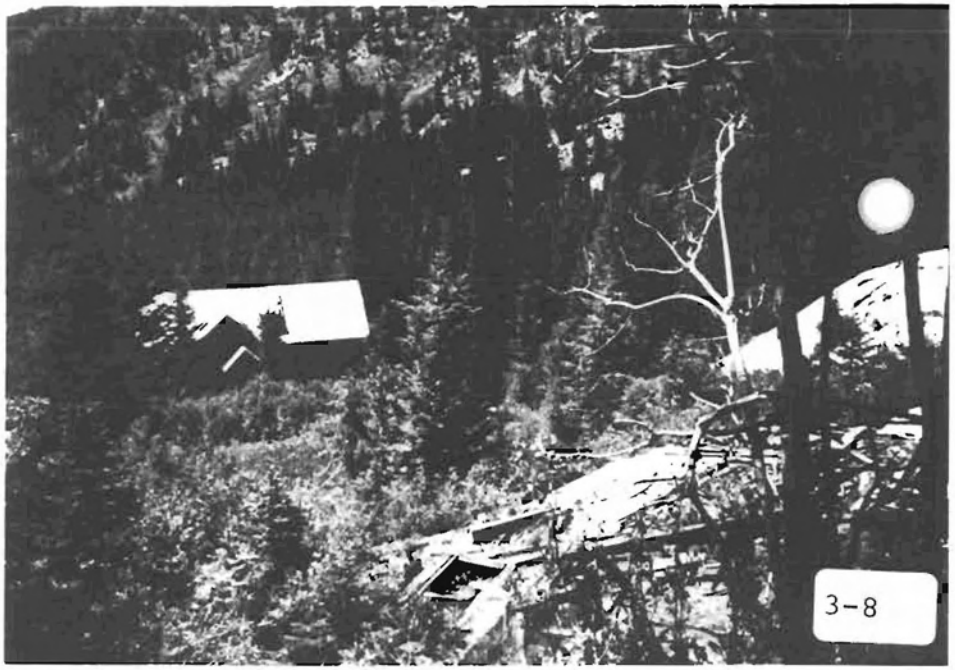

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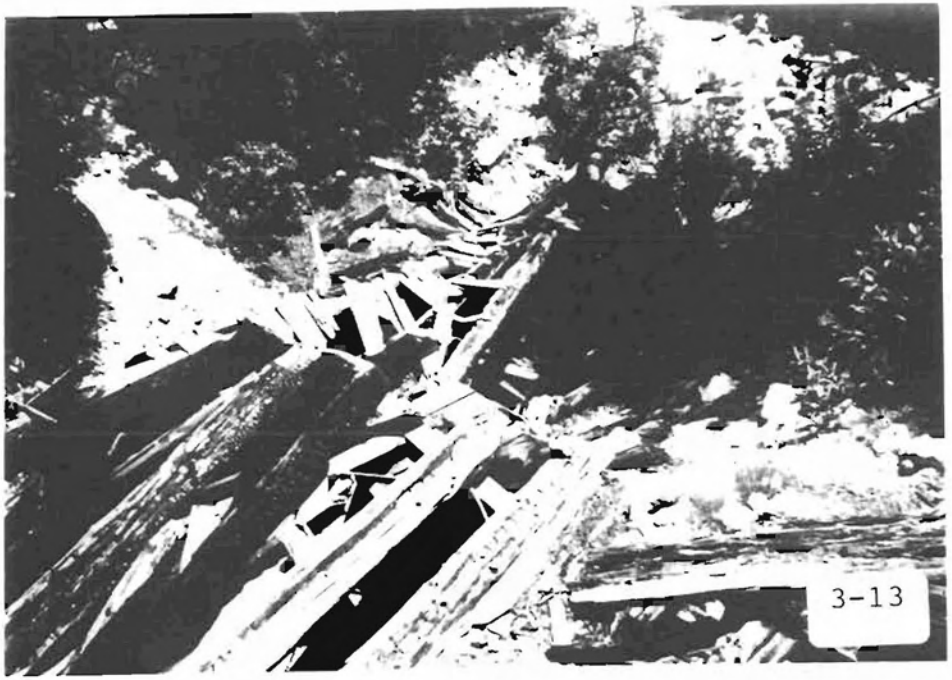

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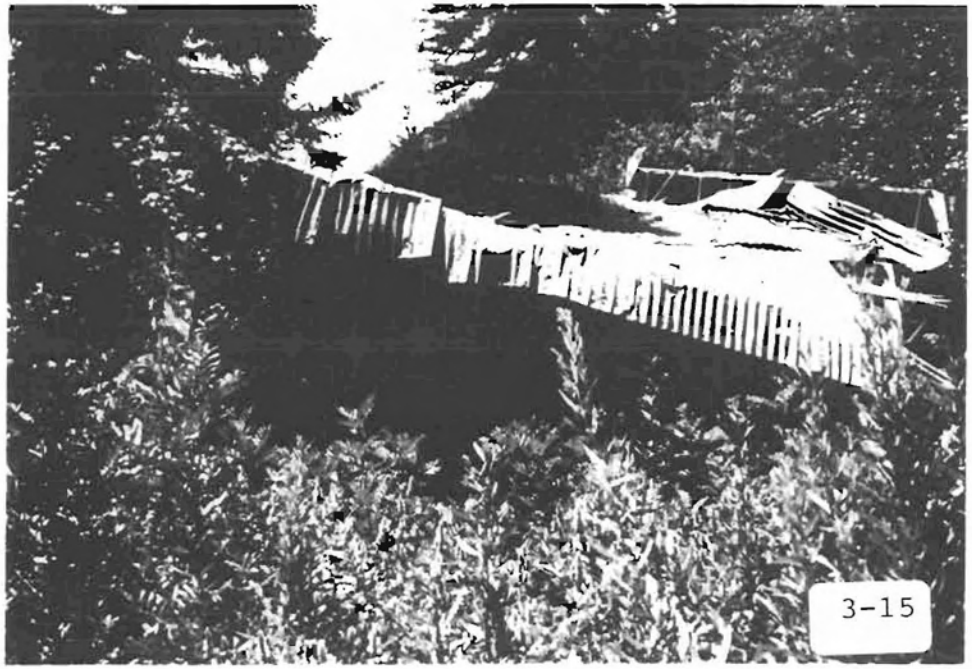

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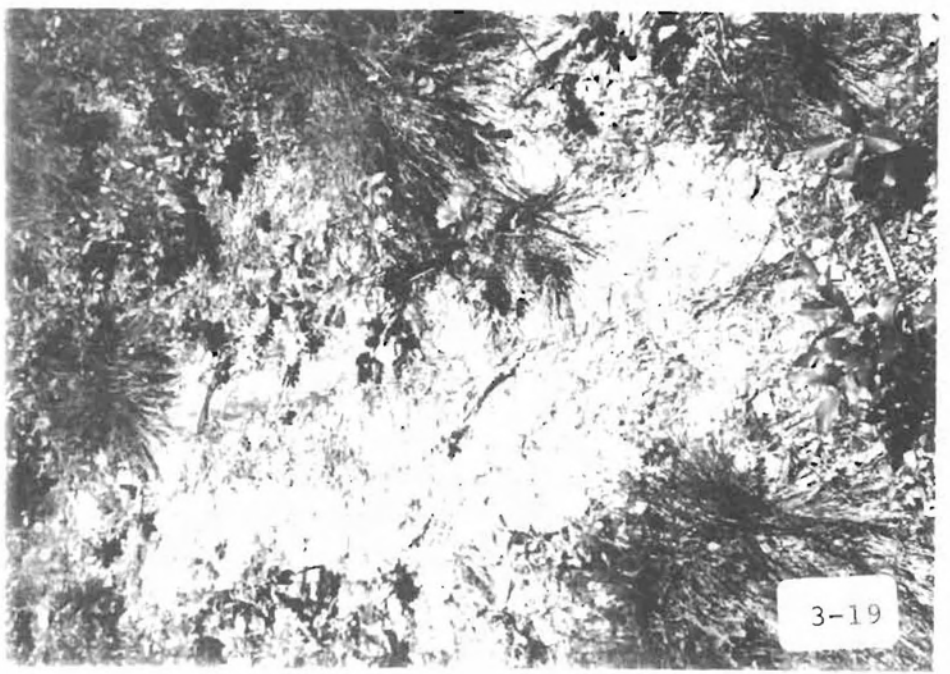

