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Harmony Mine Site
Preliminary Assessment/Site Inspection Report
Lemhi County, Idaho
TDD: 99-02-0004

Contract: 68-W6-0008
May 2000

Region 10

START

Superfund Technical Assessment and Response Team

Submitted To: Monica Tonel, Task Monitor
U.S. Environmental Protection Agency
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136113

HARMONY MINE SITE
PRELIMINARY ASSESSMENT/SITE INSPECTION REPORT
LEMHI COUNTY, IDAHO

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LIST OF ACRONYMS

Acronym	Definition
%R	percent recovery
AC	adjusted concentration
bgs	below ground surface
BLM	Bureau of Land Management
Ca	calcium
$CaCO_3$	calcium carbonate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System (EPA)
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLP	Contract Laboratory Program (EPA)
CRQL/CRDL	Contract Required Quantitation/Detection limit
DL	detection limit
DQOs	data quality objectives
DUPs	duplicates
E & E	Ecology & Environment, Inc.
EPA	United States Environmental Protection Agency
GPS	Global Positioning System
ICP	inductively coupled argon plasma (spectrometry)
IDFG	Idaho Department of Fish and Game
IDW	investigation-derived waste
J	estimated concentration
L	liter
Mg	magnesium
μg/L	micrograms per liter

LIST OF ACRONYMS (CONTINUED)

Acronym	Definition
mg/L	milligrams per liter
mg/kg	milligrams per kilogram
MSL	mean sea level
MS	matrix spike (sample)
MS/DUP	matrix spike/duplicate
MS/MSD	matrix spike/matrix spike duplicate (sample)
NPL	National Priorities List
NWI	National Wetland Inventory
PA/SI	preliminary assessment/site inspection
PPE	probable point of entry
QA	quality assurance
QC	quality control
RPD	relative percent difference
SCNF	Salmon-Challis National Forest
SCNFS	Salmon-Challis National Forest Service
SOPs	standard operating procedures
SQAP	sampling and quality assurance plan
SQL	sample quantitation limit
START	Superfund Technical Assessment and Response Team (EPA)
TAL	Target Analyte List (CLP Metals)
TCLP	toxicity characteristic leaching procedure
TDD	Technical Direction Document
TDL	Target Distance Limit
TM	Task Monitor
U	not detected above the sample quantitation limit
USBC	United States Bureau of Census

LIST OF ACRONYMS (CONTINUED)

Acronym	Definition
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
yd^3	cubic yards

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HARMONY MINE SITE
PRELIMINARY ASSESSMENT/SITE INSPECTION
LEMHI COUNTY, IDAHO

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) has tasked Ecology and Environment, Inc. (E & E) to provide technical support and conduct a combined Preliminary Assessment/Site Inspection (PA/SI) at the Harmony Mine site located in Lemhi County, Idaho. E & E completed the PA/SI activities under Technical Direction Document (TDD) No. 99-02-0004 issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START) Contract No. 68-W6-0008.

The specific goals for 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 2.4;
- Determine off-site migration of contaminants;
- Provide EPA with adequate information to determine whether the site is eligible for placement on the National Priorities List (NPL); and
- Document any threat or potential threat to public health or the environment posed by the site.

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

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

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2. SITE BACKGROUND

This section describes the site location (Section 2.1), site description (Section 2.2), site ownership history (Section 2.3), site operations and source characteristics (Section 2.4), site characterization (Section 2.5), and summary of PA/SI investigation locations (Section 2.6).

2.1 SITE LOCATION

Site Name:	Harmony Mine
CERCLIS ID No.:	IDSFN1002104
Location:	Lemhi County, Idaho
Latitude:	45° 0' 55" North
Longitude:	113° 49' 41" West
Legal Description:	Section 35, Township 20 North, Range 22 East, Boise Meridian
Site Owners/Contacts:	George C. DeSmet/Frederick A. DeSmet 2333 East 3225 South Salt Lake City, Utah 84109
	Mary B. Loving Saylor 1526 Cypress Point Drive Medford, Oregon 97504
	Stephen DeSmet 2715 East Grandview Drive Sandy, Utah 84109
	Sylvia DeSmet Deakin 2631 Chadwick Salt Lake City, Utah 84109

The Harmony Mine is located in the McDevitt Mining district in northeastern Lemhi County, Idaho, 15 miles southeast of Salmon, Idaho (Figure 2-1). The property is near the headwaters of Withington Creek, a tributary to the Lemhi River. Access to the site is provided by an unimproved gravel road open between late June and October (Figure 2-2; USGS 1989).

2.2 SITE DESCRIPTION

The Harmony Mine is a former copper mine, which has been inactive since 1931. The property consists of approximately 330 acres of land surrounded by the Salmon-Challis National Forest (SCNF). Elevations at the mine range from approximately 7,000 feet above mean sea level (MSL) at the lower end to 8,200 feet above MSL at the upper ridge. The property is privately owned but is located wholly within SCNF. The former mill building and bunkhouses were located at an elevation of 7,000 feet above MSL near the headwaters of a tributary of Withington Creek. The former mine buildings and portal of the main haulage level were at an elevation of 7,600 feet above MSL on Sal Mountain, southwest of the mill location. The mine was reported to be connected to the mill by an aerial tram (Mitchell 1995).

There are five dilapidated wood structures currently on site. These structures are the remnants of the mill and bunkhouses, which include one large three-story mill and four smaller one-story bunkhouses (Figure 2-3). Two large tailing piles are located approximately 150 feet below the former mill, on the banks of a dry channel. Reportedly both piles had collapsed into the dry channel during the 1930s (Henderson 1999). Historically, this channel contained flowing water, but after the collapse of the tailing piles, the flow went underground (Henderson 1999). It appeared that the channel was formed from snow melt runoff which washed the tailing further downstream. Two wood tailing dams located at the head of the channel were used as retention walls for the tailing piles. Both dams failed years ago (possibly in the 1930s), and only a 3-foot high portion of each dam is still present. An unnamed tributary of Withington Creek originates upstream of the tailing piles, trends northeast (underground) through the tailing area, and then re-emerges approximately 0.15 mile downstream of the tailing piles (for descriptive convenience in this report, the unnamed tributary of Withington Creek near the tailing piles will be called the South Fork of Withington Creek; Figure 2-3). Approximately 0.7 mile downstream of the tailing piles, the South Fork of Withington Creek apparently flows underground again. Tailing deposits are present on the dry creek bed encompassing a total area of approximately 10,000 square feet. It is not known if the tailing deposits were formed due to a one-time failure of the tailing dams or have been formed over time. The South Fork of Withington Creek surfaces again approximately 200 feet downstream from the tailing deposits. Tailing deposits were still visible in the creek bed for approximately 2.4 miles downstream of the tailing piles (E & E 1999a).

The area adjacent to the tailing piles and the creek is vegetated with evergreen trees and shrubs. Small fish were observed in Withington Creek during the START site visit (E & E 1999a).

2.3 SITE OWNERSHIP HISTORY

The Harmony Mine was first claimed by a few individuals until the Harmony Mines Company took over the property in 1916. The Harmony Mines Company owned the property from 1916 until 1936, when it forfeited its charter. Activities at the Harmony Mine ceased in 1931. By 1943, the property was claimed by Gold Standard Mines Corporation. Detailed information regarding site ownership history is included in a report entitled "*Potentially Responsible Party Search for the Harmony Mine Site, Salmon-Challis National Forest, Lemhi County, Idaho*," prepared by the Science Applications International Corporation under a contract with the Salmon-Challis National Forest Service in December 1999 (SAIC 1999; Appendix D).

2.4 SITE OPERATIONS AND SOURCE CHARACTERISTICS

The property comprises seven patented and 17 unpatented claims with at least six mineralized zones, each zone averaging 5 feet in thickness and 80 feet in length. Copper exists in copper sulfide ores; such as chalcopyrite, chalcocite, and pyrite. These sulfide ores occur in shear zones of quartzitic rocks. All mineral zones trend in northwesterly direction and are located at a higher elevation, approximately 0.5 mile southwest of the mill building. The bulk of production at this site came from two major ore lodes, with the principal mineral being chalcopyrite. The copper content of the ore ranged from 3 to 5 percent by weight (Ross 1925).

Ore was first discovered in the vicinity of the Harmony Mine in the 1870s. However, little work was done on the property until it was acquired by the Harmony Mines Company in 1916. From 1917 to 1919, the company built 1,176 feet of tunneling and began construction on a 100-ton mill. The mill was completed in 1920, and considerable quantities of ore were concentrated and shipped out for smelting during that year (Mitchell 1995).

The mine had five tunnels, six shafts, one raise, four crosscuts, and four drifts, for a total of approximately 6,000 feet of workings. The length of each tunnel was between 200 and 1,100 feet. The mine was equipped with electrically-driven compressors, wire-rope aerial tramways, mine cars, and rock drills. Ore was mined and carried out from tunnels and then transported through aerial tramway to the mill site. The mill utilized primary and secondary crushers; a ball mill; and a number of ore beneficiation equipment, such as Dorr classifiers, Wilfley tables, K&K flotation cells, and Aikens classifiers. Ore was crushed, beneficiated, and concentrated through flotation columns at the mill. Typically, the flotation process involves the use of chemical reagents. Information regarding the specific reagents used at the mill is not available; however, typical flotation processes at the time of site operations involved the use

of pine oil as a frothing agent. Copper concentrates were shipped 8 miles by truck to the railroad depot in Baker, Idaho, and then shipped by rail to a smelter in Utah (Mitchell 1995; Gardner 1930). The tailing were discharged at the mill site near the South Fork of Withington Creek.

Between 1916 and 1931, the total recorded production from Harmony Mine was 47,826 tons of ore. This material yielded 1,815,353 pounds of copper, 38 ounces of gold, and 2,050 ounces of silver (Mitchell 1995). The START estimated 40,000 cubic yards (yd^3) of tailings to be present at the site near the South Fork of Withington Creek (E & E 1999a).

2.5 SITE CHARACTERIZATION

2.5.1 Previous Investigations

In 1994, the Idaho Geological Survey, in cooperation with the University of Idaho, conducted an extensive review of 300 inactive or abandoned mines on the south side of the Salmon River. Harmony Mine was one of these sites. The review was sponsored by the United States Department of Agriculture, Forest Service. The scope of work included reviewing historical mine operations, geological surveys, and site inspections. A site inspection of Harmony Mine was conducted by the Idaho Geological Survey on July 20, 1994. According to the site inspection report, over 3,000 yd^3 of copper sulfide mine tailing were piled at the mine site, covering an area of approximately 7 acres (Moye 1994). The tailing piles were adjacent to the South Fork of Withington Creek. The tailing dams near the mill site had failed due to flooding, resulting in the collapse of tailing toward the creek (Moye 1994). The tailing pile area was not vegetated and appeared very unstable (Mitchell 1995). An abundance of pyrite was observed in the mill waste; however, no open workings or adits were observed with discharge. A dilapidated mill building remained on site. A pH measurement of the water in the South Fork of Withington Creek, taken 1/4 mile below the tailing dams, had a resulting pH of 7.2. No other sampling was conducted (Moye 1994).

In late August 1995, as part of the Salmon National Forest Mineral/Environmental Assessment, the United States Geological Survey (USGS) collected surface water and sediment samples in the South Fork of Withington Creek, approximately 0.2 mile below the Harmony Mine mill tailing dams. Samples were also collected from caved adit drainage water, local rocks, and sediment in the South Fork of Withington Creek downstream of the Harmony Mine mill, approximately 0.2 mile above the confluence with the main stem of Withington Creek, just inside the SCNF boundary (Figure 2-2). The flow rate in the creek at this sample point was estimated at 0.2 cubic feet per second (cfs). Samples were analyzed for metals using inductively coupled argon plasma (ICP) technology. In addition, a sample of the tailing

was collected from the flood-exposed tailing piles in the creek below the Harmony Mine mill. The tailing sample was analyzed for metals using the toxicity characteristic leaching procedure (TCLP). The results are summarized in Tables 2-1, 2-2, 2-3, and 2-4 (Feldhausen 1999).

2.5.2 START Site Visit

On July 16, 1999, START conducted a site reconnaissance at the Harmony Mine site. The site observations were made outside of the Harmony Mine property boundary since consent for access was not given at that time. However, site observations were supplemented during the later sampling event in September 1999 (E & E 1999a). START observed two large yellowish mine tailing piles located approximately 150 feet below the dilapidated former mill building. Some tailing were observed to have been flooded and washed into the South Fork of Withington Creek. Tailing deposits were observed approximately 0.7 mile downstream of the South Fork of Withington Creek. Tailing deposits were also visible in the creek bed of the main stem of Withington Creek approximately 2.4 miles downstream of the site. During the site reconnaissance in July 1999 and the sampling event in September 1999, START attempted to locate the caved mine adit identified during a previous investigation by the USGS; however, the adit could not be located (E & E 1999a, 1999b).

2.6 SUMMARY OF PA/SI INVESTIGATION LOCATIONS

Based on a review of historical and background information which 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 (CERCLA) hazardous substance sources. In addition, on- and off-site locations were identified as possible receptors of contamination originating from these sources. The potential sources and receptors are listed below:

Potential Sources:

- **Mine Tailing Piles.** Approximately 40,000 yd^3 of mine tailing are located on the site near the South Fork of Withington Creek. The tailing piles were most likely carried downstream to Withington Creek by high seasonal water. Potential hazardous substances are Target Analyte List (TAL) metals including copper, cobalt, zinc, lead, silver, selenium, and arsenic.

Potential Receptors:

- **South Fork and Main Stem of Withington Creek and Lemhi River.** Mine tailing deposits were observed in the main stem of Withington Creek to a distance of approximately 2.4 miles downstream from the site. The South Fork and the main stem of Withington Creek, as well as the Lemhi River, may be impacted by the migration of contaminants from the Harmony Mine tailing piles. Probable potential contaminants of concern associated with the tailing are TAL metals.

- **Wetlands along the South Fork and Main Stem of Withington Creek.** Approximately 0.6 mile of wetland frontage located along the South Fork and main stem of Withington Creek were field verified by a START wetland specialist during the sampling event. These wetlands may be impacted by contaminants from the Harmony Mine tailing piles. Probable potential contaminants of concern associated with the tailing are TAL metals.

TABLE 2-1

SUMMARY OF USGS SEDIMENT SAMPLE RESULTS (in ppm)

HARMONY MINE

LEMHI COUNTY, IDAHO

Sample Location	Sample Descriptions	Silver	Arsenic	Gold	Cadmium	Copper	Molybdenum	Lead	Barium	Beryllium	Cobalt	Chromium	Manganese	Nickel	Zinc
Withington Creek (South Fork), about 0.2 mile below the Harmony Mine mill tailings dams	tailings in creek as overbank deposits	0.2	68	<8	<2	2,270	<2	16	105	<1	30	16	195	8	26
Withington Creek (South Fork) downstream of the Harmony Mine mill, about 0.2 mile above the confluence with the main stem of Withington Creek	Collected to assess downstream contamination as a result of flooding and breach of mill tailings dams	<2	53	<8	<2	2,290	<2	25	374	1	30	16	292	8	37

Source: Feldhousen 1999

Key:

ppm = Parts per million.
USGS = United States Geological Survey.
< = Concentration less than method detection limit.

Table 2-2

SUMMARY OF USGS ROCK SAMPLE RESULTS (in ppm)

HARMONY MINE

LEMHI COUNT, IDAHO

Sample Location	Sample Descriptions	Silver	Arsenic	Gold	Cadmium	Copper	Molybdenum	Lead	Barium	Beryllium	Cobalt	Chromium	Manganese	Nickel	Zinc
Harmony Mine Rocks	White quartz with chalcopyrite, arsenopyrite, pyrite and secondary copper	13	10	<8	<2	>15000	>2	>247	10	<1	238	<2	84	71	209

Source: Feldhausen 1999

Key:

ppm = Parts per million.
USGS = United States Geological Survey.
> = Concentration higher than instrument calibration range.
< = Concentration less than method detection limit.

Table 2-3

SUMMARY OF USGS TAILINGS SAMPLE RESULTS (in ppm)

HARMONY MINE

LEMHI COUNTY, IDAHO

Sample Location	Sample Descriptions	Silver	Arsenic	Gold	Cadmium	Copper	Molybdenum	Lead	Barium	Beryllium	Cobalt	Chromium	Manganese	Nickel	Zinc
Harmony Mine Tailing Waste	Vertical profile of mill tailings; yellow, tan, and blue salt crusts	<0.01	<0.2	<0.01	<0.6	36000	<0.02	0.5	10	<1	260	<0.5	510	30	150

Source: Feldhausen 1999

Key:

ppm = Parts per million.
USGS = United States Geological Survey.
< = Concentration less than method detection limit.