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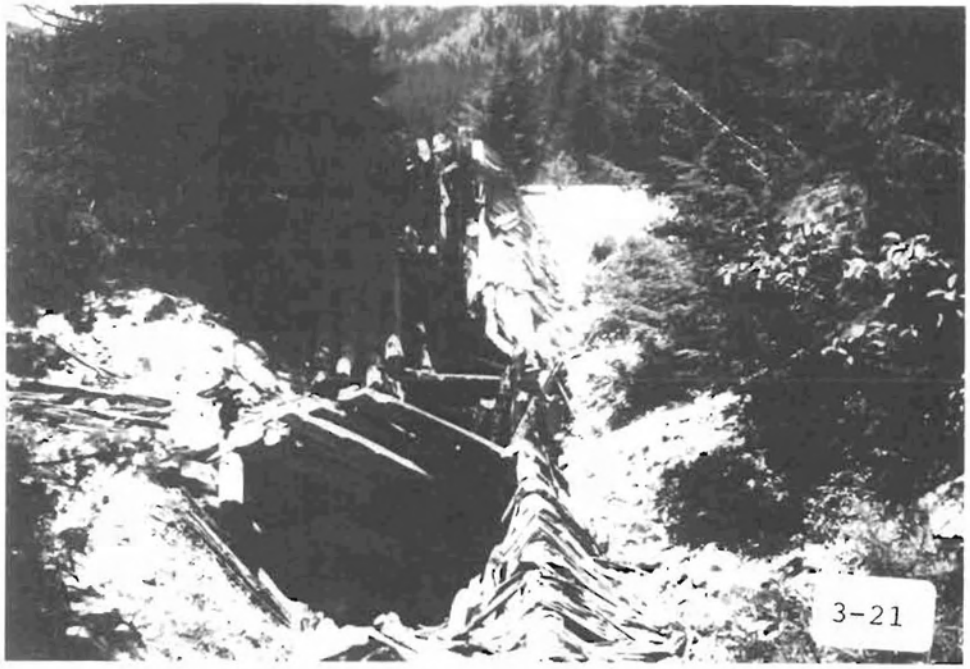

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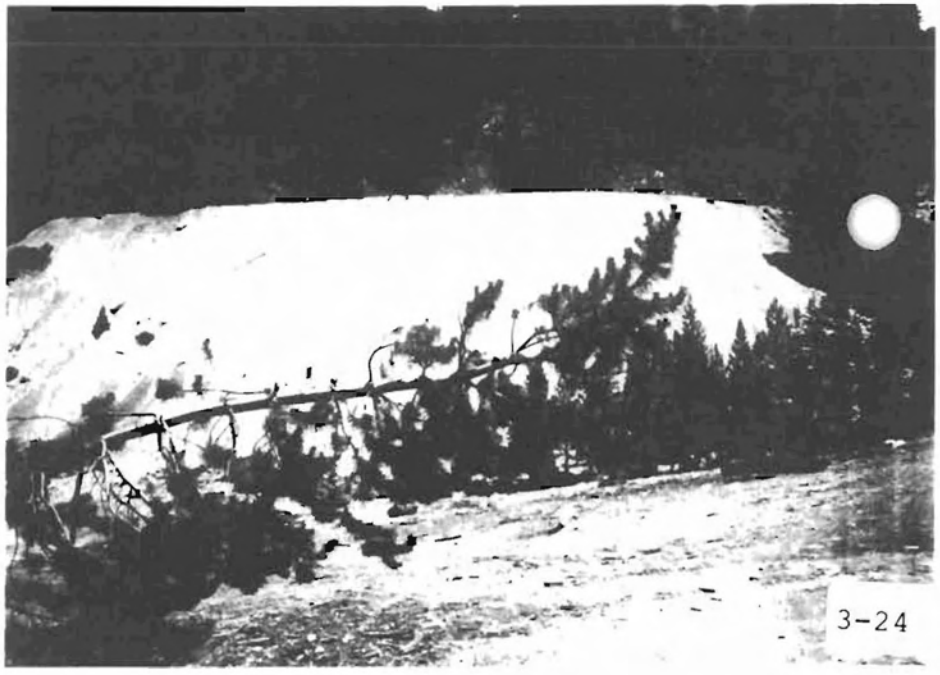
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APPENDIX C

DATA VALIDATION MEMORANDA AND ANALYTICAL RESULTS

ecology and environment, inc.
International Specialists in the Environment

1500 First Interstate Center, 999 Third Avenue
Seattle, Washington 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: August 23, 2000

TO: Leatta Dahlhoff, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-Chemist, E & E, Seattle, WA MW

SUBJ: **Inorganic Data Quality Assurance Summary Check, Deadwood Mine Site, Lowman, Idaho**

REF: TDD: 00-02-0005 PAN: EB-05-01-SI-DM

The data quality assurance summary check of 26 soil and 11 water samples collected from the Deadwood Mine site located in Lowman, Idaho, has been completed. Analysis for Target Analyte List (TAL) inorganic elements and cyanide (EPA CLP SOW ILM04.1) was performed by Sentinel, Inc., Huntsville, Alabama.

No discrepancies were noted.

The "B" qualifiers, applied by the laboratory to indicate results less than the Contract Required Detection Limit (CRDL) but greater than the Instrument Detection Limit (IDL), were changed to "JB", indicating estimated results that were less than the CRDL but greater than the IDL. When more than one qualifier was to be applied to a sample result, only the most restrictive qualifier was applied. When a "B" qualifier was applied, this was determined to be the most restrictive qualifier (these results are not used for Hazard Ranking System scoring), and the other qualifiers were deleted by the secondary reviewer.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Reply To
Attn Of: OEA-095

August 21, 2000

MEMORANDUM

Subject: Data Validation Report for the Total Inorganic Analyses of Samples from Deadwood Mine Site Assessment Case 28289 SDGs: MJ00A9, MJ00A8, MJ009R

From: Ginna Grepo-Grove, Chemist
Quality Assurance & Data Unit, OEA

To: Monica Tonel, SAM, ECL

CC: Bruce Woods, Region 10 CLP TPO
Leatta Dahlhoff, Ecology and Environment

The quality assurance (QA) review of 26 soil and 11 water samples collected from the above referenced site has been completed. These samples were analyzed for full inorganic target compounds including cyanide in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analyses (revision ILMO4.0). The analyses were performed by Sentinel, Inc. of Huntsville, AL. The data validations were performed by the Environmental Services Assistance Team (ESAT) of the USEPA Manchester Environmental Laboratory, Port Orchard, WA.

There were no significant problems encountered with the data. Approximately 10% of the total data points were qualified as estimated due to duplicate results, serial dilution results, contamination in the blanks and/or poor matrix spike recoveries. All of the samples were analyzed in accordance with the technical requirements specified in the SOW. Data as qualified can be used for all purposes.

Attached are the validation memos for the above mentioned case and sample delivery groups (SDGs).

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Table C-1

GLOBAL POSITIONING SYSTEM DATA
DEADWOOD MINE PRELIMINARY ASSESSMENT/SITE INSPECTION
VALLEY COUNTY, IDAHO

EPA Regional Tracking Number	Field Number	Decimal Degrees		Latitude			Longitude			PDOP	Horizontal Accuracy (meters)
		Latitude	Longitude	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds		
00284101	BG01	44.4686405	-115.580872	44	28	7.105854	-115	34	51.138282	3.1	0.417
00284102	WP01	44.4697197	-115.583127	44	28	10.990772	-115	34	59.256581	3.1	0.358
00284103	WP02	44.4699188	-115.583434	44	28	11.707568	-115	35	0.3630444	3.4	0.536
00284104	WP03	44.4700784	-115.58364	44	28	12.282377	-115	35	1.1028876	3.6	0.508
00284105	WP04	44.4703097	-115.583707	44	28	13.114826	-115	35	1.34394	4.2	0.409
00284106	ML01	44.4694446	-115.582805	44	28	10.000416	-115	34	58.099699	2.9	0.369
00284107	ML02	44.469357	-115.582661	44	28	9.6851244	-115	34	57.578545	3.3	0.338
00284108	ML03	44.4695149	-115.582649	44	28	10.253741	-115	34	57.537084	5.2	0.504
00284109	TP01	44.4707284	-115.584265	44	28	14.622326	-115	35	3.3531324	5.4	0.645
00284110	TP02	44.4717751	-115.584927	44	28	18.390338	-115	35	5.7378912	4.5	0.593
00284112	TP04	44.471689	-115.585542	44	28	18.080447	-115	35	7.951614	3.1	0.438
00284113	WL01	44.4719274	-115.585935	44	28	18.938784	-115	35	9.3665688	3	0.448
00284114	WL02	44.4720752	-115.585983	44	28	19.470576	-115	35	9.5376912	2.9	0.39
00284115	BG02	44.479891	-115.582526	44	28	47.607575	-115	34	57.092221	3.5	0.385
00284116	DR01	44.466312	-115.587474	44	27	58.723175	-115	35	14.907196	5.7	1.511
00284117	DR01	44.466312	-115.587474	44	27	58.723175	-115	35	14.907196	5.7	1.511
00284118	DR02	44.46774	-115.587279	44	28	3.8641008	-115	35	14.206038	4.9	0.355
00284119	DR02	44.46774	-115.587279	44	28	3.8641008	-115	35	14.206038	4.9	0.355
00284120	DR03	44.4692932	-115.5865	44	28	9.4556532	-115	35	11.399798	3	0.383
00284121	DR03	44.4692932	-115.5865	44	28	9.4556532	-115	35	11.399798	3	0.383
00284122	DR04	44.471488	-115.586826	44	28	17.356742	-115	35	12.575234	5.4	0.625
00284123	DR04	44.471488	-115.586826	44	28	17.356742	-115	35	12.575234	5.4	0.625
00284124	BG03	44.4722185	-115.587012	44	28	19.986629	-115	35	13.243506	3.5	0.478
00284125	BG03	44.4722185	-115.587012	44	28	19.986629	-115	35	13.243506	3.5	0.478
00284126	UC01	44.4670085	-115.587845	44	28	1.2306936	-115	35	16.243026	2.5	0.349
00284127	UC01	44.4670085	-115.587845	44	28	1.2306936	-115	35	16.243026	2.5	0.349
00284128	UC02	44.4685753	-115.581191	44	28	6.8712492	-115	34	52.287586	3.4	0.35
00284129	UC02	44.4685753	-115.581191	44	28	6.8712492	-115	34	52.287586	3.4	0.35
00284130	WL03	44.4721058	-115.585976	44	28	19.58088	-115	35	9.5152776	4.8	0.636
00284131	WL03	44.4721058	-115.585976	44	28	19.58088	-115	35	9.5152776	4.8	0.636
00284132	BG02	44.479891	-115.582526	44	28	47.607575	-115	34	57.092221	3.5	0.385
00284133	BG02	44.479891	-115.582526	44	28	47.607575	-115	34	57.092221	3.5	0.385
00284134	SP01	44.4691379	-115.580484	44	28	8.8963572	-115	34	49.742598	5.1	0.506
00284135	SP01	44.4691379	-115.580484	44	28	8.8963572	-115	34	49.742598	5.1	0.506
00284136	BG04	44.4698832	-115.58061	44	28	11.579344	-115	34	50.195496	5.8	0.604
00284137	BG04	44.4698832	-115.58061	44	28	11.579344	-115	34	50.195496	5.8	0.604

Key:

EPA = United States Environmental Protection Agency.
PDOP = Position dilution of precision.

LOCKHEED MARTIN
TECHNOLOGY SERVICES GROUP

ESAT Region 10
Lockheed Martin
7411 Beach Drive East
Port Orchard, WA 98366
Phone (360) 871-8723

DELIVERABLE NARRATIVE

DATE: August 8, 2000

To: Ginna Grepo-Grove, WAM, USEPA, Region 10

THROUGH: Dave Dobb, Team Manager, ESAT Region 10 DD

FROM: Chris Pace, Data Validation Task Lead, ESAT Region 10 CP

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Deadwood Mine Site Assessment. Case: 28289 SDG: MJ00A9

DOC: ESW10-4-1376
PWO: ESW72029
TDF: 3866
WA: 10-99-4-10
CN: 68-D6-0005

CC: Gerald Dodo, RPO, USEPA, Region 10
Project File

The quality assurance (QA) review of 11 soil samples collected from the above referenced site has been completed. These samples were analyzed for total metals and cyanide* by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ00A9	MJ00AK	MJ00AX
MJ00AB	MJ00AM	
MJ00AD	MJ00AP	
MJ00AF	MJ00AR	
MJ00AH	MJ00AT	

*Samples MJ00AB, MJ00AR, MJ00AT and MJ00AX were not analyzed for cyanide.

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analysis (ILM04.1) and the USEPA CLP Functional Guidelines for Inorganic Data Review, 2/94.

The conclusions presented herein are based on the information provided for the review.

Holding Time - Acceptable

The suggested holding time for cyanide is 14 days, mercury is 28 days and the rest of the metals is 180 days from the date of sample collection. The samples were collected on 7/12/00. The samples were analyzed for cyanide within 6 days, mercury within 6 days and all other metals within 9 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

The samples were prepared in accordance with the methods used. None of the data were qualified on this basis.

Initial Calibration - Acceptable

All of the samples were analyzed for total cyanide using Semi-Automated Spectrophotometric Determination. The initial calibration for cyanide met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

All of the samples were analyzed for total mercury using Cold Vapor Atomic Absorption Spectroscopy (CVAAS). The initial calibration for mercury met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

The rest of the target analytes were analyzed using Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES). The initial calibration for ICP-AES met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

None of the data were qualified on this basis.

Calibration Verification - Acceptable

The initial and continuing calibration verifications met the criteria for frequency of analysis and recovery criteria of 90-110% for ICP-AES, 80-120% for mercury and 85-115% for cyanide. The recoveries ranged from 93-108% for ICP-AES, from 90-95% for mercury and from 90-105% for cyanide. None of the data were qualified on this basis.

Detection Limits - Acceptable

All of the target analytes met the project required quantitation limits. All of the Contract Required Detection Limit (CRDL) checks met the frequency of analysis and recovery criteria.

Blanks

Procedural blanks were prepared with the samples to indicate potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified as non-detects, "U", if the analyte concentration is less than five times the analytical value in the blank.

The frequency of analysis of blanks was met. Based on the target analytes detected in the procedural, initial and continuing calibration blanks, the following results were qualified as non-detects, "U":

Analyte	Associated Samples
beryllium	All
thallium	MJ00AT

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met by all of the ICS analyzed. The recoveries ranged from 89-116%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis

Sample MJ00AK was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference with the exception of magnesium. Results for magnesium in all samples were qualified as estimated, "J". The "E" qualifiers applied by the laboratory were crossed-out by the reviewer.

Laboratory Control Sample

The frequency of analysis and the recovery criteria for the laboratory control sample were met with the exception of sodium (759%). Due to possible bias, detected sodium results in all samples were qualified as estimated, "J", and non-detects were not qualified. All other recoveries were acceptable and ranged from 69-130%.

Duplicate Sample Analysis

Sample MJ00AK was utilized for duplicate analysis. The duplicate results met the frequency of analysis and control limit criteria for all target analytes with the exception of manganese. Results for manganese in all samples were qualified as estimated, "J". The "*" qualifiers applied by the laboratory were crossed-out by the reviewer.

Matrix Spike Analysis - Acceptable

Sample MJ00AK was used for the spike analysis. The frequency of analysis and recovery criteria were met. All of the spike recoveries were acceptable and ranged from 77-118%.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

All of the samples were analyzed in accordance with technical specifications outlined in the SOW. The data, as qualified, are acceptable and can be used for all purposes.

DATA QUALIFIERS

U	-	The analyte was not detected at or above the reported result.
J	-	The analyte was positively identified. The associated numerical result is an estimate.
R	-	The data are unusable for all purposes.
N	-	There is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.
L	-	Low bias.
H	-	High bias.
Q	-	The result is estimated because the concentration is below the Contract Required Quantitation Limits (CRQLs).
K	-	Unknown Bias.

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00A9

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33116S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 88.2

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2060			P
7440-36-0	Antimony	1.5	U		P
7440-38-2	Arsenic	1.9	B	J	P
7440-39-3	Barium	28.3	B	J	P
7440-41-7	Beryllium	0.32	B	J	P
7440-43-9	Cadmium	0.52	U		P
7440-70-2	Calcium	777	B	J	P
7440-47-3	Chromium	0.43	U		P
7440-48-4	Cobalt	0.68	U		P
7440-50-8	Copper	1.2	B	J	P
7439-89-6	Iron	4430			P
7439-92-1	Lead	3.8			P
7439-95-4	Magnesium	533	B	J	P
7439-96-5	Manganese	85.2		JK	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	0.70	U		P
7440-09-7	Potassium	543	B	J	P
7782-49-2	Selenium	0.45	B	J	P
7440-22-4	Silver	0.70	U		P
7440-23-5	Sodium	272	B	J	P
7440-28-0	Thallium	0.45	U		P
7440-62-2	Vanadium	2.8	B	J	P
7440-66-6	Zinc	22.6			P
	Cyanide	0.14	U		CA

MP 8-8-00

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00AB

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33117S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 76.4

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6070			P
7440-36-0	Antimony	1.7	U		P
7440-38-2	Arsenic	10.1			P
7440-39-3	Barium	64.5			P
7440-41-7	Beryllium	1.0		U	P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	1760			P
7440-47-3	Chromium	2.3	B	J	P
7440-48-4	Cobalt	3.1	B	J	P
7440-50-8	Copper	3.8	B	J	P
7439-89-6	Iron	9980			P
7439-92-1	Lead	8.3			P
7439-95-4	Magnesium	2270		JL	P
7439-96-5	Manganese	215		JK	P
7439-97-6	Mercury	0.07	U		CV
7440-02-0	Nickel	1.3	B	J	P
7440-09-7	Potassium	1640			P
7782-49-2	Selenium	0.42	B	J	P
7440-22-4	Silver	0.81	U		P
7440-23-5	Sodium	339	B	J	P
7440-28-0	Thallium	0.52	U		P
7440-62-2	Vanadium	10.4	B	J	P
7440-66-6	Zinc	110			P
	Cyanide				NR

CP 8-8-00

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AD

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33118S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 87.2

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2220			P
7440-36-0	Antimony	1.5	U		P
7440-38-2	Arsenic	13.9			P
7440-39-3	Barium	29.8	B	J	P
7440-41-7	Beryllium	0.30	B	U	P
7440-43-9	Cadmium	0.53	U		P
7440-70-2	Calcium	775	B	J	P
7440-47-3	Chromium	1.4	B		P
7440-48-4	Cobalt	0.87	B		P
7440-50-8	Copper	1.7	B		P
7439-89-6	Iron	6160			P
7439-92-1	Lead	4.3			P
7439-95-4	Magnesium	695	B	J	P
7439-96-5	Manganese	76.5		JK	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	0.71	U		P
7440-09-7	Potassium	621	B	J	P
7782-49-2	Selenium	0.41	B	J	P
7440-22-4	Silver	0.71	U		P
7440-23-5	Sodium	127	U		P
7440-28-0	Thallium	0.46	U		P
7440-62-2	Vanadium	4.8	B	J	P
7440-66-6	Zinc	28.3			P
	Cyanide	0.14	U		CA

8-8-00

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AF

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33119S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 82.0