Table 2-4

SUMMARY OF USGS SURFACE WATER SAMPLE RESULTS (in ppb)

HARMONY MINE

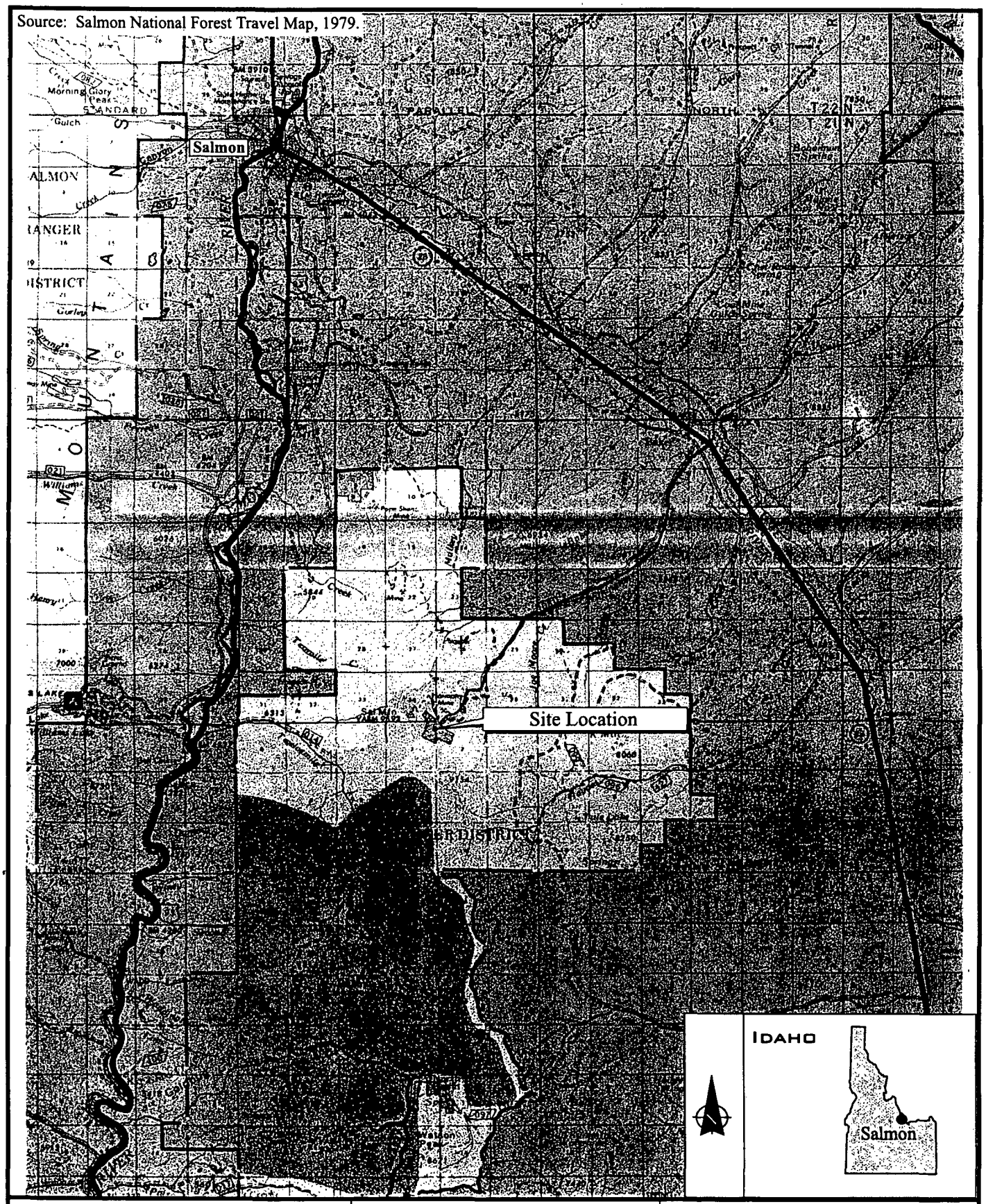
LEMHI COUNTY, IDAHO

Sample Location	Sample Descriptions	pH	Silver	Arsenic	Gold	Cadmium	Copper	Molybdenum	Lead	Cobalt	Chromium	Manganese	Nickel	Zinc
Caved mine adit	Extensive FeO_3 and iridescent floating material in water	NA	0.1	1,700	<0.1	2	19	14	8.4	620	18	>4,000	300	160
Withington Creek (South Fork), about 0.2 mile downstream of the Harmony Mine mill tailings dams	Tailings dam burst in recent past resulting in mill tailings in creek as overbank deposits	7.06	<0.1	<2	<0.1	<1	52	<0.1	<0.2	0.76	0.5	0.4	<0.7	<0.3

Source: USGS 1995

Key:

FeO_3 = Iron Oxide.
NA = Not available.
ppb = Parts per billion.
USGS = United States Geological Survey.
< = Concentration less than method detection limit.
> = Concentration higher than instrument calibration range.



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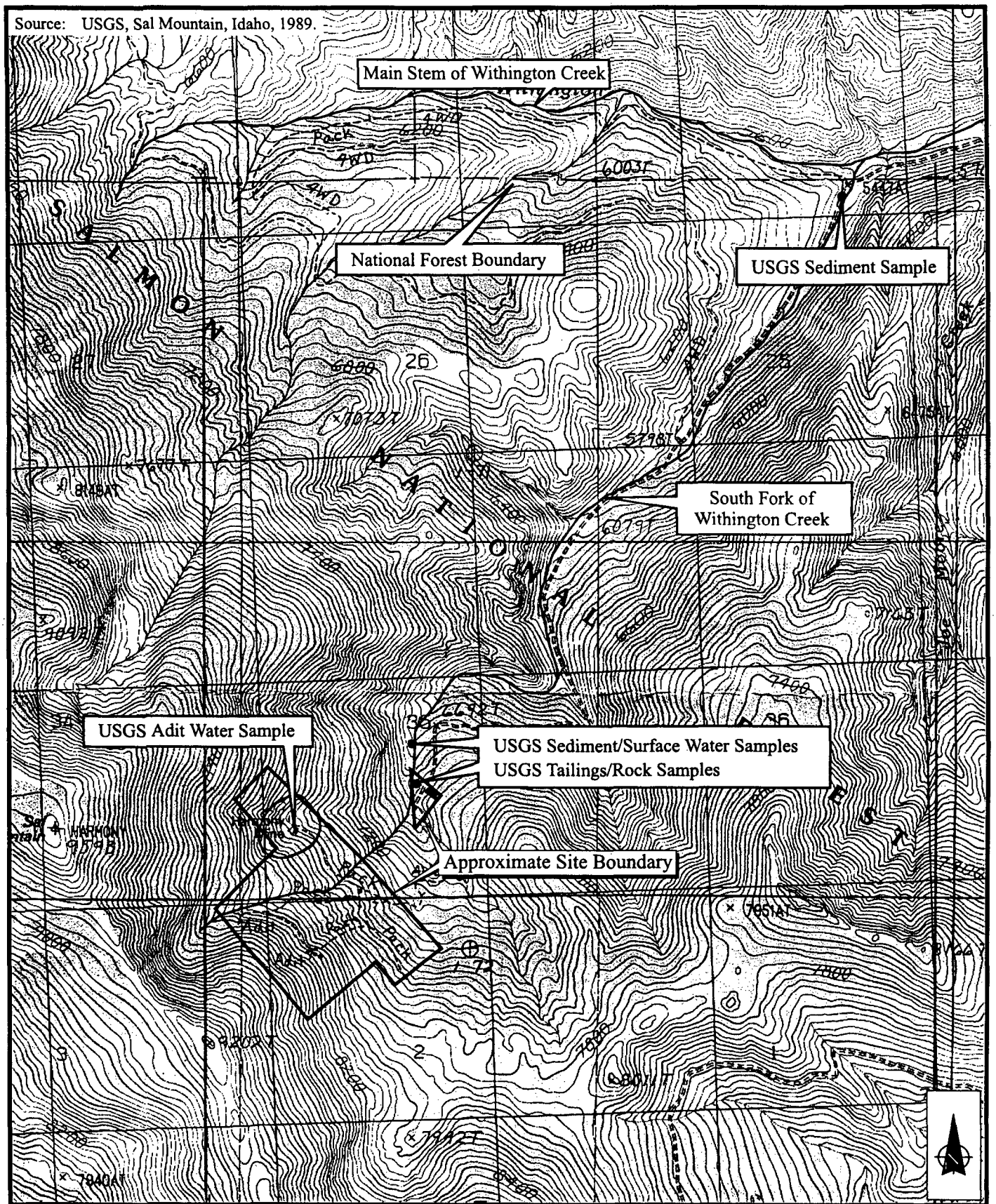
International Specialists in the Environment
Seattle, Washington

HARMONY MINE
Lemhi County, Idaho

Figure 2-1
SITE VICINITY MAP

0 2 4
Approximate Scale in Miles

Drawn:	DATE:	JOB NO.	Dwg.No.
AES	2/22/00	DB0401SAT0	DB0401 2-1



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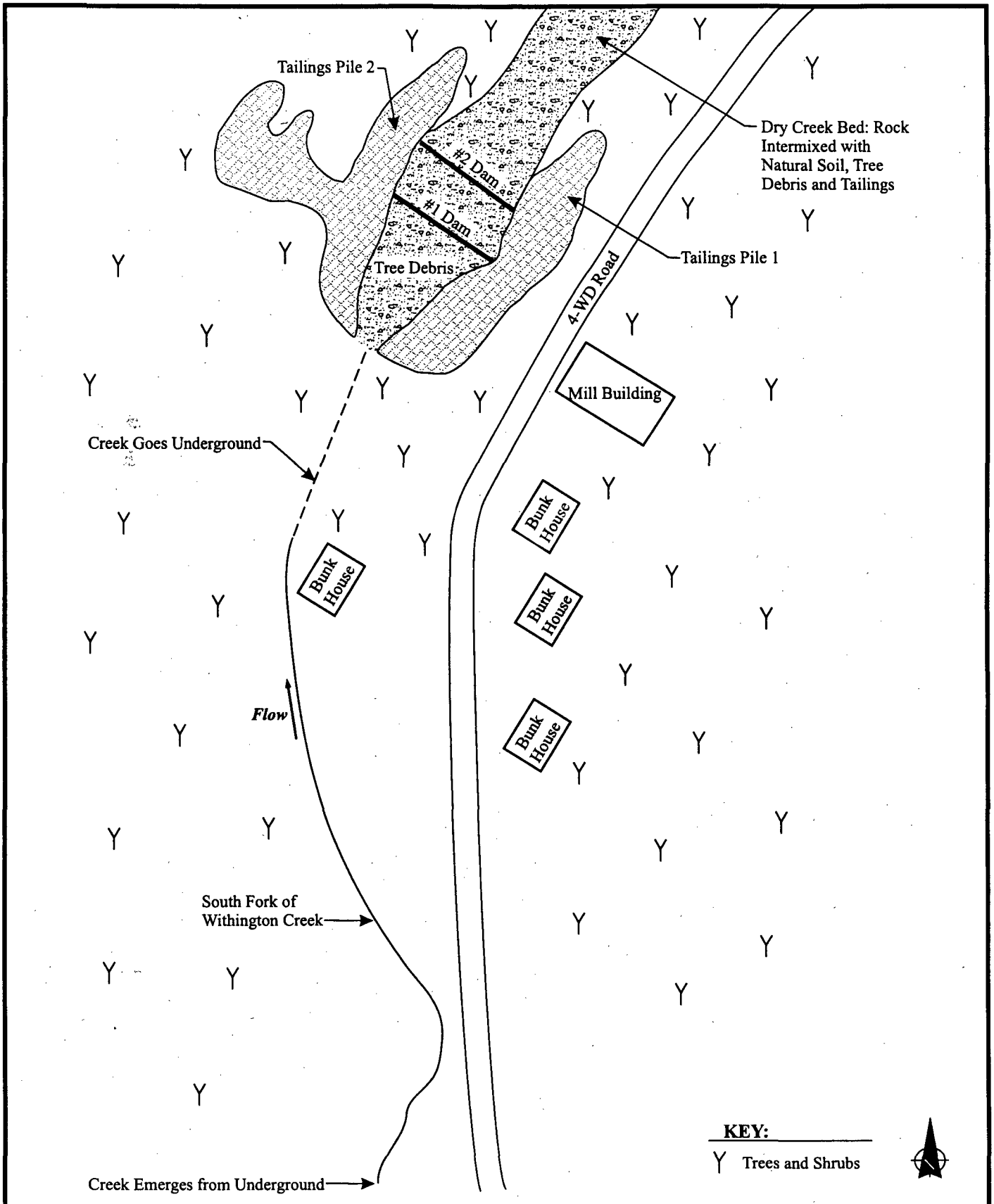
Seattle, Washington

HARMONY MINE
Lemhi County, Idaho

Figure 2-2
SITE VICINITY AND
USGS SAMPLE LOCATION MAP

0 .25 .5
Scale in Miles

Drawn:	DATE:	JOB NO.	Dwg.No.
AES	2/16/00	DB0401SAT0	DB0401 2-2



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	HARMONY MINE Lemhi County, Idaho	Figure 2-3 SITE MAP			
	Not to Scale	Drawn: AES	DATE: 2/16/00	JOB NO. DB0401SAT0	Dwg.No. DB0401 2-3

3. FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

A sampling and quality assurance plan (SQAP) was developed by START prior to field sampling (E & E 1999c). The SQAP was developed based on a review of background information, conversations with government agencies, and a site reconnaissance. 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 in Section 3.1.

The PA/SI field sampling event was conducted between September 19 and 23, 1999. A total of 43 samples, including background samples, but excluding quality assurance (QA; rinsate) samples, were collected from on-site 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 presented in Table 3-1. Photographic documentation of PA/SI field activities is presented in Appendix A.

Alphanumeric identification numbers applied by START to each sample location (for example, CR01SD) are the sample location identifiers used in the report. Sample locations are provided in Figure 3-1. The sample locations shown on Figure 3-1 are based on Global Positioning System (GPS) survey data collected in the field.

This section describes sample alteration (3.1), wetland determination (3.2), sampling methodology (Section 3.3), analytical protocol (Section 3.4), GPS data (Section 3.5), and investigation-derived waste (IDW; Section 3.6).

3.1 SAMPLE ALTERATION

The main stem of Withington Creek flows through several private properties. Consent for access to these private properties was obtained with the assistance of the Salmon-Challis National Forest (SCNF) prior to the sampling event. However, during the sampling event the START was informed by SCNF that all private property owners except one had withdrawn their consent for access to their properties. Originally, 30 sets of colocated sediment/surface water samples were designated to be collected along the South Fork and the main stem of Withington Creek. Of these samples, 15 sets were located on private properties. With the approval from the EPA Task Monitor (TM), the number of sample sets were reduced to 16. All samples were collected from public land (within the boundaries of

sample sets were reduced to 16. All samples were collected from public land (within the boundaries of Bureau of Land Management [BLM] and SCNF), except for one, which was collected from the private property whose owner gave consent for access.

3.2 WETLAND DETERMINATION

During the sampling event, publicly accessible areas of the South Fork and main stem of Withington Creek were visually observed by a START wetland specialist. The observation was conducted in order to verify the presence of wetlands as defined in Code of Federal Regulations, Title 40, Part 230, Section 3 (40 CFR 230.3). National Wetland Inventory (NWI) maps indicate that palustrine wetlands with forested or emergent vegetation or both are continuous along both branches of the creek, beginning approximately 1.2 miles downstream of the site. Observations by the START wetland specialist indicated that most of this area did not meet 40 CFR 230.3 wetland definitions. In most locations, the streams were fast-flowing alpine creeks, with few bends or turns. This type of topography results in flooding that does not occur sufficiently often enough to allow hydric soils, and subsequently hydrophytic vegetation, to develop either within the creek or along the banks.

The START wetland specialist did observe two locations within the study area where 40 CFR 230.3 wetlands are present, although both locations are not directly in the creek, but on the bank. According to NWI maps, approximately 0.4 mile of palustrine forested wetland is located approximately 3 miles downstream of the site on the main stem of Withington Creek, and approximately 0.2 mile of palustrine emergent wetland is located approximately 1.5 mile downstream of the site on the South Fork of Withington Creek. The START wetland specialist verified that these wetlands meet 40 CFR 230.3 definitions for a wetland. The wetlands were not flooded at the time of sampling.

3.3 SAMPLING METHODOLOGY

Sampling for soil, sediments, and surface water followed the standard operating procedures (SOPs) contained in Appendix A of the SQAP (E & E 1999c). Grass, leaves, and other vegetative material, rocks, and other debris unsuitable for analysis were removed from samples before being placed into sample containers. Tailing, soil, and sediment sample materials were homogenized in dedicated stainless steel bowls prior to containerization. Dedicated stainless steel spoons were used to extract, homogenize, and place sampled material into sample containers. Samples were stored in iced coolers and continuously maintained in the custody of the START personnel.