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2970			P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	1.5	B	J	P
7440-39-3	Barium	32.5	B	J	P
7440-41-7	Beryllium	0.54	B	U	P
7440-43-9	Cadmium	0.56	U		P
7440-70-2	Calcium	832	B	J	P
7440-47-3	Chromium	0.73	B		P
7440-48-4	Cobalt	0.98	B		P
7440-50-8	Copper	1.8	B		P
7439-89-6	Iron	5510			P
7439-92-1	Lead	2.8			P
7439-95-4	Magnesium	1080	B	J	P
7439-96-5	Manganese	69.4		J K	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	0.76	U		P
7440-09-7	Potassium	848	B	J	P
7782-49-2	Selenium	0.32	B	J	P
7440-22-4	Silver	0.76	U		P
7440-23-5	Sodium	135	U		P
7440-28-0	Thallium	0.49	U		P
7440-62-2	Vanadium	4.7	B	J	P
7440-66-6	Zinc	39.3			P
	Cyanide	0.15	U		CA

cf 8-8-00

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AH

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33120S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 78.1

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4890			P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.7			P
7440-39-3	Barium	62.3			P
7440-41-7	Beryllium	0.85	U		P
7440-43-9	Cadmium	0.59	U		P
7440-70-2	Calcium	1540			P
7440-47-3	Chromium	1.5	B		P
7440-48-4	Cobalt	1.9	B		P
7440-50-8	Copper	3.0	B		P
7439-89-6	Iron	8140			P
7439-92-1	Lead	4.5			P
7439-95-4	Magnesium	1690			P
7439-96-5	Manganese	134			P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	0.79	U		P
7440-09-7	Potassium	1210	B		P
7782-49-2	Selenium	0.33	U		P
7440-22-4	Silver	0.79	U		P
7440-23-5	Sodium	424	B		P
7440-28-0	Thallium	0.51	U		P
7440-62-2	Vanadium	8.1	B		P
7440-66-6	Zinc	46.0			P
	Cyanide	0.16	U		CA

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00AK

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33121S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 78.0

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2740			P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	2.7			P
7440-39-3	Barium	34.4	B	J	P
7440-41-7	Beryllium	0.51		UJ	P
7440-43-9	Cadmium	0.59	U		P
7440-70-2	Calcium	892	B	J	P
7440-47-3	Chromium	1.2	B		P
7440-48-4	Cobalt	0.87	B		P
7440-50-8	Copper	5.1	B		P
7439-89-6	Iron	4880			P
7439-92-1	Lead	2.5			P
7439-95-4	Magnesium	931	B	J	P
7439-96-5	Manganese	77.2		JK	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	0.79	U		P
7440-09-7	Potassium	732	B	J	P
7782-49-2	Selenium	0.67	B	J	P
7440-22-4	Silver	0.79	U		P
7440-23-5	Sodium	249	B	J	P
7440-28-0	Thallium	0.51	U		P
7440-62-2	Vanadium	4.5	B	J	P
7440-66-6	Zinc	26.7			P
	Cyanide	0.16	U		CA

CP 8-9-00

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00AM

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33122S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 10.2

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3170			P
7440-36-0	Antimony	12.3	U		P
7440-38-2	Arsenic	66.1			P
7440-39-3	Barium	81.5	B	J	P
7440-41-7	Beryllium	1.5		U	P
7440-43-9	Cadmium	17.3			P
7440-70-2	Calcium	5140	B	J	P
7440-47-3	Chromium	3.7	U		P
7440-48-4	Cobalt	5.8	U		P
7440-50-8	Copper	95.3			P
7439-89-6	Iron	31500			P
7439-92-1	Lead	299			P
7439-95-4	Magnesium	1510	B	J	P
7439-96-5	Manganese	682		JK	P
7439-97-6	Mercury	0.45	U		CV
7440-02-0	Nickel	6.0	U		P
7440-09-7	Potassium	1100	B	J	P
7782-49-2	Selenium	3.3	B	J	P
7440-22-4	Silver	6.0	U		P
7440-23-5	Sodium	1070	U		P
7440-28-0	Thallium	3.8	U		P
7440-62-2	Vanadium	10.4	B	J	P
7440-66-6	Zinc	1100			P
	Cyanide	1.2	U		CA

CP 8-8-00

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AP

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33123S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 53.6

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11200			P
7440-36-0	Antimony	2.4	U		P
7440-38-2	Arsenic	4.0			P
7440-39-3	Barium	121			P
7440-41-7	Beryllium	1.3		U	P
7440-43-9	Cadmium	0.86	U		P
7440-70-2	Calcium	3290			P
7440-47-3	Chromium	5.6			P
7440-48-4	Cobalt	3.5	B	J	P
7440-50-8	Copper	10.7			P
7439-89-6	Iron	11500			P
7439-92-1	Lead	10.7			P
7439-95-4	Magnesium	2440		JL	P
7439-96-5	Manganese	237		JK	P
7439-97-6	Mercury	0.09	U		CV
7440-02-0	Nickel	3.1	B	J	P
7440-09-7	Potassium	1510	B	↓	P
7782-49-2	Selenium	0.63	B	↓	P
7440-22-4	Silver	1.2	U		P
7440-23-5	Sodium	481	B	J	P
7440-28-0	Thallium	0.75	U		P
7440-62-2	Vanadium	15.0	B	J	P
7440-66-6	Zinc	66.3			P
	Cyanide	0.23	U		CA

UP 8-8-00

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AR

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33124S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 80.2

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2240			P
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	18.5			P
7440-39-3	Barium	24.7	B	J	P
7440-41-7	Beryllium	0.45	B	U	P
7440-43-9	Cadmium	0.57	U		P
7440-70-2	Calcium	596	B	J	P
7440-47-3	Chromium	1.3	B		P
7440-48-4	Cobalt	0.97	B		P
7440-50-8	Copper	5.2	B		P
7439-89-6	Iron	3830			P
7439-92-1	Lead	34.5			P
7439-95-4	Magnesium	896	B	J	P
7439-96-5	Manganese	163		J	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	0.95	B	J	P
7440-09-7	Potassium	907	B	J	P
7782-49-2	Selenium	0.37	B	J	P
7440-22-4	Silver	0.77	U		P
7440-23-5	Sodium	138	U		P
7440-28-0	Thallium	0.50	U		P
7440-62-2	Vanadium	5.8	B	J	P
7440-66-6	Zinc	133			P
	Cyanide				NR

CP 8-8-00

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00AT

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33125S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 9.1

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	802			P
7440-36-0	Antimony	151			P
7440-38-2	Arsenic	11600			P
7440-39-3	Barium	64.0	B	J	P
7440-41-7	Beryllium	2.6		U	P
7440-43-9	Cadmium	5.0	U		P
7440-70-2	Calcium	6070	B	J	P
7440-47-3	Chromium	4.1	U		P
7440-48-4	Cobalt	12.8	B	J	P
7440-50-8	Copper	14.4	B	J	P
7439-89-6	Iron	185000			P
7439-92-1	Lead	23.9			P
7439-95-4	Magnesium	877	B	E J	P
7439-96-5	Manganese	678		# JK	P
7439-97-6	Mercury	0.50	U		CV
7440-02-0	Nickel	16.3	B	J	P
7440-09-7	Potassium	1110	B	↓	P
7782-49-2	Selenium	10.0	B	↓	P
7440-22-4	Silver	6.7	U		P
7440-23-5	Sodium	7450	B	J	P
7440-28-0	Thallium	9.8		U	P
7440-62-2	Vanadium	11.8	B	J	P
7440-66-6	Zinc	21100			P
	Cyanide				NR

CF 8-8-00

Color Before: ORANGE Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:
SAMPLE IS WATERY

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AX

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A9

Matrix (soil/water): SOIL Lab Sample ID: 33126S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 87.3

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2450			P
7440-36-0	Antimony	1.5	U		P
7440-38-2	Arsenic	15.1			P
7440-39-3	Barium	26.1	B	J	P
7440-41-7	Beryllium	0.39		U	P
7440-43-9	Cadmium	0.53	U		P
7440-70-2	Calcium	938	B	J	P
7440-47-3	Chromium	1.5	B		P
7440-48-4	Cobalt	0.80	B		P
7440-50-8	Copper	3.9	B		P
7439-89-6	Iron	3990			P
7439-92-1	Lead	26.8			P
7439-95-4	Magnesium	990	B	E J	P
7439-96-5	Manganese	68.8		* J K	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	1.7	B	J	P
7440-09-7	Potassium	722	B	J	P
7782-49-2	Selenium	0.30	U		P
7440-22-4	Silver	0.71	U		P
7440-23-5	Sodium	127	U		P
7440-28-0	Thallium	0.46	U		P
7440-62-2	Vanadium	4.6	B	J	P
7440-66-6	Zinc	47.8			P
	Cyanide				NR

CP 8-8-00

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

LOCKHEED MARTIN
TECHNOLOGY SERVICES GROUP

ESAT Region 10
Lockheed Martin
7411 Beach Drive East
Port Orchard, WA 98366
Phone (360) 871-8723

DELIVERABLE NARRATIVE

DATE: August 8, 2000

To: Ginna Grepo-Grove, WAM, USEPA, Region 10

THROUGH: Dave Dobb, Team Manager, ESAT Region 10

FROM: Chris Pace, Data Validation Task Lead, ESAT Region 10

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Deadwood Mine Site Assessment. Case: 28289 SDG: MJ00A8

DOC: ESW10-4-1375
PWO: ESW72029
TDF: 3866
WA: 10-99-4-10
CN: 68-D6-0005

CC: Gerald Dodo, RPO, USEPA, Region 10
Project File

The quality assurance (QA) review of 11 water samples collected from the above referenced site has been completed. These samples were analyzed for total metals and cyanide* by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ00A8	MJ00AJ	MJ00AW
MJ00AA	MJ00AL	
MJ00AC	MJ00AN	
MJ00AE	MJ00AQ	
MJ00AG	MJ00AS	

*Samples MJ00AA, MJ00AQ, MJ00AS and MJ00AW were not analyzed for cyanide.

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analysis (ILM04.1) and the USEPA CLP Functional Guidelines for Inorganic Data Review, 2/94.

The conclusions presented herein are based on the information provided for the review.

Holding Time - Acceptable

The suggested holding time for cyanide is 14 days, mercury is 28 days and the rest of the metals is 180 days from the date of sample collection. The samples were collected on 7/12/00. The samples were analyzed for cyanide within 6 days, mercury within 6 days and all other metals within 9 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

The samples were prepared in accordance with the methods used. None of the data were qualified on this basis.

Initial Calibration - Acceptable

All of the samples were analyzed for total cyanide using Semi-Automated Spectrophotometric Determination. The initial calibration for cyanide met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

All of the samples were analyzed for total mercury using Cold Vapor Atomic Absorption Spectroscopy (CVAAS). The initial calibration for mercury met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

The rest of the target analytes were analyzed using Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES). The initial calibration for ICP-AES met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

None of the data were qualified on this basis.

Calibration Verification - Acceptable

The initial and continuing calibration verifications met the criteria for frequency of analysis and recovery criteria of 90-110% for ICP-AES, 80-120% for mercury and 85-115% for cyanide. The recoveries ranged from 93-107% for ICP-AES, from 93-97% for mercury and from 92-107% for cyanide. None of the data were qualified on this basis.

Detection Limits - Acceptable

All of the target analytes met the project required quantitation limits. All of the Contract Required Detection Limit (CRDL) checks met the frequency of analysis and recovery criteria.

Blanks

Procedural blanks were prepared with the samples to indicate potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified as non-detects, "U", if the analyte concentration is less than five times the analytical value in the blank.

The frequency of analysis of blanks was met. Based on the target analytes detected in the procedural, initial and continuing calibration blanks, the following results were qualified as non-detects, "U":

Analyte	Associated Samples
thallium	MJ00AE, MJ00AG, MJ00AW

Analytes which yielded a negative response in the preparation blank and/or continuing calibration blank(s) at concentrations comparable to or less than the absolute value of the blank(s) were qualified as estimated, "J/UJ", due to possible low bias. The following samples were qualified:

Analyte	Associated Samples
lead	MJ00A8, MJ00AG, MJ00AQ

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met by all of the ICS analyzed. The recoveries ranged from 87-114%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis - Acceptable

Sample MJ00AJ was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference. None of the data were qualified on this basis.

Laboratory Control Sample - Acceptable

The frequency of analysis and the recovery criteria for the laboratory control sample were met. The recoveries ranged from 91-108%. None of the data were qualified on this basis.

Duplicate Sample Analysis

Sample MJ00AJ was utilized for duplicate analysis. The duplicate results met the frequency of analysis and control limit criteria for all target analytes with the exception of lead. Results for lead in all samples were qualified as estimated, "J". The "*" qualifiers applied by the laboratory were crossed-out by the reviewer.

Matrix Spike Analysis - Acceptable

Sample MJ00AJ was used for the spike analysis. The frequency of analysis and recovery criteria were met. All of the spike recoveries were acceptable and ranged from 88-107%. None of the data were qualified on this basis.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

All of the samples were analyzed in accordance with technical specifications outlined in the SOW. The data, as qualified, are acceptable and can be used for all purposes.

DATA QUALIFIERS

U	-	The analyte was not detected at or above the reported result.
J	-	The analyte was positively identified. The associated numerical result is an estimate.
R	-	The data are unusable for all purposes.
N	-	There is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.
L	-	Low bias.
H	-	High bias.
Q	-	The result is estimated because the concentration is below the Contract Required Quantitation Limits (CRQLs).
K	-	Unknown Bias.

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00A8

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33105S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	1.7	U		P
7440-39-3	Barium	13.4	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	10400			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	42.7	B	J	P
7439-92-1	Lead	2.6	B	J	P
7439-95-4	Magnesium	948	B	J	P
7439-96-5	Manganese	2.2	B	J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	540	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	1890	B	J	P
7440-28-0	Thallium	2.0	U		P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	14.8	B	J	P
	Cyanide	2.5	U		CA

cf 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AA

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33106S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	2.2	B	J	P
7440-39-3	Barium	12.2	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	10200			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	82.6	B	J	P
7439-92-1	Lead	4.3		J ≠ JK	P
7439-95-4	Magnesium	989	B	J	P
7439-96-5	Manganese	10.2	B	J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	553	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	2140	B	J	P
7440-28-0	Thallium	2.0	U		P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	40.7			P
	Cyanide				NR

CF 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AC

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33107S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	1.7	U		P
7440-39-3	Barium	15.7	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	11400			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	44.6	B	J	P
7439-92-1	Lead	4.8		J+ JK	P
7439-95-4	Magnesium	1050	B	J	P
7439-96-5	Manganese	2.2	B	J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	721	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	2190	B	J	P
7440-28-0	Thallium	2.0	U		P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	27.7			P
	Cyanide	2.5	U		CA

CP 9-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AE

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33108S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	1.7	U		P
7440-39-3	Barium	15.2	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	11100			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	74.7	B	J	P
7439-92-1	Lead	7.2		J+ JK	P
7439-95-4	Magnesium	1000	B	J	P
7439-96-5	Manganese	2.3	B	J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	584	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	1880	B	J	P
7440-28-0	Thallium	2.6	[illegible]	J	P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	22.8			P
_____	Cyanide	2.5	U		CA

CP 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AG

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33109S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	1.7	U		P
7440-39-3	Barium	15.6	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	11500			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	44.8	B	J	P
7439-92-1	Lead	2.8	B	J*	P
7439-95-4	Magnesium	1050	B	J	P
7439-96-5	Manganese	1.9	B	J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	612	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	1980	B	J	P
7440-28-0	Thallium	2.2	[redacted]	U	P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	12.2	B	J	P
	Cyanide	2.5	U		CA

cp 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00AJ

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33110S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	1.7	U		P
7440-39-3	Barium	16.2	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	12600			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	43.6	B	J	P
7439-92-1	Lead	7.7		J+ JK	P
7439-95-4	Magnesium	1060	B		P
7439-96-5	Manganese	3.0	B	J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	596	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	1940	B	J	P
7440-28-0	Thallium	2.3	B	J	P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	26.0			P
	Cyanide	2.5	U		CA

JP 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AL

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33111S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	2.3	B	J	P
7440-39-3	Barium	17.2	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	14100			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	569			P
7439-92-1	Lead	7.8		J+JK	P
7439-95-4	Magnesium	1380	B	J	P
7439-96-5	Manganese	35.8			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	1070	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	2330	B	J	P
7440-28-0	Thallium	2.0	U		P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	31.8			P
	Cyanide	2.5	U		CA

cf 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AN

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33112S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	1.7	U		P
7440-39-3	Barium	15.4	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	11600			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	59.9	B	J	P
7439-92-1	Lead	5.0		J K	P
7439-95-4	Magnesium	1050	B	J	P
7439-96-5	Manganese	2.7	B	J	P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	615	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	2080	B	J	P
7440-28-0	Thallium	2.0	U		P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	15.6	B	J	P
	Cyanide	2.5	U		CA

CP 8-9-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AQ

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33113S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	83.6	U		P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	22.4			P
7440-39-3	Barium	5.7	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	10700			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	449			P
7439-92-1	Lead	2.6	B	# J	P
7439-95-4	Magnesium	2010	B	J	P
7439-96-5	Manganese	112			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	767	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	2970	B	J	P
7440-28-0	Thallium	2.0	U		P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	455			P
	Cyanide				NR

CP 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AS

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33114S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	93.4	B	J	P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	176			P
7440-39-3	Barium	16.0	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	36000			P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	B	J	P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	3310			P
7439-92-1	Lead	3.8		+ JK	P
7439-95-4	Magnesium	8160			P
7439-96-5	Manganese	617			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	5.7	B	J	P
7440-09-7	Potassium	1550	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	5980			P
7440-28-0	Thallium	2.0	U		P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	2380			P
	Cyanide				NR

cf 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00AW

Lab Name: Sentinel, Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ00A8

Matrix (soil/water): WATER Lab Sample ID: 33115S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 0.0

Concentration Units (ug/L or mg/Kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	359			P
7440-36-0	Antimony	6.4	U		P
7440-38-2	Arsenic	7.0	B	J	P
7440-39-3	Barium	10.4	B	J	P
7440-41-7	Beryllium	0.80	U		P
7440-43-9	Cadmium	2.3	U		P
7440-70-2	Calcium	4680	B	J	P
7440-47-3	Chromium	1.9	U		P
7440-48-4	Cobalt	3.0	U		P
7440-50-8	Copper	3.6	U		P
7439-89-6	Iron	320			P
7439-92-1	Lead	16.9		J + JK	P
7439-95-4	Magnesium	560	B	J	P
7439-96-5	Manganese	39.4			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	3.1	U		P
7440-09-7	Potassium	683	B	J	P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	3.1	U		P
7440-23-5	Sodium	2370	B	J	P
7440-28-0	Thallium	2.7	B	J	P
7440-62-2	Vanadium	2.7	U		P
7440-66-6	Zinc	32.9			P
	Cyanide				NR