3.3.1 Tailing/Soil Samples

A total of 13 tailing/soil samples, including two background surface soil samples, were collected (Figure 3-1). Five tailing samples were collected from the on-site tailing piles and downstream tailing deposits, including one surface and one colocated subsurface sample, and three additional surface tailing samples (WP01SS, WP01SB, WP02SS, WP03SS, WP04SS); five surface soil samples were collected from the wetlands present along Withington Creek (WL01SS through WL05SS); one surface soil sample was collected from the bank of Withington Creek (CR03SS); one background surface soil sample (BG01SS) was collected upstream of the site; and one background wetland surface soil sample (BG02SS) was collected at the bank of a tributary (Joe Moore Creek) to Withington Creek. Surface soil samples were collected from 0 to 6 inches below ground surface (bgs) using dedicated stainless steel spoons. The subsurface soil sample (WP01SB) was collected from 3 to 3.5 feet bgs using a decontaminated hand auger.

3.3.2 Sediment Samples

A total of 15 sediment samples (CR01SD through CR14SD, BG01SD), including one background sample from upstream of the South Fork of Withington Creek (BG01SD) and four background samples from four tributaries along Withington Creek (CR06SD, CR07SD, CR10SD, and CR12SD), were collected from the South Fork and main stem of Withington Creek and associated tributaries (Figure 3-1). Sediment samples were collected in the creek below the average water line from 0 to 6 inches bgs. Tailing deposits at bends or corners in the creek were targeted. Samples were collected from the most downstream locations to the most upstream locations to eliminate cross contamination. For tributary samples, the samples were collected approximately 7 to 10 feet upstream of the confluence between the tributary and Withington Creek.

3.3.3 Surface Water Samples

A total of 15 surface water samples (CR01SW through CR14SW, BG01SW), including one background sample from upstream of the South Fork of Withington Creek and four background samples from four tributaries along Withington Creek, were collected from the main stem and South Fork of Withington Creek and associated tributaries (Figure 3-1). Surface water samples were colocated with the respective sediment samples. Surface water samples were collected by hand-dipping a 1-liter polyethylene bottle sample container into the stream and filling the bottle with the surface water layer between 0 and 6 inches below the water surface. An aliquot of each sample was tested in the field for

pH, temperature, and specific conductance using the Horiba™ U-10 Multimeter. The sample aliquot to be analyzed for TAL metals was preserved as required and the pH was checked after preservation to ensure that the appropriate pH level had been achieved.

3.4 ANALYTICAL PROTOCOL

Samples collected during PA/SI were analyzed for TAL metals for all matrices and acidity. Surface water samples were also tested for sulfate concentrations. All samples were analyzed for TAL metals by Southwest Laboratory of Oklahoma, Inc. in Broken Arrow, Oklahoma, using CLP method ILM04.0. Acidity (EPA Method 305.1) and concentration of sulfate (EPA Method 300.0) were analyzed by the EPA, Region 10, Laboratory located in Manchester, Washington. Results of hardness for all water samples were calculated by START from the results of the TAL metals analysis based on the following equation:

$$\text{Hardness (mg equivalent } CaCO_3 \text{ /L)} = 2.497\ [\text{Ca, mg/L}] + 4.118\ [\text{Mg, mg/L}]$$

3.5 GLOBAL POSITIONING SYSTEM DATA

Trimble Pathfinder Professional GPS survey units and Corvalis data loggers were used by START personnel to approximate the horizontal location coordinates of the PA/SI samples. GPS coordinates for samples collected along Withington Creek were plotted on the topographic map (Figure 3-1). GPS coordinates by sample point are listed in Appendix B.

3.6 INVESTIGATION-DERIVED WASTE

IDW generated during the PA/SI sampling effort consisted of one 50-gallon bag of solid disposable sampling equipment. The bag of sampling equipment was disposed of as non-hazardous solid waste in a municipal solid waste landfill.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY

HARMONY MINE PA/SI

LEMHI COUNTY, IDAHO

EPA Sample ID	START Sample ID	CLP Sample ID	Sample Collection		Matrix	Depth (bgs)	Analysis		Description
			Date	Time			Metals	Acidity/ Sulfate	
99394100	CR01SD	MJCF15	09/21/99	1120	Sediment	0-6"	X		Dark-gray, sand and 20% gravel, wet.
99394101	CR01SW	MJCF16	09/21/99	1115	Surface Water	NA	X	X	Temp=10.7 °C; pH=7.67; Conductivity=0.106
99394102	CR02SD	MJCF17	09/21/99	1238	Sediment	0-6"	X		Dark-gray, fine to medium sand and 20% gravel, wet.
99394103	CR02SW	MJCF18	99/09/21	1235	Surface Water	NA	X	X	Temp=9.8 °C; pH=7.97; Conductivity=0.079
99394104	CR03SD	MJCF19	99/09/21	1330	Sediment	0-6"	X		Dark-gray and fine grading to coarse sand, trace gravel, wet.
99394105	CR03SW	MJCF20	09/21/99	1325	Surface Water	NA	X	X	Temp=10.9 °C; pH=8.07; Conductivity=0.038
99394106	CR04SD	MJCF21	09/21/99	1400	Sediment	0-6"	X		Dark-gray fine to coarse sand, trace gravel, wet.
99394107	CR04SW	MJCF22	09/21/99	1355	Surface Water	NA	X	X	Temp=11.1 °C; pH=8.42; Conductivity=0.044
99394108	CR05SD	MJCF23	09/21/99	1540	Sediment	0-6"	X		Dark-gray very fine to fine sand, trace coarse sand, very wet and soupy.
99394109	CR05SW	MJCF24	09/21/99	1535	Surface Water	NA	X	X	Temp=11.6 °C; pH=8.01; Conductivity=0.072
99394110	CR06SD	MJCF25	09/21/99	1605	Sediment	0-6"	X		Dark-gray fine to coarse sand and gravel, wet.
99394111	CR06SW	MJCF26	09/21/99	1600	Surface Water	NA	X	X	Temp=10.8 °C; pH=7.53; Conductivity=0.070
99394112	CR07SD	MJCF27	09/21/99	1759	Sediment	0-6"	X		Black muck. No tailings was visible.
99394113	CR07SW	MJCF28	09/21/99	1755	Surface Water	NA	X	X	Temp=11.6 °C; pH=8.54; Conductivity=0.081
99394114	CR08SD	MJCF29	09/21/99	1845	Sediment	0-6"	X		Black very fine to fine sand, trace coarse sand, wet.
99394115	CR08SW	MJCF30	09/21/99	1840	Surface Water	NA	X	X	Temp=10.1 °C; pH=8.70; Conductivity=0.033
99394116	CR09SD	MJCF31	09/22/99	0933	Sediment	0-6"	X		Dark-gray fine to coarse sand, trace gravel, wet.
99394117	CR09SW	MJCF32	09/22/99	0927	Surface Water	NA	X	X	Temp=7.3 °C; pH=5.87; Conductivity=0.680
99394118	CR10SD	MJCF33	09/22/99	1045	Sediment	0-6"	X		Dark-gray fine sand, wet.
99394119	CR10SW	MJCF34	09/22/99	1040	Surface Water	NA	X	X	Temp=6.7 °C; pH=6.04; Conductivity=0.023

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY

HARMONY MINE PA/SI

LEMHI COUNTY, IDAHO

EPA Sample ID	START Sample ID	CLP Sample ID	Sample Collection		Matrix	Depth (bgs)	Analysis		Description
			Date	Time			Metals	Acidity/ Sulfate	
99394120	CR11SD	MJCF35	09/22/99	1130	Sediment	0-6"	X		Olive-tan fine to very fine sand, wet.
99394121	CR11SW	MJCF36	09/22/99	1125	Surface Water	NA	X	X	Temp=7.1 °C; pH=6.83; Conductivity=0.022
99394122	CR12SD	MJCF37	09/22/99	1345	Sediment	0-6"	X		Dark-gray fine to coarse sand and gravel (river rock), wet.
99394123	CR12SW	MJCF38	09/22/99	1340	Surface Water	NA	X	X	Temp=7.5 °C; pH=7.10; Conductivity=0.023
99394124	CR13SD	MJCF39	09/22/99	1415	Sediment	0-6"	X		Dark-gray fine sand, wet.
99394125	CR13SW	MJCF40	09/22/99	1410	Surface Water	NA	X	X	Temp=6.6 °C; pH=7.17; Conductivity=0.019
99394126	CR14SD	MJCF41	09/22/99	1510	Sediment	0-6"	X		Dark-gray fine sand (trace debris), trace coarse sand.
99394127	CR14SW	MJCF42	09/22/99	1505	Surface Water	NA	X	X	Temp=6.1 °C; pH=7.44; Conductivity=0.020
99394301	WP04SS	MJCF66	09/22/99	1201	Soil	0-6"	X		Tan fine sand, dry.
99394302	WL04SS	MJCF67	09/22/99	0910	Soil	0-6"	X		Dark-brown peat and silt, with tree roots, moist.
99394303	WL03SS	MJCF68	09/22/99	0850	Soil	0-6"	X		Black fine sand silt (muck), wet.
99394304	BG01SD	MJCF69	09/22/99	1735	Sediment	0-6"	X		Background sediment. Dark-gray fine sand, trace tree debris, trace coarse sand, wet.
99394305	BG01SW	MJCF70	09/22/99	1730	Surface Water	NA	X	X	Background surface water. Temp=6.3 °C; pH=6.57; Conductivity=0.024
99394306	BG01SS	MJCF65	09/22/99	1750	Soil	0-6"	X		Background surface soil. Brown organic material, peat.
99394307	WP01SS	MJCF72	09/20/99	1225	Soil	0-6"	X		Tan fine to very fine sand, dry.
99394308	WP01SB	MJCF73	09/20/99	1305	Soil	3-3.5'	X		Olive fine to very fine sand, dry.
99394309	WP02SS	MJCF74	09/20/99	1205	Soil	0-6"	X		Tan fine to very fine sand, dry.
99394310	WP03SS	MJCF75	09/20/99	1250	Soil	0-6"	X		Tan fine to very fine sand, dry.
99394311	CR03SS	MJCF76	09/21/99	1345	Soil	0-6"	X		Light grayish brown fine sand, dry.
99394312	WL01SS	MJCF77	09/21/99	1640	Soil	0-6"	X		Light gray fine sand, dry.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY

HARMONY MINE PA/SI

LEMHI COUNTY, IDAHO

EPA Sample ID	START Sample ID	CLP Sample ID	Sample Collection		Matrix	Depth (bgs)	Analysis		Description
			Date	Time			Metals	Acidity/ Sulfate	
99394313	WL02SS	MJCF71	09/21/99	1713	Soil	0-6"	X		Gray fine sand and organic material, darker and more rooty than WL01SS, dry.
99394147	RS01SW	MJCF62	99/09/22	1920	Water	NA	X		Rinsate
99394148	WL05SS	MJCF63	99/09/22	1905	Soil	0-6"	X		Brown organic material (peat), trace vegetative material.
99394149	BG02SS	MJCF64	99/09/22	1845	Soil	0-6"	X		Background wetland surface soil. Dark-brown very fine sand, trace silt, trace organic material.

Key:

bgs = Below ground surface.
°C = Degree Celsius.
CLP = Contract Laboratory Program.
EPA = U.S. Environmental Protection Agency.
ID = Identification.
NA = Not applicable.
START = Superfund Technical Assessment and Response Team.
Temp = Temperature.
' = Feet.
" = Inches.

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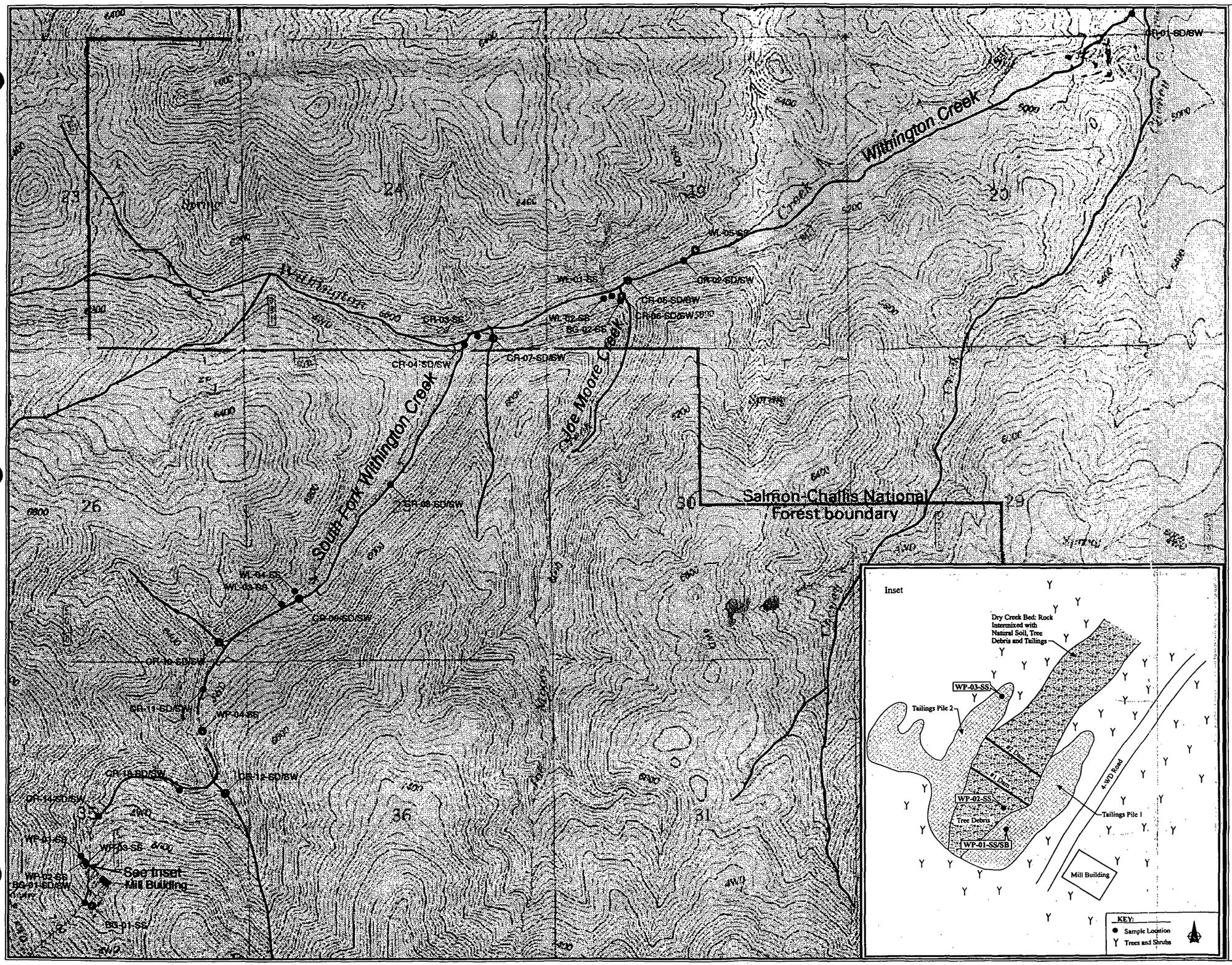

Figure 3-1

Harmony Mine Site
Sample Location Map

Lemhi County, Idaho

LEGEND

- ● Sample Location (Located with GPS)
- ○ Sample Location (Approximate, Located by visual observation)
- ------ Dry Creek Bed

Base Map Source: USGS, Sal Mountain, Idaho, 1989

N W E S

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Miles

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

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4. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences or contamination or both of sampling equipment, glassware, reagents, etc. Specific QC requirements for laboratory analyses are incorporated in the analytical methods performed by the laboratory. Additional QC requirements are provided in the EPA *Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 1991). These QC requirements or equivalent requirements were followed for analytical work on the Harmony Mine PA/SI.

4.1 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

A minimum of one matrix spike/duplicate (MS/DUP) for sulfate and inorganic analyses was designated per 20 samples collected for each matrix sampled during the project. A minimum of one duplicate for acidity was designated per 20 samples collected for each matrix sampled during the project.

One rinsate sample (at a rate of one per 20 samples collected from each piece of non-dedicated sampling equipment) was collected from the decontaminated hand augers and submitted for analysis for the project. Detected analytes in the rinsate blank sample are presented in Table 4-1.

The analytical laboratories analyzed several QC samples for QA purposes according to EPA methods. The analyzed QC samples included initial and continuing calibrations, method blanks, matrix spikes (MSs), duplicates (DUPs), and laboratory control samples.