JF 8-8-00

Color Before: COLORLESS Clarity Before: CLEAR Texture:

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Comments:

LOCKHEED MARTIN
TECHNOLOGY SERVICES GROUP

ESAT Region 10
Lockheed Martin
7411 Beach Drive East
Port Orchard, WA 98366
Phone (360) 871-8723

DELIVERABLE NARRATIVE

DATE: August 7, 2000

To: Ginna Grepo-Grove, WAM, USEPA, Region 10

THROUGH: Dave Dobb, Team Manager, ESAT Region 10 DD

FROM: Chris Pace, Data Validation Task Lead, ESAT Region 10 CP

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Deadwood Mine Site Assessment. Case: 28289 SDG: MJ009R

DOC: ESW10-4-1374
PWO: ESW72029
TDF: 3866
WA: 10-99-4-10
CN: 68-D6-0005

CC: Gerald Dodo, RPO, USEPA, Region 10
Project File

The quality assurance (QA) review of 15 soil samples collected from the above referenced site has been completed. These samples were analyzed for total metals and cyanide* by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ009R	MJ009Y	MJ00A3
MJ009S	MJ009Z	MJ00A4
MJ009T	MJ00A0	MJ00A5
MJ009W	MJ00A1	MJ00A6
MJ009X	MJ00A2	MJ00A7

*Samples MJ009S, MJ009T, MJ009W and MJ009X were not analyzed for cyanide.

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analysis (ILM04.1) and the USEPA CLP Functional Guidelines for Inorganic Data Review, 2/94.

The conclusions presented herein are based on the information provided for the review.

Holding Time - Acceptable

The suggested holding time for cyanide is 14 days, mercury is 28 days and the rest of the metals is 180 days from the date of sample collection. The samples were collected on 7/11/00. The samples were analyzed for cyanide within 7 days, mercury within 7 days and all other metals within 13 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

The samples were prepared in accordance with the methods used. None of the data were qualified on this basis.

Initial Calibration - Acceptable

All of the samples were analyzed for total cyanide using Semi-Automated Spectrophotometric Determination. The initial calibration for cyanide met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

All of the samples were analyzed for total mercury using Cold Vapor Atomic Absorption Spectroscopy (CVAAS). The initial calibration for mercury met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

The rest of the target analytes were analyzed using Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES). The initial calibration for ICP-AES met the frequency of analysis and the linearity criteria (correlation coefficients, r=>0.995).

None of the data were qualified on this basis.

Calibration Verification - Acceptable

The initial and continuing calibration verifications met the criteria for frequency of analysis and recovery criteria of 90-110% for ICP-AES, 80-120% for mercury and 85-115% for cyanide. The recoveries ranged from 93-107% for ICP-AES, from 91-97% for mercury and from 89-92% for cyanide. None of the data were qualified on this basis.

Detection Limits - Acceptable

All of the target analytes met the project required quantitation limits. All of the Contract Required Detection Limit (CRDL) checks met the frequency of analysis and recovery criteria.

Blanks

Procedural blanks were prepared with the samples to indicate potential contamination from the digestion or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified as non-detects, "U", if the analyte concentration is less than five times the analytical value in the blank.

The frequency of analysis of blanks was met. Based on the target analytes detected in the procedural, initial and continuing calibration blanks, the following results were qualified as non-detects, "U":

Analyte	Associated Samples
thallium	MJ00A1, MJ00A2, MJ00A3, MJ00A4, MJ00A5, MJ00A6

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met by all of the ICS analyzed. The recoveries ranged from 86-110%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis - Acceptable

Sample MJ00A7 was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference. None of the data were qualified on this basis.

Laboratory Control Sample

The frequency of analysis and the recovery criteria for the laboratory control sample were met with the exception of sodium (766%). Due to possible bias, detected sodium results in all samples were qualified as estimated, "J", and non-detects were not qualified. All other recoveries were acceptable and ranged from 77-131%.

Duplicate Sample Analysis - Acceptable

Sample MJ00A7 was utilized for duplicate analysis. The duplicate results met the frequency of analysis and control limit criteria for all target analytes. None of the data were qualified on this basis.

Matrix Spike Analysis

Sample MJ00A7 was used for the spike analysis. The frequency of analysis and recovery criteria were met with the exception of antimony (57%) and cyanide (67%) in the spike sample MJ00A7S. Due to possible bias, the detected and non-detected antimony and cyanide results in all samples were qualified as estimated, "J/UJ". The "N" qualifiers applied by the laboratory were crossed-out by the reviewer. All of the other spike recoveries were acceptable and ranged from 89-108%.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

All of the samples were analyzed in accordance with technical specifications outlined in the SOW. The data, as qualified, are acceptable and can be used for all purposes.

DATA QUALIFIERS

U	-	The analyte was not detected at or above the reported result.
J	-	The analyte was positively identified. The associated numerical result is an estimate.
R	-	The data are unusable for all purposes.
N	-	There is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical result is an estimate.
UJ	-	The analyte was not detected at or above the reported estimated result. The associated numerical value is an estimate of the quantitation limit of the analyte in this sample.
L	-	Low bias.
H	-	High bias.
Q	-	The result is estimated because the concentration is below the Contract Required Quantitation Limits (CRQLs).
K	-	Unknown Bias.

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ009R

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33090S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 95.0

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7920			P
7440-36-0	Antimony	1.3	U	NUJK	P
7440-38-2	Arsenic	4.3			P
7440-39-3	Barium	111			P
7440-41-7	Beryllium	1.2			P
7440-43-9	Cadmium	0.48	U		P
7440-70-2	Calcium	3500			P
7440-47-3	Chromium	7.1			P
7440-48-4	Cobalt	5.8	B	J	P
7440-50-8	Copper	8.9			P
7439-89-6	Iron	9360			P
7439-92-1	Lead	16.1			P
7439-95-4	Magnesium	3830			P
7439-96-5	Manganese	383			P
7439-97-6	Mercury	0.05	U		CV
7440-02-0	Nickel	10.9			P
7440-09-7	Potassium	1510			P
7782-49-2	Selenium	0.42	B	J	P
7440-22-4	Silver	0.65	U		P
7440-23-5	Sodium	319	B	J	P
7440-28-0	Thallium	0.42	U		P
7440-62-2	Vanadium	15.4			P
7440-66-6	Zinc	84.7			P
	Cyanide	0.13	U	NUJK	CA

CF 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ009S

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33091S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 94.8

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2550			P
7440-36-0	Antimony	46.9		NJL	P
7440-38-2	Arsenic	137			P
7440-39-3	Barium	50.1			P
7440-41-7	Beryllium	0.38	B	J	P
7440-43-9	Cadmium	36.5			P
7440-70-2	Calcium	2310			P
7440-47-3	Chromium	2.3			P
7440-48-4	Cobalt	4.2	B	J	P
7440-50-8	Copper	236			P
7439-89-6	Iron	16900			P
7439-92-1	Lead	1810			P
7439-95-4	Magnesium	1700			P
7439-96-5	Manganese	745			P
7439-97-6	Mercury	1.7			CV
7440-02-0	Nickel	9.4			P
7440-09-7	Potassium	705	B	J	P
7782-49-2	Selenium	2.2			P
7440-22-4	Silver	55.0			P
7440-23-5	Sodium	2040		JH	P
7440-28-0	Thallium	0.42	U		P
7440-62-2	Vanadium	10.1	B	J	P
7440-66-6	Zinc	4540			P
	Cyanide				NR

CR 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ009T

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33092S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 95.6

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3340			P
7440-36-0	Antimony	44.0		MJL	P
7440-38-2	Arsenic	239			P
7440-39-3	Barium	56.2			P
7440-41-7	Beryllium	0.46	B	J	P
7440-43-9	Cadmium	42.2			P
7440-70-2	Calcium	3840			P
7440-47-3	Chromium	6.5			P
7440-48-4	Cobalt	7.7	B	J	P
7440-50-8	Copper	278			P
7439-89-6	Iron	26400			P
7439-92-1	Lead	1430			P
7439-95-4	Magnesium	2970			P
7439-96-5	Manganese	1000			P
7439-97-6	Mercury	2.2			CV
7440-02-0	Nickel	30.4			P
7440-09-7	Potassium	739	B	J	P
7782-49-2	Selenium	2.8			P
7440-22-4	Silver	31.4			P
7440-23-5	Sodium	2550		JH	P
7440-28-0	Thallium	0.42	U		P
7440-62-2	Vanadium	14.4			P
7440-66-6	Zinc	5920			P
	Cyanide				NR

CP 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ009W

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33093S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 91.8

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2500			P
7440-36-0	Antimony	31.7		N J L	P
7440-38-2	Arsenic	144			P
7440-39-3	Barium	49.9			P
7440-41-7	Beryllium	0.26	B	J	P
7440-43-9	Cadmium	34.3			P
7440-70-2	Calcium	3540			P
7440-47-3	Chromium	2.7			P
7440-48-4	Cobalt	3.9	B	J	P
7440-50-8	Copper	206			P
7439-89-6	Iron	14300			P
7439-92-1	Lead	1190			P
7439-95-4	Magnesium	2040			P
7439-96-5	Manganese	532			P
7439-97-6	Mercury	1.4			CV
7440-02-0	Nickel	11.3			P
7440-09-7	Potassium	688	B	J	P
7782-49-2	Selenium	2.0			P
7440-22-4	Silver	22.2			P
7440-23-5	Sodium	1820		J H	P
7440-28-0	Thallium	0.44	U		P
7440-62-2	Vanadium	9.2	B	J	P
7440-66-6	Zinc	4170			P
	Cyanide				NR

cp 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

Q

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ009X

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33094S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 95.8

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2540			P
7440-36-0	Antimony	21.8		~~N~~ JL	P
7440-38-2	Arsenic	145			P
7440-39-3	Barium	71.4			P
7440-41-7	Beryllium	0.31	B	J	P
7440-43-9	Cadmium	28.4			P
7440-70-2	Calcium	9590			P
7440-47-3	Chromium	3.4			P
7440-48-4	Cobalt	5.0	B	J	P
7440-50-8	Copper	153			P
7439-89-6	Iron	15700			P
7439-92-1	Lead	931			P
7439-95-4	Magnesium	4460			P
7439-96-5	Manganese	694			P
7439-97-6	Mercury	1.5			CV
7440-02-0	Nickel	14.2			P
7440-09-7	Potassium	739	B	J	P
7782-49-2	Selenium	2.1			P
7440-22-4	Silver	13.0			P
7440-23-5	Sodium	1310		JH	P
7440-28-0	Thallium	0.42	U		P
7440-62-2	Vanadium	10.9			P
7440-66-6	Zinc	3000			P
	Cyanide				NR

cf 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

X

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ009Y

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33095S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 90.7

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4850			P
7440-36-0	Antimony	55.1		NJL	P
7440-38-2	Arsenic	114			P
7440-39-3	Barium	68.4			P
7440-41-7	Beryllium	0.61	B	J	P
7440-43-9	Cadmium	50.3			P
7440-70-2	Calcium	866	B	J	P
7440-47-3	Chromium	3.1			P
7440-48-4	Cobalt	18.3			P
7440-50-8	Copper	492			P
7439-89-6	Iron	9850			P
7439-92-1	Lead	997			P
7439-95-4	Magnesium	1430			P
7439-96-5	Manganese	813			P
7439-97-6	Mercury	6.6			CV
7440-02-0	Nickel	3.2	B	J	P
7440-09-7	Potassium	1250			P
7782-49-2	Selenium	1.5			P
7440-22-4	Silver	22.5			P
7440-23-5	Sodium	1490		JH	P
7440-28-0	Thallium	0.44	U		P
7440-62-2	Vanadium	12.3			P
7440-66-6	Zinc	3140			P
	Cyanide	0.14	U	NUJK	CA

MP 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

8

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ009Z

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33096S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 97.5

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2800			P
7440-36-0	Antimony	122		NJL	P
7440-38-2	Arsenic	100			P
7440-39-3	Barium	40.8	B	J	P
7440-41-7	Beryllium	0.41	B	J	P
7440-43-9	Cadmium	90.1			P
7440-70-2	Calcium	615	B	J	P
7440-47-3	Chromium	2.6			P
7440-48-4	Cobalt	3.6	B	J	P
7440-50-8	Copper	409			P
7439-89-6	Iron	12400			P
7439-92-1	Lead	16800			P
7439-95-4	Magnesium	960	B	J	P
7439-96-5	Manganese	155			P
7439-97-6	Mercury	10.1			CV
7440-02-0	Nickel	2.5	B	J	P
7440-09-7	Potassium	892	B	J	P
7782-49-2	Selenium	11.0			P
7440-22-4	Silver	76.3			P
7440-23-5	Sodium	4450		JH	P
7440-28-0	Thallium	0.41	U		P
7440-62-2	Vanadium	7.5	B	J	P
7440-66-6	Zinc	9510			P
	Cyanide	0.13	U	NUJK	CA

CM 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00A0

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33097S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 90.0

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5840			P
7440-36-0	Antimony	45.0		N J L	P
7440-38-2	Arsenic	76.4			P
7440-39-3	Barium	55.2			P
7440-41-7	Beryllium	0.67	B	J	P
7440-43-9	Cadmium	46.8			P
7440-70-2	Calcium	684	B	J	P
7440-47-3	Chromium	4.0			P
7440-48-4	Cobalt	4.9	B	J	P
7440-50-8	Copper	988			P
7439-89-6	Iron	11100			P
7439-92-1	Lead	1200			P
7439-95-4	Magnesium	1360			P
7439-96-5	Manganese	246			P
7439-97-6	Mercury	19.5			CV
7440-02-0	Nickel	5.0	B	J	P
7440-09-7	Potassium	1390			P
7782-49-2	Selenium	1.8			P
7440-22-4	Silver	30.6			P
7440-23-5	Sodium	5190		J H	P
7440-28-0	Thallium	0.44	U		P
7440-62-2	Vanadium	10.2	B	J	P
7440-66-6	Zinc	11200			P
	Cyanide	0.23	B	N J	CA

CPS-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00A1

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33098S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 93.4

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	542			P
7440-36-0	Antimony	64.0		NJL	P
7440-38-2	Arsenic	73.0			P
7440-39-3	Barium	5.1	B	J	P
7440-41-7	Beryllium	1.2			P
7440-43-9	Cadmium	7.1			P
7440-70-2	Calcium	1300			P
7440-47-3	Chromium	1.2	B	J	P
7440-48-4	Cobalt	10.1	B	J	P
7440-50-8	Copper	303			P
7439-89-6	Iron	125000			P
7439-92-1	Lead	697			P
7439-95-4	Magnesium	2650			P
7439-96-5	Manganese	6920			P
7439-97-6	Mercury	0.78			CV
7440-02-0	Nickel	12.3			P
7440-09-7	Potassium	133	B	J	P
7782-49-2	Selenium	3.6			P
7440-22-4	Silver	25.8			P
7440-23-5	Sodium	815	B	J/W	P
7440-28-0	Thallium	3.0		U	P
7440-62-2	Vanadium	24.5			P
7440-66-6	Zinc	1520			P
	Cyanide	0.13	U	NUJK	CA

CP 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00A2

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33099S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 86.3

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	719			P
7440-36-0	Antimony	26.8		N J L	P
7440-38-2	Arsenic	187			P
7440-39-3	Barium	24.3	B	J	P
7440-41-7	Beryllium	0.60	B	J	P
7440-43-9	Cadmium	37.1			P
7440-70-2	Calcium	3750			P
7440-47-3	Chromium	3.5			P
7440-48-4	Cobalt	5.3	B	J	P
7440-50-8	Copper	256			P
7439-89-6	Iron	53200			P
7439-92-1	Lead	820			P
7439-95-4	Magnesium	3630			P
7439-96-5	Manganese	2640			P
7439-97-6	Mercury	1.2			CV
7440-02-0	Nickel	7.6	B	J	P
7440-09-7	Potassium	344	B	J	P
7782-49-2	Selenium	2.8			P
7440-22-4	Silver	8.1			P
7440-23-5	Sodium	991	B	J HW	P
7440-28-0	Thallium	1.4	B	U	P
7440-62-2	Vanadium	13.4			P
7440-66-6	Zinc	2180			P
	Cyanide	0.70		N J L	CA

CP 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00A3

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33100S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 91.1

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	637			P
7440-36-0	Antimony	25.0		~~N~~ J L	P
7440-38-2	Arsenic	127			P
7440-39-3	Barium	6.1	B	J	P
7440-41-7	Beryllium	0.61	B	J	P
7440-43-9	Cadmium	38.9			P
7440-70-2	Calcium	3110			P
7440-47-3	Chromium	2.7			P
7440-48-4	Cobalt	7.6	B	J	P
7440-50-8	Copper	186			P
7439-89-6	Iron	60500			P
7439-92-1	Lead	676			P
7439-95-4	Magnesium	3940			P
7439-96-5	Manganese	3160			P
7439-97-6	Mercury	1.5			CV
7440-02-0	Nickel	9.5			P
7440-09-7	Potassium	326	B	J	P
7782-49-2	Selenium	2.5			P
7440-22-4	Silver	11.2			P
7440-23-5	Sodium	1480		J H	P
7440-28-0	Thallium	1.2	~~B~~	U	P
7440-62-2	Vanadium	14.3			P
7440-66-6	Zinc	3230			P
	Cyanide	0.25	B	~~N~~ J ~~L~~	CA

CP 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00A4

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33101S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 85.0

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	309			P
7440-36-0	Antimony	31.3		NJL	P
7440-38-2	Arsenic	211			P
7440-39-3	Barium	9.2	B	J	P
7440-41-7	Beryllium	0.66	B	J	P
7440-43-9	Cadmium	39.2			P
7440-70-2	Calcium	1210			P
7440-47-3	Chromium	0.71	B	J	P
7440-48-4	Cobalt	5.6	B	J	P
7440-50-8	Copper	143			P
7439-89-6	Iron	67300			P
7439-92-1	Lead	1020			P
7439-95-4	Magnesium	3590			P
7439-96-5	Manganese	3410			P
7439-97-6	Mercury	5.0			CV
7440-02-0	Nickel	6.0	B	J	P
7440-09-7	Potassium	197	B	J	P
7782-49-2	Selenium	2.6			P
7440-22-4	Silver	14.1			P
7440-23-5	Sodium	1490		JH	P
7440-28-0	Thallium	1.5	B	U	P
7440-62-2	Vanadium	16.0			P
7440-66-6	Zinc	3310			P
	Cyanide	0.15	U	NUJK	CA