4.2 DATA VALIDATION

EPA chemists reviewed and validated data from analyses performed by CLP and EPA laboratories. These analyses encompassed sulfate, acidity, and TAL metals. START chemists performed a validation check on the EPA-generated QA memoranda.

All samples were collected following the guidance of the SQAP (E & E 1999c) for the field activities. The TAL metals analyses were performed by a CLP laboratory following the *Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 1991). The sulfate and acidity analyses were performed at the EPA Region 10 Laboratory, located in Manchester, Washington, following EPA SW-846 Methods 300.0 and 305.1, respectively.

Data qualifiers were applied as necessary according to the following guidance document:

- *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (1994).

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

4.3 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 the definitive data, without error and bias determination criteria, would be used for the sampling and analyses conducted during the field activities. The data quality achieved during the fieldwork produced sufficient data that met the DQOs stated in the SQAP (E & E 1999).

A discussion of the objectives that were accomplished is presented in the following sections.

4.4 PROJECT-SPECIFIC DATA QUALITY OBJECTIVES

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

4.4.1 Precision

Precision measures the reproducibility of the sampling and analytical methods. Laboratory and field precision is defined as the relative percent difference (RPD) between duplicate sample analyses. The laboratory duplicate samples or MS/MSD samples measure the precision of the analytical method.

The RPD values were reviewed for all laboratory analyses. Approximately 15.7 percent of the sample results were qualified as estimated quantities (J) based on duplicate RPD QC outliers. Overall, the project DQO for precision of 90 percent was met.

4.4.2 Accuracy

Accuracy measures the reproducibility of the sampling and analytical methodology. Laboratory accuracy is defined as the MS percent recoveries (%Rs). The MS %R values were reviewed for all MS and MSD analyses. Approximately 4.9 percent of the data were qualified as estimated ("J" or "UJ") based on MS/MSD recoveries. Overall, the project DQO for accuracy of 90 percent was met.

4.4.3 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 data validation and usability. All of the Harmony Mine PA/SI data were determined to be usable, therefore the project DQO for completeness of 90 percent was met.

4.4.4 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. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices. The DQO for representativeness of 90 percent was met.

4.4.5 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 DQO for comparability of 90 percent was met.

4.5 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PARAMETERS

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

4.5.1 Holding Times

Approximately 0.1 percent of the data were qualified as estimated quantities ("UJ") based on holding time QC outliers.

4.5.2 Laboratory Blanks

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

Inorganics: lead and zinc.

Any associated sample result less than five times the blank contamination were qualified as not detected ("U"). See the data QA memoranda (Appendix C) for sample results that were qualified based on blank contamination.

4.5.3 Rinsate Blanks

The rinsate blank met the frequency criteria. The following contaminants were detected in the rinsate blank:

Inorganics: chromium, copper, iron, manganese, and nickel.

In order to attain the level of contamination detected in the rinsate blank, gross contamination would need to be present on the field or laboratory equipment. The rinsate water, obtained from pouring ultra-pure deionized blank water provided by Environment Sampling Supply over the decontaminated hand auger, may have been contaminated. Sample results for the above-listed analytes should be viewed with caution.

TABLE 4-1

RINSATE ANALYTICAL RESULTS SUMMARY
HARMONY MINE PA/SI
LEMHI COUNTY, IDAHO

START Sample ID	RS01SW
EPA Sample ID	99394147
TAL Metals (µg/L)	
CHROMIUM	**5.6 JB**
COPPER	**1.3 JB**
IRON	**162**
MANGANESE	**1.8 JB**
NICKEL	**2.9 J**

Note: Bold type indicates concentrations above sample quantation limits or detection limits.

Key:

B	= Associated sample result is greater than instrument detection limit but less than contract requirement detection limit.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical value is an estimate.
PA/SI	= Preliminary Assessment / Site Inspection.
START	= Superfund Technical Assessment and Response Team.
TAL	= Target Analyte List.
µg/L	= Micrograms per liter.

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5. ANALYTICAL RESULTS REPORTING AND BACKGROUND SAMPLES

This section describes reporting and methods applied to analytical results presented in Sections 6 and 7 and discusses background locations and sample results. All samples collected for laboratory analysis are listed in Table 3-1.

5.1 ANALYTICAL RESULTS EVALUATION CRITERIA

Analytical results presented in the summary tables in Sections 6 and 7 show all analytes detected above laboratory detection limits ("DL") 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 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 detection limits; or
- At least three times greater than the background concentration when the background concentration equals or exceeds the detection limit.

The analytical summary tables present all detected analytes, but only those detected analytes at potential sources or in targets meeting the significant/elevated concentration criteria are discussed in the report text. All detected concentrations are discussed for background samples.

For analytical results that are qualified as estimated, the sample concentration was adjusted as described in *Using Qualified Data to Document an Observed Release and Observed Contamination* (EPA 1996) before determining whether the concentration was significant or elevated. 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 the target. When samples were diluted for re-analysis at laboratory, the dilution results were considered for evaluation and are provided in the tables.

5.1.1 Sample Results Reporting

When four or more analytes are detected or are significant/elevated for an analytical suite (for example, TAL metals) in Sections 6 and 7, the number of such analytes and the concentration ranges are given. When three or fewer analytes are detected or are significant/elevated for an analytical suite, the specific analyte and its concentration is provided. Analytical results summary tables in each section list the specific detected compounds and 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 the report. For this reason, these elements will not be discussed in this report.

5.2 BACKGROUND SAMPLES

Background samples were collected for each of the naturally occurring media from which PA/SI samples were collected. Those media are soil, sediment, and surface water. Results for the appropriate background sample are shown in the first column in the analytical results summary tables in Sections 6 and 7 for comparison against source/target results. For sediment and surface water in the South Fork and main stem of Withington Creek, several background samples were collected. Background samples from headwaters and attribution samples from a number of tributaries to the main stem of Withington Creek were collected. The analytical results of all background samples are shaded and arranged from the most upstream to downstream in the analytical results summary tables in Section 7. Sample results of each sample will be compared to that of its upstream background samples.

5.2.1 Background Soil

5.2.1.1 Sample Locations

Two background surface soil samples (BG01SS and BG02SS) were collected from locations which were considered to be out of the range of influence from the mining waste (Figure 3-1). Sample BG01SS was collected approximately 0.1 mile southwest of the tailings piles and approximately 25 feet upland from the headwaters of the South Fork of Withington Creek. The sample, which was collected from 0 to 6 inches bgs, consisted of brown organic material and appeared to be natural soil. For purposes of this report, sample BG01SS was used for comparison to the on-site tailings samples.

The background sample BG02SS was intended to be used for comparison to wetland soil

samples. The sample was collected from 0 to 6 inches bgs on the bushy bank of Joe Moore Creek, a tributary of Withington Creek (Figure 3-1). The Joe Moore Creek bank is classified by the NWI map as a temporarily flooded forested palustrine wetland (USFWS 1984, 1986). The sample location was approximately 100 feet south of the confluence between Joe Moore Creek and the main stem of Withington Creek. The soil type, consisting of dark brown fine sand with trace silt and organic material, matched that of the wetland samples collected along the South Fork and main stem of Withington Creek.

5.2.1.2 Sample Results

Sample results are summarized in Tables 6-1 and 7-5. Nine TAL metals were detected above the adjusted CRDLs in sample BG01SS at concentrations ranging from an adjusted concentration (AC) of 0.79 milligram per kilogram (mg/kg; mercury) to 701.8 mg/kg (AC; manganese). Six TAL metals were detected above the CRDLs in sample BG02SS at concentrations ranging from 1.7 mg/kg (beryllium) to 248 mg/kg (AC; manganese).

5.2.2 Background Sediment/Surface Water

5.2.2.1 Sample Locations

Five sets of colocated sediment and surface water samples were collected from five locations in the headwaters and tributaries of the South Fork and main stem of Withington Creek. One set of background sediment/surface water samples (BG01SD/BG01SW) was collected from the headwaters of the South Fork of Withington Creek which emerges from underground approximately 0.1 mile upstream of the site. No drainage or tributaries to the creek were observed between the headwaters and the site. Four sets of sediment/surface water samples (CR06SD/CR06SW, CR07SD/CR07SW, CR10SD/CR10SW, and CR12SD/CR12SW) were collected from 4 tributaries to the South Fork and main stem of Withington Creek (Figure 3-1). All tributary samples were collected approximately 7 to 10 feet upstream of their confluence with the creek.

5.2.2.2 Sample Results

Sample results are summarized in Tables 7-3 and 7-4. Seven TAL metals were detected above the adjusted CRDLs in sediment sample BG01SD at concentrations ranging from an estimated 5.8 mg/kg (lead) to 2,380 mg/kg (copper). Eleven TAL metals were detected above the adjusted CRDLs in sediment samples CR06SD, CR07SD, CR10SD, and CR12SD, at concentrations ranging from 2.4 mg/kg (AC; cadmium in CR10SD) to 1,460 mg/kg (copper in CR10SD). Copper was detected above the adjusted CRDLs in background surface water samples BG01SW and CR10SW, at concentrations of 174 and 40.3 micrograms per liter (μg/L), respectively.

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6. POTENTIAL SOURCES

This section describes sample locations and analytical results of PA/SI samples obtained from potential sources. Table 6-1 summarizes analytes detected in samples collected from potential source locations. Laboratory data sheets of analytical results for all samples are in Appendix C.

6.1 MINE TAILINGS

Two large piles of mine tailings with a combined volume of approximately 40,000 yd^3 are located at both sides of a dry channel at the Harmony Mine site. The first pile (tailings pile 1) is located on the south side of the dry channel, closer to the mill building; the second pile (tailings pile 2) is located on the north side of the dry channel, farther from the mill building (inset of Figure 3-1). The volume was estimated based on measurements obtained by START in the field (E & E 1999a). It was assumed that the cross section of the pile is rhombic with a natural slope of 60 degrees. The width of each pile was measured to be approximately 42 feet, the thickness approximately 45 feet, and the length approximately 280 feet. The volume of each pile was calculated to be approximately 20,000 yd^3, or 40,000 yd^3 for both piles. The tailings piles are not contained and have partially collapsed into the dry channel which historically contained flowing water during high water periods. The tailings were flooded downstream of the site into the South Fork and main stem of Withington Creek. Tailings deposits were visible in main stem of Withington Creek approximately 2.4 miles downstream of the site.

6.1.1 Sample Locations

Four tailings samples were collected from the tailings piles at the mill site (Figure 3-1), including three surface soil samples (WP01SS, WP02SS, and WP03SS) from 0 to 6 inches bgs and one subsurface soil sample (WP01SB) from 3 to 3.5 feet bgs. Samples WP01SS and WP01SB were collected from a sample location at the top of tailings pile 1. Sample WP02SS was collected from the northwestern slope of tailings pile 1. Sample WP03SS was collected from the top of tailings pile 2. Additionally, one surface soil sample, WP04SS, was collected from the dry tailings deposit located approximately 0.7 mile downstream of the South Fork of Withington Creek.

6.1.2 Sample Results

Sample results are summarized in Table 6-1. Four analytes (cadmium, copper, selenium, and

thallium) were detected at significant concentrations ranging from 1.8 mg/kg (cadmium in sample WP01SS) to 5,870 mg/kg (copper in sample WP02SS) in all five tailings samples. Arsenic was detected at a significant concentration of 39.89 mg/kg (AC) in sample WP01SS. Cobalt was detected at significant concentrations ranging from 19.5 mg/kg in sample WP01SS to 68.1 mg/kg in sample WP02SS in four of the five tailings samples. Silver was detected at significant concentrations in sample WP02SS (2.6 mg/kg) and sample WP04SS (2.2 mg/kg). Vanadium was detected at significant concentrations in sample WP01SS (20.7 mg/kg) and sample WP02SS (16.4 mg/kg).

TABLE 6-1

TAILINGS/SOIL SAMPLES
HARMONY MINE PA/SI
LEMHI COUNTY, IDAHO

START Sample ID	BG01SS	WP01SS	WP01SB	WP02SS	WP03SS	WP04SS
EPA Sample ID	99394306	99394307	99394308	99394309	99394310	99394301
Sample Location	Background	On-Site				Near-Site
Sample Depth (bgs)	0-6"	0-6"	3-3.5'	0-6"		
TAL Metals (mg/kg)						
Aluminum	11500	16000	19000	24500	16200	14400
Antimony	2.1 JB (17.3 Ua)	5.8 JB	3 U	6.7 JB	2.9 U	9 JB
Arsenic	7.3 JK (12.702 AC)	69.4 JH (39.8851 AC)	21.9 JH (12.5862 AC)	44 JH (25.2874 AC)	13.8 JH (7.931 AC)	36.7 JH (21.092 AC)
Barium	178	125	10.6 JB	15 JB	5.2 JB	6.4 JB
Beryllium	0.57 JB (1.45 Ua)	0.29 JB	0.22 U	0.24 U	0.2 U	0.2 U
Cadmium	1.3 JB (1.45 Ua)	1.8	1.9	2.7	1.9	2
Calcium	14300 JK (18304 AC)	321 JB	62 JB	63.8 JB	36.1 JB	42.1 JB
Chromium	9.3 JK (11.997 AC)	15.3	12.9	19.5	10.1	10.2
Cobalt	11.9 JB (14.5 Ua)	19.5	23.9	68.1	14.4	26.3
Copper	144	680	500	5870	491	1400
Iron	30900 JK (41406 AC)	64500	72300	103000	73400	72000
Lead	89.8 JK (129.312 AC)	27.1 JH (18.8194 AC)	12.4 JH (8.6111 AC)	37 JH (25.6944 AC)	7.8 JH (5.4167 AC)	14.8 JH (10.2778 AC)
Magnesium	2380	3140	5580	6330	4750	4110
Manganese	566 JK (701.84 AC)	190 JH (153.2258 AC)	206 JH (166.129 AC)	184 JH (148.3871 AC)	169 JH (136.2903 AC)	127 JH (102.4194 AC)
Mercury	0.43 JK (0.7869 AC)	0.37	0.18	0.7	0.38	0.39
Nickel	13.2	11.6	7.2 JB	10.1	4.3 JB	4.4 JB
Potassium	1650	1980	462 JB	1640	396 JB	705 JB
Selenium	1.2 U	6.1	4.6	8.8	4.9	7.2
Silver	0.29 U	0.98 JB	0.54 JB	2.6	0.76 JB	2.2
Sodium	461 JB	363 JB	271 JB	321 JB	252 JB	259 JB
Thallium	2.4 JB (2.90 Ua)	7.1	6.3	9.7	6.9	7
Vanadium	11.9 JB (14.5 Ua)	20.7	14.1	16.4	13.7	10.1 JB
Zinc	53.2	40.1 JK (26.7333 AC)	25.3 JK (16.8667 AC)	55.8 JK (37.2 AC)	27 JK (18 AC)	37.5 JK (25 AC)

[a] Result listed is the corresponding adjusted CRDL.

Note: Bold type indicates concentrations above sample quantation limits or detection limits.
Underlined type indicates result is significant.

Key:

AC = Adjusted concentration as per EPA guidance document 540-F-94-028.
B = Associated sample result is greater than instrument detection limit, but less than contract required detection limit.
bgs = below ground surface.
CRDL = Contract Required Detection Limit.
EPA = United States Enviromental Protection Agency.
H = High bias.
ID = Identification.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
mg/kg = Milligrams per kilogram.
PA/SI = Preliminary Assessment/Site Inspection.
START = Superfund Technical Assessment and Response Team.
TAL = Target Analyte List.
U = The matter was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

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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 data QA forms from laboratory analyses are presented in Appendix C. This section discusses the groundwater migration pathway (Section 7.1), surface water migration pathway (Section 7.2), soil exposure pathway (Section 7.3), and air migration pathway (Section 7.4).

7.1 GROUNDWATER MIGRATION PATHWAY

This section describes the site's geology, hydrogeology, and groundwater targets.

7.1.1 Geology

The primary geologic formation at the site is metamorphosed rocks of sedimentary origin probably of the Yellowjacket Formation (Middle Proterozoic). The metamorphic rocks consist of medium-gray to medium-dark-gray, mostly thin- to medium-bedded, very fine-grained to fine-grained, feldspathic, finely biotitic quartzite and subordinate interbedded dark-greenish-gray to medium-dark-gray, thin- to medium-bedded siltite and argillite. All the rocks have undergone metamorphism, with the development of slaty cleavage or schistosity and partial recrystallization. Abundance of fracturing at intersections of shear zones also developed at the Harmony Mine. Oxidation of the sulfide ore was evident at some spots. Probable thickness is more than 8,000 feet, although the base of the formation has not been found and the upper portion is bounded by the late Cretaceous Medicine Lodge thrust plate in east-central Idaho and in southwestern Montana (Ross 1925; USGS 1993).

7.1.2 Hydrogeology

The principal water-bearing units in the area are locally occurring, unconsolidated sediments consisting of Holocene alluvial deposits. The alluvial deposits consist primarily of gravel with intercalated sand and silt. The thickness and three-dimensional shape of the alluvial deposits are not well defined (USGS 1998). Shallow groundwater also occurs in near-surface fractures and folds of rocks. Well depths in the area range from 23 to 50 feet bgs (IDWR various dates).

7.1.3 Targets

Four domestic wells are located within a 4-mile radius of the site (IDWR various dates). The average number of persons per household for Lemhi County is 2.47 (USBC 1990). The total number of drinking wells and population served within the 4-mile radius of the site is provided in Table 7-1. Groundwater is used for drinking and livestock watering purposes with the 4-mile target distance limit (TDL). The site is not in 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

The Harmony Mine site is located near the headwaters of the South Fork of Withington Creek (Figure 2-1). The headwaters emerge from underground approximately 0.1 miles upstream of the site and flow underground through the tailings area and re-emerge at approximately 0.15 mile downstream of the site. The probably point of entry (PPE) is where the flow re-emerges from underground. The South Fork of Withington Creek flows from the PPE approximately 2.2 miles northeast to its confluence with the main stem of Withington Creek. The main stem of Withington Creek discharges into the Lemhi River approximately 5.8 miles from this confluence. The Lemhi River flows northwest for approximately 10 additional miles to its confluence with the Salmon River. The 15-mile TDL consists of 2.2 miles in the South Fork Withington Creek; 5.8 miles in the main stem of Withington Creek; and 7 miles in the Lemhi River. From June to August the main stem of Withington Creek is diverted for irrigation and does not reach the Lemhi River (Smith 1999).

The flow rate of the South Fork of Withington Creek is approximately 3.2 cfs, as recorded near its confluence with the main stem Withington Creek in September 1999 (E & E 1999a). The flow rate of the main stem of Withington Creek is approximately 4.2 cfs, as recorded near its confluence with the South Fork of Withington Creek in September 1999 (E & E 1999a). The average flow rate of the Lemhi River is 228 cfs, as recorded at gage station 13305000 at latitude 44^0 56' 24" and longitude 113^0 38' 16", approximately 9 miles upstream of its confluence with the main stem Withington Creek (USGS 2000).

The average annual precipitation and the 2-year, 24-hour rainfall event recorded at the nearest station (Salmon) is approximately 10.17 and 1.5 inches, respectively (WRCC 1998). The upgradient drainage area of the site is estimated to be 50 acres (USGS 1989). The surficial soil type consists of clay, gravel, and sand according to the well logs in the area (IDWR various dates). The permeability of the soil is high.

No flood map is available for the site area. It was reported that tailings piles were flooded in the 1930s (Henderson 1999).

7.2.2 Targets

Withington Creek and Lemhi River are not used for domestic drinking water. Local residents obtain drinking water from groundwater or springs (IDWR 1999).

No commercial fishing is conducted in Withington Creek or the Lemhi River. Very little sport fishing is conducted in Withington Creek because of a lack of abundance of fish (Southwell 2000). The Lemhi River supports sport fishing; however, fish catch data for the Lemhi River is not available from the Idaho Fish and Game Department (IDFG). A local resident claims that several hundreds pounds of fish are caught each year in the Lemhi River within the 15-mile TDL (Southwell 2000).

Within the 15-mile TDL, non-federal listed resident fish species such as rainbow trout (*Salmo gairdneri*) and westslope cutthroat trout (*Oncorhynchus Clarki lewisi*) are present in the South Fork and main stem of Withington Creek, as well as in the Lemhi River (SCNFS 1998). The South Fork and main stem of Withington Creek are considered spawning areas critical for the maintenance of these resident fish species (Smith 1999). Within the 15-mile TDL, the federal-listed threatened Snake River spring/summer chinook salmon (*Oncorhynchus tshawytscha*) are present in the Lemhi River. Historically, the chinook salmon species reportedly have used the Withington Creek watershed for spawning and rearing (SCNFS 1998). At present, however, no anadromous fish are known to be present in the Withington Creek watershed due to fish migration barriers resulting from irrigation practices (Larkin 1999). During recent years, efforts have been made by SCNFS and IDFG to improve the fish migration habitat and to attract salmon species back to the Withington watershed (Smith 1999). According to an IDFG fish biologist, all Salmon River tributaries, including Withington Creek and the Lemhi River, are considered critical habitat for federal-listed threatened Snake River spring/summer chinook salmon (Cannamela 1999).

At least 0.6 mile of wetland frontage exists within the 15-mile TDL based on the NWI maps and the field observations by a START wetland specialist (E & E 1999a). Both the South Fork and main stem of Withington Creek and Lemhi River are used for commercial livestock watering and irrigation of commercial crops (IDWR 1999).

7.2.3 Sample Locations

Ten sediment samples and 10 colocated surface water samples were collected from 10 locations along the South Fork and main stem of Withington Creek. Among these, samples CR01SD/CR01SW were collected from the main stem of Withington Creek from private property located approximately 5.3

miles downstream from the site. Samples CR02SD/CR02SW were collected from the main stem of Withington Creek near and within the BLM boundary, approximately 3.3 miles downstream from the site. Samples CR05SD/CR05SW were collected approximately 3 miles downstream of the site and downstream of the confluence between Joe Moore Creek and the main stem of Withington Creek. Samples CR03SD/CR03SW and CR04SD/CR04SW were collected approximately 2.4 miles downstream of the site in the main stem and South Fork of Withington Creek, respectively. Samples CR08SD/CR08SW, CR09SD/CR09SW, CR11SD/CR11SW, CR13SD/CR13SW, and CR14SD/CR14SW were collected at approximately 0.5 mile intervals in the South Fork of Withington Creek with the most upstream sample (CR14SD/CR14SW) collected at the location where the South Fork of Withington Creek re-emerges from underground approximately 0.15 mile downstream of the site (Figure 3-1). The samples were collected to determine whether contamination from potential sources at the site is migrating to nearby streams and to determine the extent of the contamination.

In addition to the colocated sediment and surface water samples collected, five surface soil samples (WL01SS to WL05SS) were collected from the wetlands along the South Fork and main stem of Withington Creek, and one surface soil sample (CR03SS) was collected in the creek bank along the main stem of Withington Creek. Tailings may be released to the wetlands and creek bank during periods of high water. These samples were collected to determine whether contamination from potential sources at the site is migrating to nearby wetlands and to determine the extent of the contamination. Samples WL01SS and WL02SS were collected from a temporarily flooded forested palustrine wetland located approximately 3 miles downstream from the site. Samples WL03SS and WL04SS were collected from a seasonally flooded emergent palustrine wetland located approximately 1.5 mile downstream from the site. Sample WL05SS was collected from a temporarily flooded forested palustrine wetland located approximately 3.3 miles downstream of the site. Sample CR03SS was collected from tailings observed on the creek bank along the main stem of Withington Creek where samples CR03SD/SW were collected.

7.2.4 Sample Results

Sediment sample results are summarized in Table 7-3, surface water sample results are summarized in Table 7-4, and wetland/creek bank soil sample results are summarized in Table 7-5. Of the metals detected in the sediment samples, selenium, thallium, and vanadium were the only metals detected at elevated concentrations. Selenium was detected in samples CR14SD, CR13SD, and CR11SD at elevated concentrations of 3.2 mg/kg, 2.8 mg/kg, and 3.9 mg/kg, respectively. Thallium was detected in samples CR13SD and CR11SD at concentrations of 2.82 mg/kg (AC) and 3.87 mg/kg (AC), respectively. Vanadium was detected in sample CR03SD at an elevated concentration of 13.1 mg/kg. However, this detection appeared to be an anomalous, since vanadium was not detected at an elevated

concentration in sediment samples collected upstream of CR03SD.

For surface water samples, mercury was detected in sample CR05SW at an elevated concentration of 0.18 μg/L (AC). However, mercury was not detected at a significant concentration in any of the source samples.

For the wetland/creek bank soil samples, seven metals were detected at elevated concentrations. Copper was detected at elevated concentrations in all six samples, ranging from 339 mg/kg in sample WL05SS to 5,720 mg/kg in sample WL04SS. Arsenic (7.5 mg/kg to 16.3 mg/kg; AC), chromium (11.1 mg/kg to 13.4 mg/kg), cobalt (17.7 mg/kg to 35.4 mg/kg), and selenium (1.4 mg/kg to 3.5 mg/kg) were detected at elevated concentrations in at least 3 samples. Mercury was detected at an elevated concentration (0.31 mg/kg) in sample WL04SS. However, mercury was not detected at significant concentrations in source samples.

7.3 SOIL EXPOSURE PATHWAY

No residences, schools, or day care centers are located within 200 feet of the site. Since the mine is inactive, no workers are present at the site (Henderson 1999). Commercial livestock grazing was observed within 200 feet of the tailings at the site. No terrestrial sensitive environments are located on the mine site (Stephens 1999). The residential population within a 1-mile radius of the site is provided in Table 7-2.

7.4 AIR MIGRATION PATHWAY

Since the mine is inactive, no workers are present at the site. The nearest individual is located approximately 0.5 mile from the site. Approximately 79 people reside within a 4-mile radius of the site (EPA 1999).

Within the 4-mile TDL, Withington Creek and the Lemhi River are spawning areas critical for maintenance of the resident fish species, such as rainbow trout *(Salmo gairdneri)* and westslope cutthroat trout (*Oncorhynchus Clarki lewisi*; Smith 1999). According to IDFG, all Salmon River tributaries including Withington Creek and the Lemhi River are considered critical habitat for federal-listed threatened Snake River spring/summer chinook salmon (*Oncorhynchus tshawytscha*; Cannamela 1999). Based on the NWI maps and observations by the START wetland specialist, it is estimated that less than 2 acres of wetlands are present within the 4-mile TDL. The resident population and wetland acreage within the 4-mile TDL is provided in Table 7-2.

Table 7-1

GROUNDWATER DRINKING WATER POPULATION WITHIN A 4-MILE RADIUS
HARMONY MINE PA/SI
LEMHI COUNTY, IDAHO

DISTANCE (MILES)	WELL IDENTIFICATION	Number of Persons Per Household*	Total Population Per Distance Ring
0 to 1/4	0 domestic drinking wells	2.47	0
1/4 to 1/2	0 domestic drinking wells	2.47	0
1/2 to 1	2 domestic drinking wells	2.47	4.94
1 to 2	0 domestic drinking wells	2.47	0
2 to 3	2 domestic drinking wells	2.47	4.94
3 to 4	0 domestic drinking wells	2.47	0
Total			9.88

Source: IDWR Well Logs, Various dates.

* Persons per household is based on the average of 2.47 in Lemhi County, Idaho (USBC 1990).

Table 7-2

POPULATIONS AND WETLAND ACREAGE WITHIN A 4-MILE RADIUS
HARMONY MINE PA/SI
LEMHI COUNTY, IDAHO

DISTANCE (MILES)	RESIDENTS	WETLAND ACREAGE
On a source	0	0
0 to 1/4	0	0
1/4 to 1/2	1	0
1/2 to 1	5	0
1 to 2	17	0
2 to 3	26	2
3 to 4	30	0
Total	79	2

Source: EPA 1999; USFWS 1984 and 1986; E & E 1999a.

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TABLE 7-3

SEDIMENT SAMPLES
HARMONY MINE PA/SI
LEMHI COUNTY, IDAHO

START Sample ID EPA Sample ID	BG01SD 99394304	CR14SD 99394126	CR13SD 99394124	CR12SD 99394122	CR11SD 99394120	CR10SD 99394118	CR09SD 99394116	CR08SD 99394114	CR04SD 99394106	CR03SD 99394104	CR07SD 99394112	CR06SD 99394110	CR05SD 99394108	CR02SD 99394102	CR01SD 99394100
Sample Location	Background	South Fork of Withington Creek (Public Property)		Tributary (Public Property)	South Fork of Withington Creek (Public Property)	Tributary (Public Property)	South Fork of Withington Creek (Public Property)			Main Stem of Withington Creek (Public Property)	Tributary (Public Property)	Tributary (Public Property)	Main Stem of Withington Creek (Public Property)		Main Stem of Withington Creek (Private Property)
Sample Depth (bgs)	0-6"														
TAL Metals (mg/kg)															
ALUMINUM	6930	12600	14100	3440	14000	13700	8260	9990	2920	6180	8680	5460	7580	4330	2850
ANTIMONY	2.8 JB (14.9 U*)	3.9 JB	3.4 JB	1.2 JB (14.4 U*)	5.7 JB	6.3 JB (15.1 U*)	3 JB	2.2 JB	0.71 UJK	0.74 UJK	1.7 JB (25.6 U*)	0.76 UJK (0.5048 AC)	0.94 JB	1 JB	0.77 JB
ARSENIC	19.5 JH	28.1 JK (16.1494 AC)	25.3 JK (14.5402 AC)	2.4 JB (2.40 U*)	38.1 JK (21.8966 AC)	33.5 JK (58.29 AC)	13.5 JK (7.7586 AC)	9.9 JK (5.6897 AC)	5.2 JK (2.9885 AC)	4.3 JK (2.4713 AC)	6.4 JK (11.136 AC)	3.6 JK (6.264 AC)	6.5 JK (3.7356 AC)	8.8 JK (5.0575 AC)	3.3 JK (1.8966 AC)
BARIUM	45.9 JB (49.8 U*)	23.9 JB	47.3 JB	100	22.2 JB	21.5 JB (50.4 U*)	88.4	205	86.3	131	163	115	148	83.4	81.9
BERYLLIUM	0.45 JB (1.24 U*)	0.3 JB	0.42 JB	0.61 JB (1.20 U*)	0.25 JB	0.31 JB (1.26 U*)	0.37 JB	0.8 JB	0.38 JB	0.41 JB	0.68 JB (2.13 U*)	0.42 JB (1.27 U*)	0.55 JB	0.61 JB	0.32 JB
CADMIUM	0.62 JB (1.24 U*)	1.5 JK (1.0638 AC)	1.3 JB	0.4 JB (1.20 U*)	1.5 JK (1.0638 AC)	1.7 JK (2.397 AC)	0.97 JB	0.52 JB	0.53 JB	0.51 JB	0.93 JB (2.13 U*)	0.56 JB (1.27 U*)	0.68 JB	1.3 JK (0.922 AC)	1.2 JB
CALCIUM	882 JB	291 JB	1390 JK (1085.938 AC)	703 JB	273 JB	291 JB	936 JB	4970 JK (3882.813 AC)	1280 JK (1000 AC)	2380 JK (1859.375 AC)	6830 JK (8742.4 AC)	2050 JK (2624 AC)	3350 JK (2617.188 AC)	1890 JK (1476.563 AC)	1810 JK (1414.063 AC)
CHROMIUM	6.9	9.1 JK (7.0543 AC)	11.3 JK (8.7597 AC)	3.5 JK (4.515 AC)	9.6 JK (7.4419 AC)	9.6 JK (12.384 AC)	5 JK (3.876 AC)	7.7 JK (5.969 AC)	2.6 JK (2.0155 AC)	12.3 JK (9.5349 AC)	9.4 JK (12.126 AC)	9.4 JK (12.126 AC)	9.1 JK (7.0543 AC)	6.7 JK (5.1938 AC)	5.9 JK (4.5736 AC)
COBALT	22.2	34.6	37.9	16.5	32.4	28.9	39.2	19.9 JB	8.2 JB	6.1 JB	16.8 JB (21.3 U*)	13.2	15.3	13.4	4.3 JB
COPPER	2390	2340	3430	907	1840	1460	1710	3170	219	25.9	1240	273	677	314	57.8
IRON	21600	47100 JK (35149.25 AC)	43500 JK (32462.69 AC)	12500 JK (16750 AC)	54500 JK (40671.64 AC)	48700 JK (65258 AC)	25800 JK (19253.73 AC)	17300 JK (12910.45 AC)	15700 JK (11716.42 AC)	11900 JK (8880.597 AC)	12500 JK (16750 AC)	13300 JK (17822 AC)	14900 JK (11119.4 AC)	15500 JK (11567.16 AC)	8490 JK (6335.821 AC)
LEAD	8.8 JH	13 JK (9.0278 AC)	14.2 JK (9.8611 AC)	6.6 JK (9.504 AC)	18.1 JK (12.5694 AC)	21.7 JK (31.248 AC)	9.1 JK (6.3194 AC)	10.4 JK (7.2222 AC)	6.9 JK (4.7917 AC)	31 JK (21.5278 AC)	24 JK (34.56 AC)	20.4 JK (29.376 AC)	17.8 JK (12.3611 AC)	25.9 JK (17.9861 AC)	19.4 JK (13.4722 AC)
MAGNESIUM	1560	3210	3410	714 JB	3920	3870	2160	1820 JB	930 JB	3240	2240	2390	2420	1600	1070 JB
MANGANESE	449 JH	468 JK (377.4194 AC)	440 JK (354.8387 AC)	389 JK (482.36 AC)	188 JK (151.6129 AC)	206 JK (255.44 AC)	350 JK (282.2581 AC)	323 JK (260.4839 AC)	324 JK (261.2903 AC)	428 JK (345.1613 AC)	512 JK (634.88 AC)	348 JK (431.52 AC)	423 JK (341.129 AC)	337 JK (271.7742 AC)	143 JK (115.3226 AC)
MERCURY	0.06 UJK (0.1098 AC)	0.06 UJK	0.07 JB	0.06 UJK	0.07 JB	0.06 JB (0.23 U*)	0.06 UJK	0.13 UJK	0.06 UJK	0.06 UJK	0.11 UJK	0.06 UJK	0.07 UJK	0.06 UJK	0.06 UJK
NICKEL	8 JB (9.95 U*)	7.1 JB	8.6 JB	5.8 JB (9.60 U*)	5.6 JB	5.7 JB (10.1 U*)	4.2 JB	8.9 JB	4.4 JB	8.4 JB	10.5 JB (17.0 U*)	7.4 JB (10.2 U*)	7.9 JB	5.5 JB	3.6 JB
POTASSIUM	720 JB	1010 JB	1080 JB	1730	668 JB	662 JB	1140 JB	1060 JB	1440	1390	1340 JB	1280	1490	983 JB	969 JB
SELENIUM	1 U	3.2	2.8	0.96 U	3.9	2.4	1 U	2.1 U	0.95 U	0.98 U	1.7 U	1 U	1 U	0.99 U	0.98 U
SILVER	0.25 U	0.3 JB	0.32 JB	0.24 U	0.43 JB	0.25 U	0.25 U	0.52 U	0.24 U	0.25 U	0.43 U	0.25 U	0.26 U	0.25 U	0.24 U
SODIUM	354 JB	354 JB	375 JB	361 JB	315 JB	303 JB	341 JB	745 JB	295 JB	403 JB	570 JB	404 JB	430 JB	374 JB	364 JB
THALLIUM	2.5 JB (2.49 U*)	5.3 JB	4.6 JK (2.8221 AC)	1.2 JB (2.40 U*)	6.3 JK (3.865 AC)	8.6 JK (10.416 AC)	2.8 JK (1.7178 AC)	1.7 JB	1.6 JB	1.1 JB	1.8 JB (4.26 U*)	1.3 JB (2.55 U*)	1.3 JB	1.8 JB	1.2 JB
VANADIUM	8.8 JB (12.4 U*)	10.7 JB	11.7 JB	5.3 JB (12.10 U*)	10.8 JB	10.1 JB (12.6 U*)	6.9 JB	7.3 JB	5.7 JB	13.1	9.4 JB (21.3 U*)	11.5 JB (12.7 U*)	10.7 JB	9.7 JB	7.7 JB
ZINC	19.1 JK (28.63 AC)	35	33.6	15.8	30.7	31.4	24.8	30.9	21.4	76.7	68.6	53.3	51.4	64.5	57.7