WP 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ00A5

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33102S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 79.7

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	645			P
7440-36-0	Antimony	39.7		N J L	P
7440-38-2	Arsenic	116			P
7440-39-3	Barium	4.0	B	J	P
7440-41-7	Beryllium	0.66	B	J	P
7440-43-9	Cadmium	119			P
7440-70-2	Calcium	1840			P
7440-47-3	Chromium	3.3			P
7440-48-4	Cobalt	7.7	B	J	P
7440-50-8	Copper	215			P
7439-89-6	Iron	61300			P
7439-92-1	Lead	1140			P
7439-95-4	Magnesium	3760			P
7439-96-5	Manganese	3040			P
7439-97-6	Mercury	3.9			CV
7440-02-0	Nickel	8.3	B	J	P
7440-09-7	Potassium	213	B	J	P
7782-49-2	Selenium	2.6			P
7440-22-4	Silver	11.8			P
7440-23-5	Sodium	4940		J H	P
7440-28-0	Thallium	1.3	U	U	P
7440-62-2	Vanadium	15.0			P
7440-66-6	Zinc	10800			P
	Cyanide	0.16	U	N U J K	CA

cp 8-7-00

Color Before: GREY Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:
GREY W/ ORANGE SPECKS

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00A6

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33103S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 64.3

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1130			P
7440-36-0	Antimony	14.1	B	N J	P
7440-38-2	Arsenic	74.5			P
7440-39-3	Barium	13.5	B	J	P
7440-41-7	Beryllium	0.44	B	J	P
7440-43-9	Cadmium	17.7			P
7440-70-2	Calcium	1150	B	J	P
7440-47-3	Chromium	3.2			P
7440-48-4	Cobalt	3.3	B	J	P
7440-50-8	Copper	206			P
7439-89-6	Iron	34000			P
7439-92-1	Lead	582			P
7439-95-4	Magnesium	2030			P
7439-96-5	Manganese	1620			P
7439-97-6	Mercury	0.69			CV
7440-02-0	Nickel	6.1	B	J	P
7440-09-7	Potassium	303	B	J	P
7782-49-2	Selenium	1.6			P
7440-22-4	Silver	7.5			P
7440-23-5	Sodium	875	B	J	P
7440-28-0	Thallium	1.0	U	U	P
7440-62-2	Vanadium	9.7	B	J	P
7440-66-6	Zinc	2070			P
	Cyanide	0.19	U	UJK	CA

LP 8-1-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ00A7

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Matrix (soil/water): SOIL Lab Sample ID: 33104S

Level (low/med): LOW Date Received: 07/14/00

% Solids: 45.3

Concentration Units (ug/L or mg/Kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	14400			P
7440-36-0	Antimony	2.8	U	NUJK	P
7440-38-2	Arsenic	5.7			P
7440-39-3	Barium	179			P
7440-41-7	Beryllium	1.4	B	J	P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	4810			P
7440-47-3	Chromium	8.5			P
7440-48-4	Cobalt	4.8	B	J	P
7440-50-8	Copper	20.3			P
7439-89-6	Iron	14500			P
7439-92-1	Lead	17.6			P
7439-95-4	Magnesium	3100			P
7439-96-5	Manganese	275			P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	4.5	B	J	P
7440-09-7	Potassium	1620	B	↓	P
7782-49-2	Selenium	1.1	B		P
7440-22-4	Silver	1.4	U		P
7440-23-5	Sodium	712	B	J	P
7440-28-0	Thallium	0.88	U		P
7440-62-2	Vanadium	21.2	B	J	P
7440-66-6	Zinc	104			P
	Cyanide	0.27	U	NUJK	CA

CP 8-7-00

Color Before: BROWN Clarity Before: Texture: FINE

Color After: YELLOW Clarity After: Artifacts:

Comments:

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

ICP ID Number: P3 Date: 07/01/00

Flame AA ID Number:

Furnace AA ID Number:

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum	308.20		200	83.6	P
Antimony	206.80		60	6.4	P
Arsenic	189.00		10	1.7	P
Barium	493.40		200	1.2	P
Beryllium	313.00		5	0.8	P
Cadmium	226.50		5	2.3	P
Calcium	317.90		5000	73.1	P
Chromium	267.70		10	1.9	P
Cobalt	228.60		50	3.0	P
Copper	324.70		25	3.6	P
Iron	271.40		100	31.8	P
Lead	220.30		3	1.0	P
Magnesium	279.00		5000	42.8	P
Manganese	257.60		15	0.7	P
Mercury			0.2		NR
Nickel	231.60		40	3.1	P
Potassium	766.40		5000	26.9	P
Selenium	196.00		5	1.3	P
Silver	328.00		10	3.1	P
Sodium	330.20		5000	554.5	P
Thallium	190.80		10	2.0	P
Vanadium	292.40		50	2.7	P
Zinc	206.20		20	3.6	P
Cyanide			10		NR

Comments:

P3: THERM0 JARRELL ASH

10
INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

ICP ID Number: Date: 07/15/00

Flame AA ID Number: C5

Furnace AA ID Number:

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		NR
Antimony			60		NR
Arsenic			10		NR
Barium			200		NR
Beryllium			5		NR
Cadmium			5		NR
Calcium			5000		NR
Chromium			10		NR
Cobalt			50		NR
Copper			25		NR
Iron			100		NR
Lead			3		NR
Magnesium			5000		NR
Manganese			15		NR
Mercury	253.60		0.2	0.1	CV
Nickel			40		NR
Potassium			5000		NR
Selenium			5		NR
Silver			10		NR
Sodium			5000		NR
Thallium			10		NR
Vanadium			50		NR
Zinc			20		NR
Cyanide			10		NR

Comments:
C5: CETAC M6000

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INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

ICP ID Number: Date: 07/15/00

Flame AA ID Number: C1

Furnace AA ID Number:

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		NR
Antimony			60		NR
Arsenic			10		NR
Barium			200		NR
Beryllium			5		NR
Cadmium			5		NR
Calcium			5000		NR
Chromium			10		NR
Cobalt			50		NR
Copper			25		NR
Iron			100		NR
Lead			3		NR
Magnesium			5000		NR
Manganese			15		NR
Mercury			0.2		NR
Nickel			40		NR
Potassium			5000		NR
Selenium			5		NR
Silver			10		NR
Sodium			5000		NR
Thallium			10		NR
Vanadium			50		NR
Zinc			20		NR
Cyanide	578.00		10	2.5	CA

Comments:

C1: LACHAT

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PREPARATION LOG

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Method: P

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
LCSS	07/18/00	1.00	200
MJ009R	07/18/00	1.00	200
MJ009S	07/18/00	1.00	200
MJ009T	07/18/00	1.00	200
MJ009W	07/18/00	1.00	200
MJ009X	07/18/00	1.00	200
MJ009Y	07/18/00	1.01	200
MJ009Z	07/18/00	1.00	200
MJ00A0	07/18/00	1.00	200
MJ00A1	07/18/00	1.00	200
MJ00A2	07/18/00	1.00	200
MJ00A3	07/18/00	1.00	200
MJ00A4	07/18/00	1.00	200
MJ00A5	07/18/00	1.02	200
MJ00A6	07/18/00	1.00	200
MJ00A7	07/18/00	1.00	200
MJ00A7D	07/18/00	1.00	200
MJ00A7S	07/18/00	1.00	200
PBS	07/18/00	1.00	200

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PREPARATION LOG

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Method: CV

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
LCSS	07/17/00	0.20	100
MJ009R	07/17/00	0.20	100
MJ009S	07/17/00	0.20	100
MJ009T	07/17/00	0.20	100
MJ009W	07/17/00	0.20	100
MJ009X	07/17/00	0.20	100
MJ009Y	07/17/00	0.20	100
MJ009Z	07/17/00	0.20	100
MJ00A0	07/17/00	0.20	100
MJ00A1	07/17/00	0.20	100
MJ00A2	07/17/00	0.20	100
MJ00A3	07/17/00	0.20	100
MJ00A4	07/17/00	0.20	100
MJ00A5	07/17/00	0.20	100
MJ00A6	07/17/00	0.20	100
MJ00A7	07/17/00	0.20	100
MJ00A7D	07/17/00	0.20	100
MJ00A7S	07/17/00	0.20	100
PBS	07/17/00	0.20	100

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PREPARATION LOG

Lab Name: Sentinel Inc. Contract: 68-W-00-085

Lab Code: SENTIN Case No.: 28289 SAS No.: SDG No.: MJ009R

Method: CA

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
LCSS	07/17/00	1.00	50
MJ009R	07/17/00	1.02	50
MJ009Y	07/17/00	1.00	50
MJ009Z	07/17/00	1.00	50
MJ00A0	07/17/00	1.01	50
MJ00A1	07/17/00	1.01	50
MJ00A2	07/17/00	1.02	50
MJ00A3	07/17/00	1.02	50
MJ00A4	07/17/00	1.00	50
MJ00A5	07/17/00	1.01	50
MJ00A6	07/17/00	1.02	50
MJ00A7	07/17/00	1.02	50
MJ00A7D	07/17/00	1.01	50
MJ00A7S	07/17/00	1.00	50
PBS	07/17/00	1.00	50
S100	07/17/00		50

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