* Result listed is corresponding adjusted CRDL

Note: Bold type indicates concentrations above sample quantitation limits or detection limits. Underlined type indicates result is elevated. Background samples are shaded.

Key:

AC = Adjusted concentration as per EPA guidance document 540-R-94-028.
B = Associated sample result is greater than instrument detection limit, but less than contract required detection limit.
bgs = Below ground surface.
CRDL = Contact Required Detection Limit.
EPA = United States Environmental Protection Agency.
H = High Bias.
ID = Identification.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
mg/kg = Milligrams per kilogram.
PA/SI = Preliminary Assessment/Site Inspection.
START = Superfund Technical Assessment and Response Team.
TAL = Target Analyte List.
U = The material was analyzed for this parameter, but was not detected. The associated numerical value is the sample quantitation limit.
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.

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TABLE 7-4

SURFACE WATER SAMPLES
HARMONY MINE PA/SI
LEMHI COUNTY, IDAHO

START Sample ID EPA Sample ID	BG01SW 99394305	CR14SW 99394127	CR13SW 99394125	CR12SW 99394123	CR11SW 99394121	CR10SW 99394119	CR09SW 99394117	CR08SW 99394115	CR04SW 99394107	CR03SW 99394105	CR07SW 99394113	CR06SW 99394111	CR05SW 99394109	CR02SW 99394103	CR01SW 99394101
Sample Location	Background (Public Property)	South Fork of Withington Creek (Public Property)		Tributary (Public Property)	South Fork of Withington Creek (Public Property)	Tributary (Public Property)	South Fork of Withington Creek (Public Property)			Main Stem of Withington Creek (Public Property)	Tributary (Public Property)	Tributary (Public Property)	Main Stem of Withington Creek (Public Property)		Main Stem of Withington Creek (Private Property)
Sample Depth	0-6"														
TAL Metals (µg/L)															
ALUMINUM	24.8 U	19.3 U	26 U	103 JB	159 JB	129 JB	83.1 U	81.5 U	67.3 U	55.7 U	91 JB	131 JB	65.5 U	73.9 U	117 JB
BARIUM	2.2 JB (200 U*)	2.4 JB	3.6 JB	27.2 JB (200 U*)	10.6 JB	11.4 JB (200 U*)	12 JB	17.3 JB	16.8 JB	20.2 JB	26.7 JB (200 U*)	25.5 JB (200 U*)	23.9 JB	24.8 JB	35.2 JB
CALCIUM	1700 JB	1900 JB	2080 JB	2290 JB	2210 JB	2350 JB	2890 JB	3820 JB	3940 JB	7620	8560	8130	7800	8280	11200
COBALT	1.2 JB (50 U*)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
COPPER	174	50.5	29	2.4 JB	58.9	40.3	34	28.6	25.2	17.3 JB	19.1 JB	11.9 JB	13.6 JB	11.8 JB	16 JB
IRON	39.2 JB	20.9 JB	25.2 JB	52.1 JB	275	181	74.5 JB	53.4 JB	48.3 JB	43.5 JB	100	85 JB	64.8 JB	54.3 JB	130
LEAD	1 U	1 U	1 U	1 U	1.6 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.6 U	1.3 U
MAGNESIUM	400 JB	526 JB	669 JB	724 JB	743 JB	777 JB	822 JB	995 JB	991 JB	2180 JB	2370 JB	1940 JB	2090 JB	2190 JB	2830 JB
MANGANESE	1 JB (15 U*)	1 U	1 U	1 JB (15 U*)	1.5 JB	1 JB (15 U*)	1 U	1 U	1 U	1.1 JB	7.3 JB (15 U*)	3.9 JB (15 U*)	4.4 JB	3.1 JB	5.2 JB
MERCURY	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.27 JH (0.18 AC)	0.1 U	0.1 U
NICKEL	1.4 JB (40 U*)	1 U	1 U	1 U	1.1 JB	1 U	1 U	1 U	1 U	1 U	1 U	1.2 JB (40 U*)	1 U	1 U	1 U
POTASSIUM	432 JB	505 JB	633 JB	845 JB	754 JB	786 JB	789 JB	911 JB	850 JB	910 JB	1050 JB	1036 JB	997 JB	1030 JB	1760 JB
SODIUM	962 JB	1030 JB	1100 JB	1400 JB	1220 JB	1290 JB	1400 JB	1650 JB	1720 JB	2740 JB	3060 JB	3288 JB	2970 JB	3150 JB	5360 JL
Acidity (mg/L as $CaCO_3$)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
pH (measured)	6.57	7.44	7.17	7.1	6.83	6.04	5.8	8.7	8.42	8.07	8.54	7.93	8.01	7.97	7.67
Sulfate (mg/L)	2.56	3.29	3.24	1.54	2.54	2.54	2.68	2.78	2.86	6.42	5.59	4.15	5.21	5.26	5.06
Hardness (mg equivalent $CaCO_3$ /L)	5.86	6.88	7.91	8.66	8.54	9.83	10.55	13.57	13.85	27.87	31	28.27	27.94	29.54	39.42

* Result listed is corresponding adjusted CRDL

Note: Bold type indicates concentrations above sample quantitation limits or detection limits. Underlined type indicates result is elevated. Background samples are shaded.

Key:

AC	= Adjusted concentration as per EPA guidance document 540-F-94-028.
B	= Associated sample result is greater than instrument detection limit but less than contract required detection limit.
bgs	= Below ground surface.
CRDL	= Contact Required Detection Limit.
EPA	= United States Environmental Protection Agency.
H	= High Bias.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical value is an estimate.
L	= Low bias.
mg/L	= Milligrams per liter.
µg/L	= Micrograms per liter.
PA/SI	= Preliminary Assessment/Site Inspection.
START	= Superfund Technical Assessment and Response Team.
TAL	= Target Analyte List.
U	= The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

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intentionally left blank.

TABLE 7-5

WETLAND/CREEK BANK SURFACE SOIL SAMPLES
HARMONY MINE PA/SI
LEMHI COUNTY, IDAHO

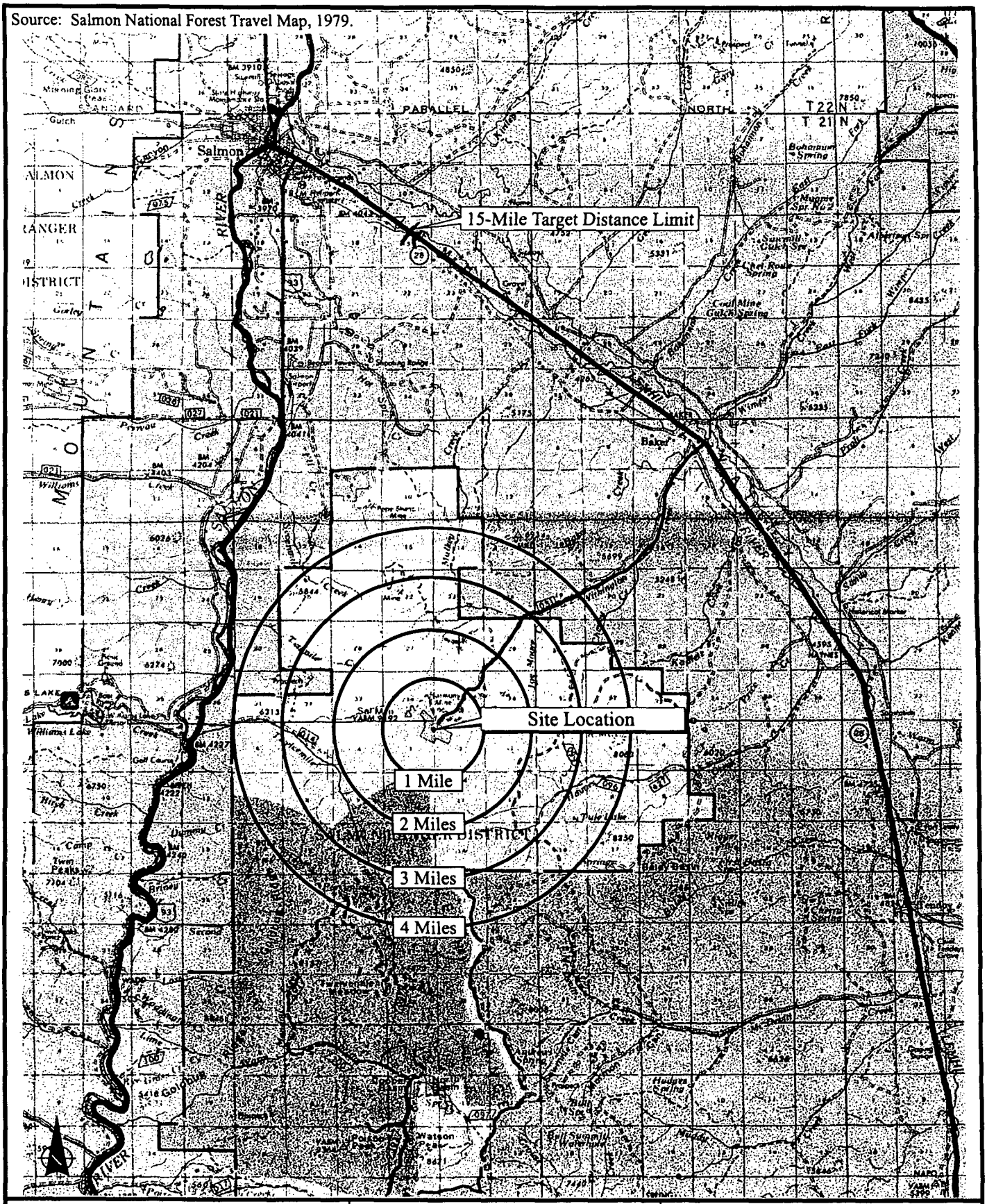
START Sample ID	BG02SS	WL01SS	WL02SS	WL03SS	WL04SS	WL05SS	CR03SS
EPA Sample ID	99394149	99394312	99394313	99394303	99394302	99394148	99394311
Sample Location	Background	Wetland					Creek Bank
Sample Depth (bgs)	0-6"	0-6"					
TAL Metals (mg/kg)							
Aluminum	5050	9190	9470	14900	16500	7170	9060
Antimony	0.89 UJK (1.7622 AC)	1.1 U	2.3 JB	2.6 JB	4.2 JB	0.67 UJK	2.6 U
Arsenic	1 JB (7.42 U*)	9.3 JH (5.3448 AC)	13.1 JH (7.5287 AC)	16.5 JH (9.4828 AC)	28.4 JH (16.3218 AC)	4.7 JK (2.7011 AC)	16.1 JH (9.2529 AC)
Barium	198	174	166	170	168	186	117
Beryllium	1.7	0.46 JB	0.56 JB	0.87 JB	0.93 JB	0.63 JB	0.4 JB
Cadmium	0.3 UJK (0.423 AC)	0.69 JB	1.2 JB	1 JB	1.3 JB	0.41 JB	0.81 JB
Calcium	5400 JK (6912 AC)	2950	3820	3800	4130	2730 JK (2132.813 AC)	1530
Chromium	2.8 JB (7.42 U*)	11.7	11.1	11.8	13.4	4.8 JK (3.7209 AC)	6.6
Cobalt	0.94 JB (14.8 U*)	14.3	17.7	22.5	35.4	6.2 JB	26
Copper	7.8	699	1130	2930	5720	339	1420
Iron	3730 JK (4998.2 AC)	19300	21600	32600	43600	9870 JK (7365.671 AC)	26900
Lead	6.6 JK (9.504 AC)	23 JH (15.9722 AC)	26.3 JH (18.2639 AC)	16.2 JH (11.25 AC)	18 JH (12.5 AC)	10.3 JK (7.1528 AC)	13 JH (9.0278 AC)
Magnesium	1030 JB	3320	3090	3130	3670	1500	2340
Manganese	200 JK (248 AC)	344 JH (277.42 AC)	408 JH (329.0323 AC)	316 JH (254.8387 AC)	375 JH (302.4194 AC)	342 JK (275.8065 AC)	365 JH (294.3548 AC)
Mercury	0.07 UJK (0.1281 AC)	0.05 UJK	0.08 JB	0.18 JB	0.31	0.08 JB	0.06 JB
Nickel	2.1 JB (11.9 U*)	8.5	9 JB	12.5 JB	11.6 JB	3.5 JB	5.3 JB
Potassium	1430 JB	1920	1960	1500 JB	1480 JB	1880	1480
Selenium	1.2 U	0.82 U	1 U	2.2	3.5	0.89 U	1.4
Sodium	555 JB	381 JB	416 JB	546 JB	641 JB	389 JB	297 JB
Thallium	1.2 JB (2.97 U*)	2 JB	2.4 JB	3.1 JB	5	0.86 JB	2.3
Vanadium	5.1 JB (14.8 U*)	13.2	12.4 JB	12.1 JB	12.8 JB	5.7 JB	8.6 JB
Zinc	19	61.4 JK (40.9333 AC)	54.1 JK (36.0667 AC)	39.9 JK (26.6 AC)	54.2 JK (36.1333 AC)	29.7	28.3 JK (18.8667 AC)

* Result listed is corresponding adjusted CRDL.

Note: Bold type indicates concentrations above sample quantitation limits or detection limits.
Underlined type indicates result is elevated.

Key:

AC = Adjusted concentration as per EPA guidance document 540-F-94-028.
B = Associated sample result is greater than instrument detection limit but less than contract required detection limit.
bgs = Below ground surface.
CRDL = Contract Required Detection Limit.
EPA = United States Environmental Protection Agency.
H = High Bias.
ID = Identification.
J = The analyte was positively identified. The associated numerical value is an estimate.
K = Unknown bias.
mg/kg = Milligrams per kilogram.
PA/SI = Preliminary Assessment / Site Inspection.
START = Superfund Technical Assessment and Response Team.
TAL = Target Analyte List.
U = The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ = The material was analyzed for but was not detected. The associated numerical value is the estimated sample quantitation limit.



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	HARMONY MINE Lemhi County, Idaho	Figure 7-1 4-MILE AND 15-MILE TDL MAP			
		Drawn: AES	DATE: 2/22/00	JOB NO. DB0401SAT0	Dwg.No. DB0401 7-1

8. SUMMARY AND CONCLUSIONS

In September 1999, START conducted PA/SI sampling at the Harmony Mine site located in northeastern Lemhi County, Idaho. The site is located approximately 15 miles southeast of Salmon, Idaho. The total property encompasses approximately 330 acres of land. Harmony Mine was operated from 1916 to 1931 and produced primarily copper ore concentrate. Ore was mined from underground tunnels and transported to a mill on the property for concentration. Tailings from the ore concentration process were discharged in a dry channel below the mill building. The volume of the tailings piles were estimated by the START to be approximately 40,000 yd^3. The tailings piles are located near the South Fork of Withington Creek. The South Fork of Withington Creek originates approximately 0.1 mile upgradient of the mill site, flows underground through the site area, and re-emerges approximately 0.15 mile downstream of the site. Historically, the South Fork of Withington Creek flowed through the tailings piles area and washed tailings downstream of the site. Tailings deposits were observed to a distance approximately 2.4 miles downstream of the site.

The Harmony Mine property is not fenced, with limited public access due to its remoteness. The nearest resident is located approximately 0.5 mile from the site.

The PA/SI involved the collection of samples from potential source areas and migration routes. A total of 43 samples, including background samples, but excluding QA samples, were collected. Samples were collected from the tailings located at the mill site, from the South Fork and main stem of Withington Creek, and from wetlands located along Withington Creek. The media sampled consisted of surface and subsurface soil, sediment, and surface water. Samples were analyzed by the EPA, Region 10, Laboratory in Manchester, Washington, and a CLP laboratory in Broken Arrow, Oklahoma. Section 8.1 summarizes the potential source analytical sample results and a brief overview of the analytes which were detected in the source samples. Section 8.2 summarizes the potential target analytical sample results and a brief overview of analytes which were detected in the target samples.

8.1 SOURCES

Source samples were collected from tailings piles at the mill site and tailings deposits down-gradient of the mill site. Five surface/subsurface soil samples were collected from the source. A total of eight TAL metals, including arsenic, copper, cobalt, chromium, silver, selenium, thallium, and vanadium, were detected at significant concentrations in the source samples.

8.2 TARGETS

Due to the remoteness of the site, the primary targets that are subject to actual or potential contamination are in the surface water migration pathway.

8.2.1 Surface Water Migration Pathway

A total of 15 sediment and 15 colocated surface water samples were collected in Withington Creek. Three metals, selenium, thallium, and vanadium, were detected in sediment samples at elevated concentrations. Selenium and thallium may be attributable to the source at the site. Of the metals detected in the surface water sample, only mercury was elevated with respect to background concentrations. However, mercury was not detected at a significant concentration in any of the source samples.

A total of five surface soil samples were collected in the wetlands located along the South Fork and the main stem of Withington Creek. Seven TAL metals (arsenic, copper, chromium, cobalt, selenium, thallium, and mercury) were detected at elevated concentrations, with six of them (arsenic, copper, chromium, cobalt, selenium, and thallium) appear to be attributable to the source at the site. Copper was detected at elevated concentrations in all samples including the most downstream sample collected approximately 3.3 miles from the site.

8.3 CONCLUSIONS

Several metals were detected at significant or elevated concentrations in the PA/SI samples collected from the mining wastes and sediments in nearby streams. Concentrations of copper up to approximately 5,000 mg/kg were detected in the source at the site and in nearby wetland soils, and concentrations of copper up to approximately 3,000 mg/kg were detected in Withington Creek sediments. However, the concentration of copper in the sediment samples collected from Withington Creek were not elevated when compared to the results of the background samples collected upstream and from tributaries of Withington Creek. The cause of the high concentration of copper in background sediments is unclear. Elevated concentrations of selenium and thallium detected in Withington Creek sediments may be attributable to the sources at the site. Elevated concentrations of copper, arsenic, chromium, cobalt, selenium, and thallium were also detected in wetland soils adjacent to the South Fork and main stem of Withington Creek downstream of the site. These metals may have migrated to the wetland areas during periods of high flow. Migration of contaminants from sources at the site to areas approximately 3.3 miles downstream of the site was observed during the PA/SI.

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APPENDIX A

PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial #: NA **TDD #: 99-02-0004**

Lens Type: Disposal Kodak Camera **Site Name: Harmony Mine, Lemhi County, Idaho**

Photo No.	Dir.	Date	By	Time	Description
1-1	NE	09/19/99	LL	1745	Cows grazing along the road approximately 7 miles from Harmony Mine.
1-2	SW	09/19/99	DW	1747	Cows grazing along the road approximately 7 miles from Harmony Mine.
1-3	NE	09/20/99	LL	1045	Cow grazing approximately 400 feet from the tailings piles at Harmony Mine.
1-4	W	09/20/99	LL	1105	Cows grazing is approximately 400 feet from the tailings piles at Harmony Mines.
1-5	NW	09/20/99	LL	1345	A portion of tailings pile 2 at the site.
1-6	E	09/20/99	LL	1346	Tailings pile 1 and mill structure. Photo taken from tailings pile 2. Note the greenish-blue color on the slope indicating presence of copper sulfates.
1-7	S	09/20/99	LL	1348	Tailings pile 2.
1-8	S	09/20/99	LL	1349	Tailings pile 2. Shot at the location of photo 1-7.
1-9	SE	09/20/99	LL	1350	Tailings pile 1 (left) and tailings pile 2 (right). Shot at the location of photo 1-7.
1-10	S	09/20/99	LL	1400	No. 1 (background) and No. 2 (foreground) collapsed tailings dams.
1-11	E	09/20/99	LL	1405	Mill structure at the site. Shot from the base of the structure.
1-12	D	09/20/99	LL	1406	Cow dung in front of the mill structure, indicating the presence of cattle at the site.
1-13	D	09/20/99	LL	1635	Withington Creek within Louck's property (near the property boundary line).
1-14	NE	09/20/99	LL	1637	Withington Creek within Louck's property, approximately 25 feet upstream from the location of photo 1-14.
1-15	D	09/20/99	LL	1645	Close-up of Withington Creek at the location of photo 1-14.
1-16	D	09/20/99	LL	1652	Marshy grassy area on the bank of Withington Creek at the location of photo 1-14.
2-1	W	09/20/99	SL	1210	Location of soil sample WP02. Photo taken from on top of tailings pile 1.
2-2	D	09/20/99	SL	1211	Close-up of location WP02.
2-3	D	09/20/99	SL	1212	Close-up of homogenized sample WP02SS.
2-4	D	09/20/99	SL	1230	Close-up of homogenized sample WP01SS.
2-5	W	09/20/99	SL	1230	Location of soil sample WP01 on tailings pile 1.
2-6	E	09/20/99	SL	1250	Location of soil sample WP01. Hand auger was used to collect subsurface soil sample.
2-7	NE	09/20/99	SL	1300	Location of soil sample WP03.
2-8	D	09/20/99	SL	1310	Close-up of homogenized sample WP03SS.
2-9	D	09/20/99	SL	1319	Close-up of homogenized sample WP01SB.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial #: NA **TDD #: 99-02-0004**

Lens Type: Disposal Kodak Camera **Site Name: Harmony Mine, Lemhi County, Idaho**

Photo No.	Dir.	Date	By	Time	Description
2-10	W	09/21/99	DW	1115	Collection of sample CR01SW.
2-11	D	09/21/99	SL	1150	Close-up of Forest Service sample CR01SD (split sample) at location CR01SW.
2-12	D	09/21/99	SL	1150	Close-up of sample CR01SD.
2-13	D	09/21/99	SL	1245	Close-up of sample CR02SD.
2-14	S	09/21/99	SL	1245	Sample location CR02, looking upstream.
2-15	S	09/21/99	SL	1245	Sample location CR02.
2-16	S	09/21/99	SL	1320	Confluence of South Fork of Withington Creek and main stem of Withington Creek.
2-17	S	09/21/99	DW	1330	Close-up of homogenized sample CR03SD.
2-18	E	09/21/99	DW	1345	Sample location CR03SS.
2-19	D	09/21/99	DW	1345	Close-up of homogenized sample CR03SS.
2-20	D	09/21/99	DW	1400	Close-up of homogenized sample CR04SD.
2-21	W	09/21/99	DW	1400	Sample location CR04.
3-1	W	09/21/99	SL	1430	Measurement of streamflow of South Fork of Withington Creek at the confluence with the main stem of Withington Creek.
3-2	D	09/21/99	SL	1540	Close-up of homogenized sample CR05SD.
3-3	D	09/21/99	LL	1600	Confluence of Joe Moore Creek with the main stem of Withington Creek.
3-4	D	09/21/99	SL	1600	Close-up of homogenized sample CR06SD.
3-5	S	09/21/99	LL	1650	Sample location WL01.
3-6	D	09/21/99	SL	1650	Close-up of homogenized sample WL01SS.
3-7	N	09/21/99	SL	1715	Sample location WL02.
3-8	S	09/21/99	SL	1755	Unnamed tributary No. 1 to the main stem of Withington Creek.
3-9	D	09/21/99	DW	1800	Close-up of homogenized sample CR07SD.
3-10	D	09/21/99	SL	1830	Close-up of homogenized sample CR08SD.
3-11	NE	09/22/99	SL	0849	Sample location WL03.
3-12	D	09/22/99	SL	0910	Close-up of homogenized sample WL03SS.
3-13	NE	09/22/99	SL	0920	Sample location WL04.
3-14	D	09/22/99	SL	0920	Close-up of homogenized sample WL04SS.
3-15	D	09/22/99	SL	0935	Close-up of homogenized sample CR09SD. Note that the white board in the picture indicates CR07SD; it should be corrected to CR09SD.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial #: NA **TDD #: 99-02-0004**

Lens Type: Disposal Kodak Camera **Site Name: Harmony Mine, Lemhi County, Idaho**

Photo No.	Dir.	Date	By	Time	Description
3-16	W	09/22/99	SL	1000	Forest Service sample (in a bowl).
3-17	W	09/22/99	LL	1035	Confluence of unnamed tributary No. 2 with South Fork of Withington Creek.
3-18	D	09/22/99	SL	1050	Close-up of homogenized sample CR10SD.
3-19	S	09/22/99	LL	1105	Dry creek bed, photo taken from the end of large tailings deposition area.
3-20	N	09/22/99	LL	1110	Dry creek bed 50 feet downstream from the location in photo 3-20.
3-21	S	09/22/99	LL	1120	Photo taken from the end of the dry creek bed in photo 3-20. Note that the bushy tree in the background marks the location of a large tailings deposition area.
3-22	D	09/22/99	LL	1125	Withington Creek emerges from the end of the dry portion of the creek bed.
4-1	D	09/22/99	DW	1150	Close-up of homogenized sample CR11SD.
4-2	N	09/22/99	DW	1210	North of sample location WP04.
4-3	S	09/22/99	DW	1210	South of sample location WP04.
4-4	D	09/22/99	DW	1210	Close-up of homogenized sample WP04SS.
4-5	W	09/22/99	LL	1300	South Fork of Withington Creek near sample location CR12. Note that the creek bed was dry, water appeared to flow underneath the dry creek.
4-6	D	09/22/99	LL	1305	Confluence of unnamed tributary No. 3 with the South Fork of Withington Creek.
4-7	D	09/22/99	DW	1350	Close-up of homogenized sample CR12SD.
4-8	D	09/22/99	DW	1415	Close-up of homogenized sample CR13SD.
4-9	N	09/22/99	SL	1415	Sample location CR13, looking upstream.
4-10	S	09/22/99	SL	1505	Dead trees near the tailings pile at site.
4-11	D	09/22/99	DW	1520	Close-up of homogenized sample CR14SD.
4-12	S	09/22/99	DW	1520	Sample location CR14. Note that the South Fork of Withington Creek surfaces at this location.
4-13	S	09/22/99	SL	1650	Slide area where the headwater of Withington Creek appears to be located.
4-14	SW	09/22/99	SL	1650	Building located upgradient of mill site at 7,400 feet above MSL.
4-15	SW	09/22/99	LL	1710	View of mill structure at the Harmony Mine site. Shot from building at 7,400 feet above MSL. Note the mill structure is located in the center of the photo.
4-16	S	09/22/99	SL	1715	Dry creek channel of headwater of South Fork of Withington Creek, looking upstream.
4-17	N	09/22/99	SL	1715	Dry creek channel of headwater of South Fork of Withington Creek, looking downstream.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial #: NA **TDD #: 99-02-0004**
Lens Type: Disposal Kodak Camera **Site Name: Harmony Mine, Lemhi County, Idaho**

Photo No.	Dir.	Date	By	Time	Description
4-18	S	09/22/99	LL	1750	South Fork of Withington Creek surfaces approximately 0.1 miles upstream of the site.
4-19	D	09/22/99	SL	1750	Close-up of homogenized sample BG01SD.
4-20	D	09/22/99	SL	1800	Close-up of homogenized sample BG01SS.
4-21	S	09/22/99	SL	1845	Sample location BG02SS.
4-22	D	09/22/99	SL	1845	Close-up of homogenized sample BG02SS.

Key:

D = Down.
Dir. = Direction.
DW = Dan Weiss.
E = East.
LL = Lilin Li.
MSL = Mean Sea Level.
N = North.
NA = Not Applicable.
NE = Northeast.
NW = Northwest.
TDD = Technical Direction Document.
S = South.
SE = Southeast.
SL = Susan Lipinski.
SW = Southwest.
W = West.


1-1

1–2


1-4

1-6


1-7

1-8


1-9


1–10

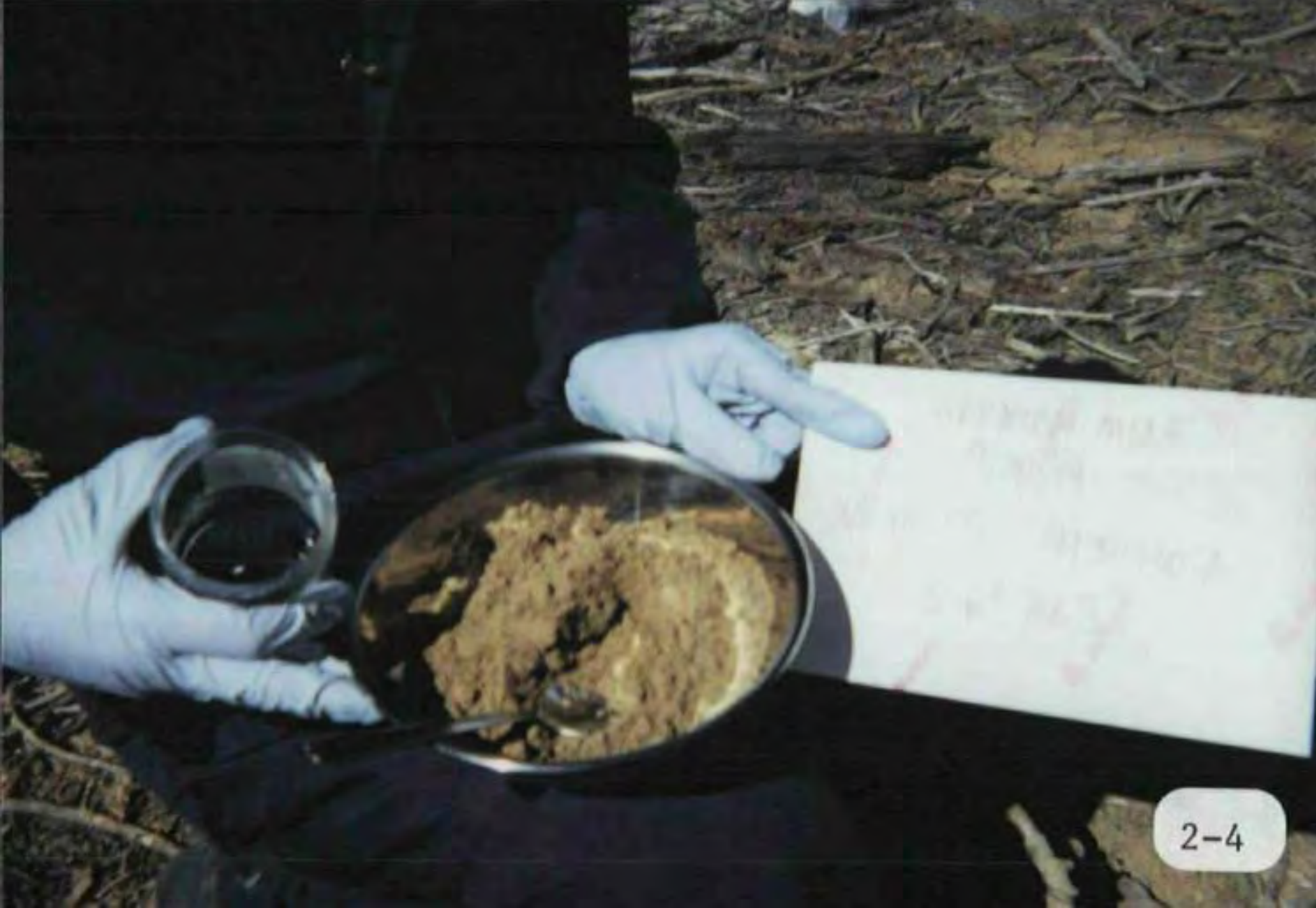

1–12


1-15


2-1


2-2

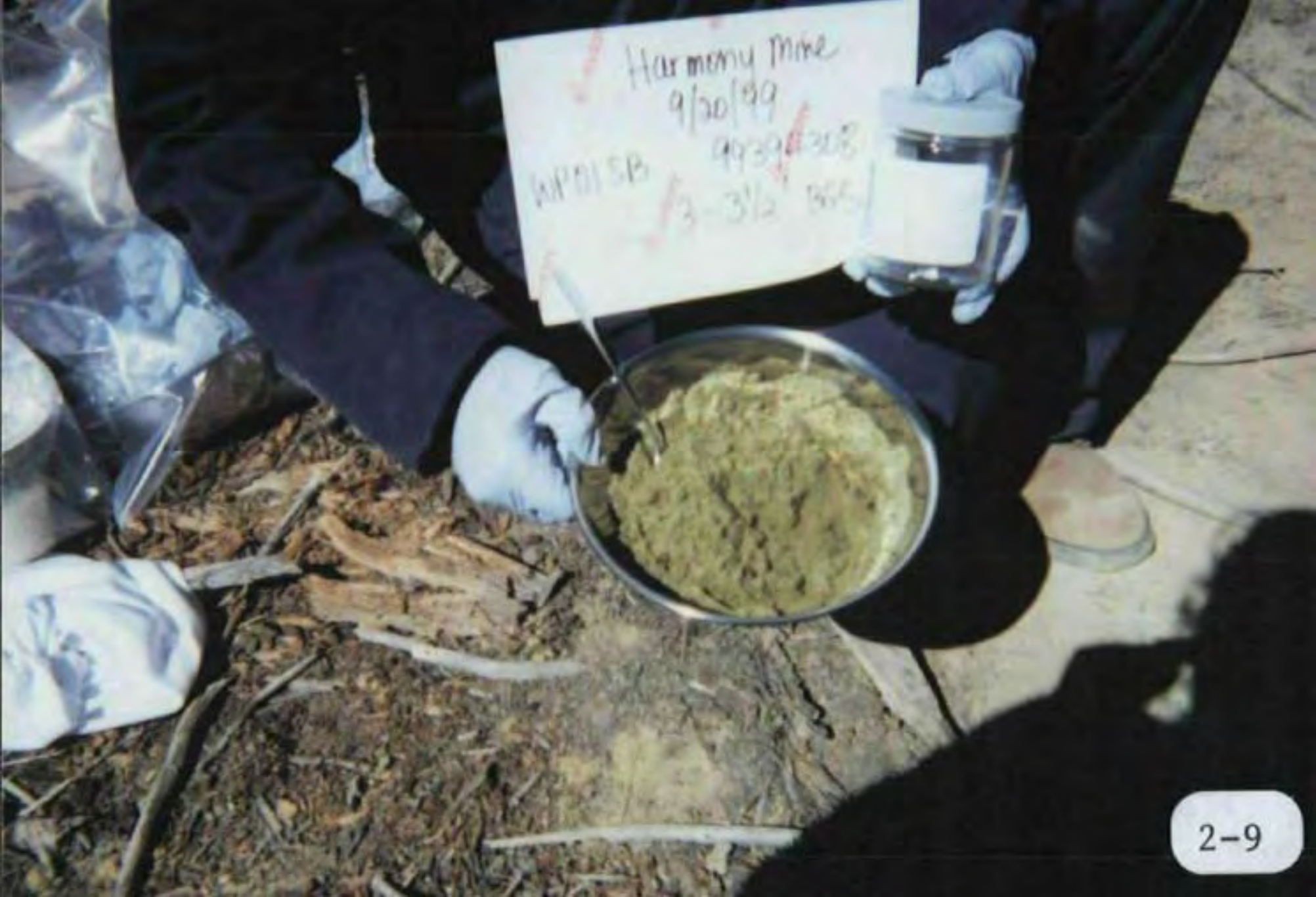

9/20/99
Harmony
WP02-
9894309
0-6" BGS



2-4

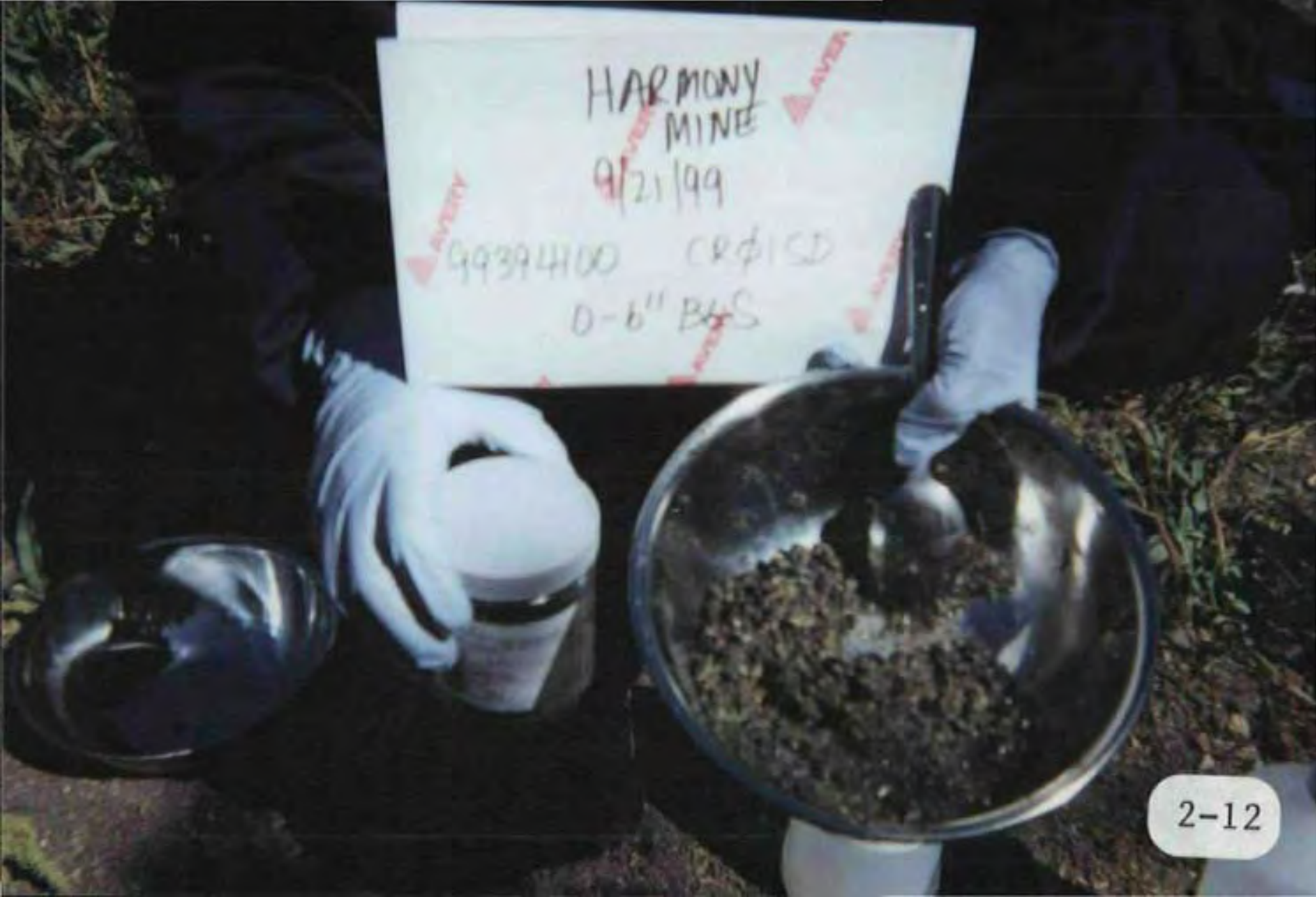
2-5

2–6


Harmony Mine
9/20/99


2-10


HARMONY MINE
9/21/99
FOREST SERVICE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MINE
9/21/99
9939410D CR#1SD
0-6" B&S
2-12

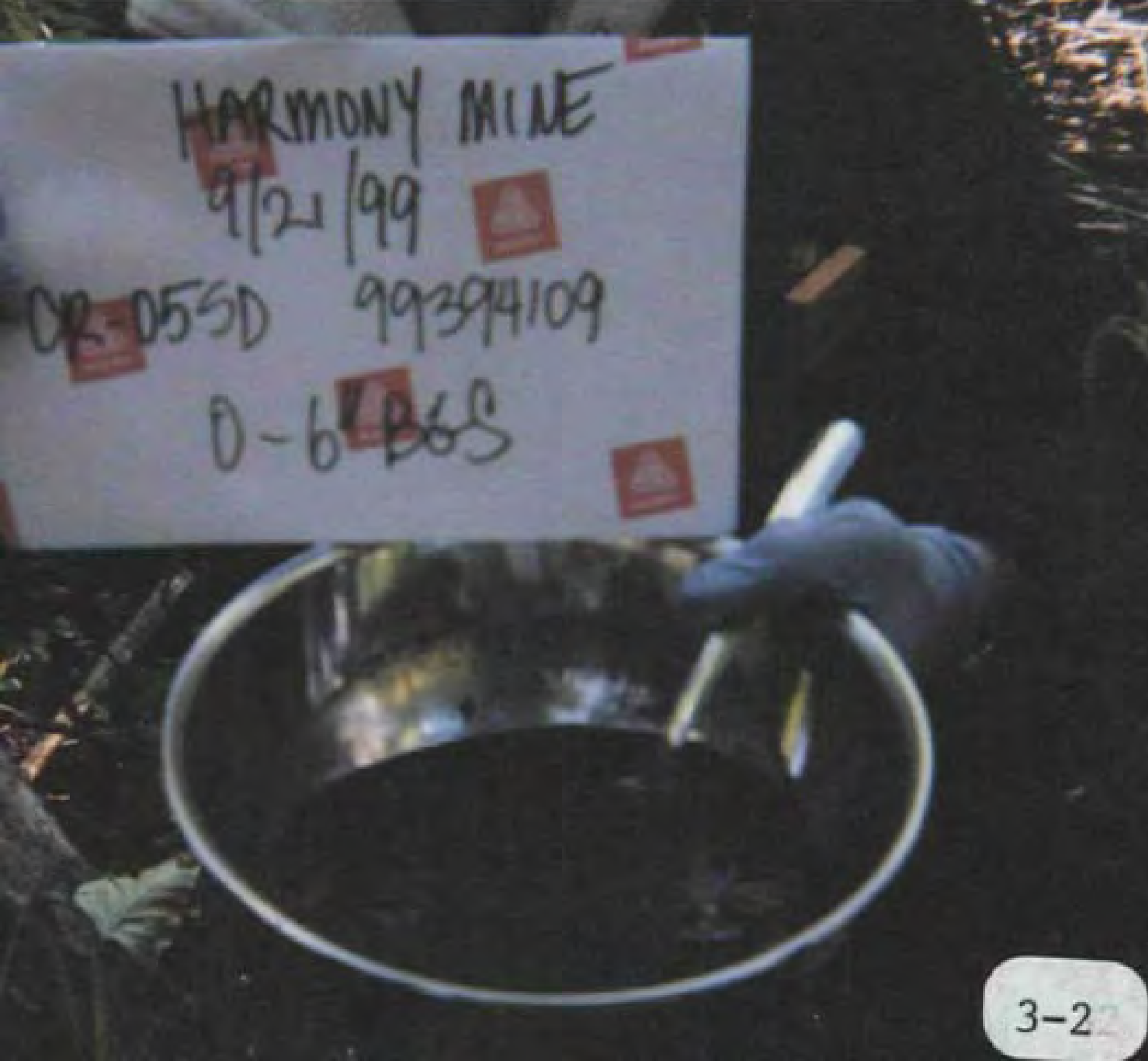

MONKY MILK
9/2 99
CR@25
99394102
0-6" B


2-15


0-6" BGS


9/21/99
2-19

2-20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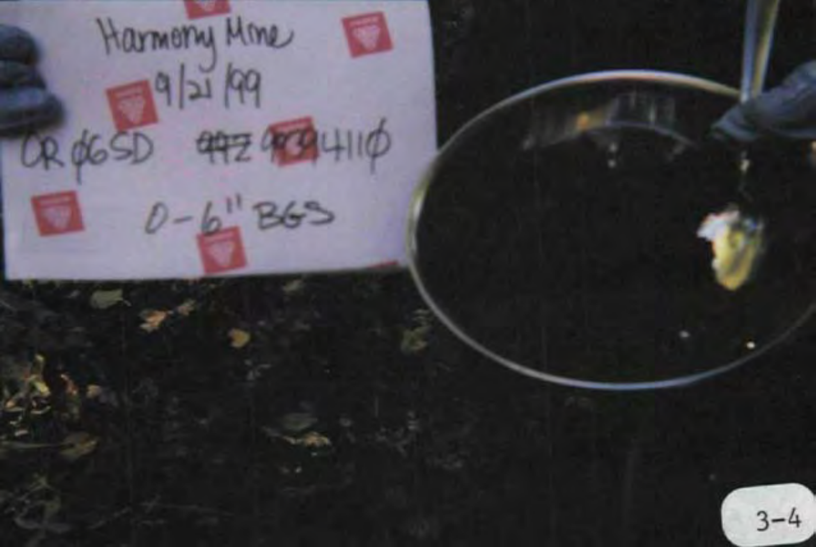
9/21/99
CR-055D 99394109
0-6 BGS

3-3



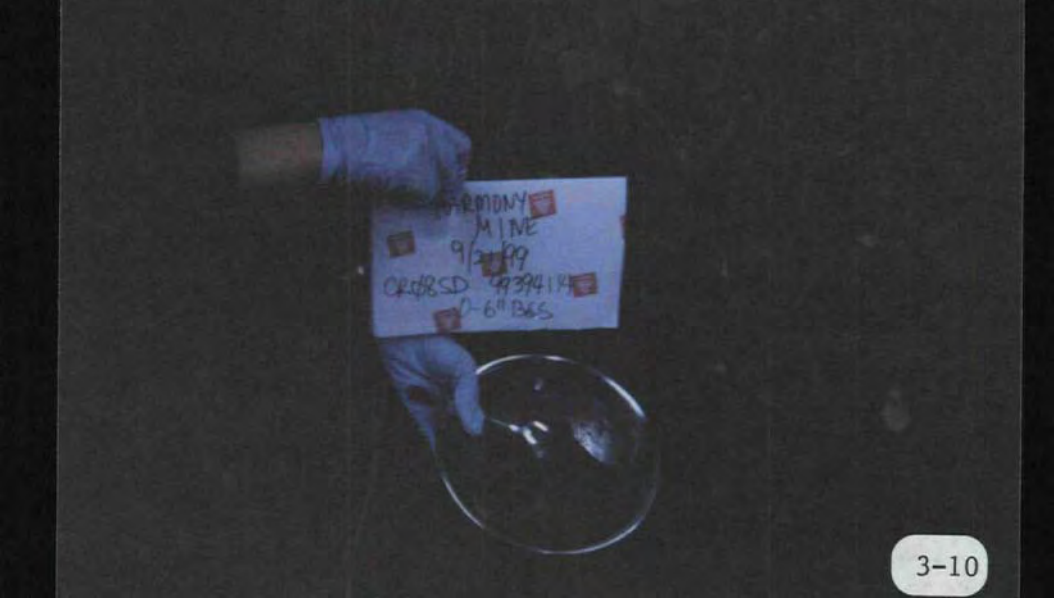
3-4

3–5


HARMONY MINE
9/21/99
SS
0-6" BGS
INDEX

3–7


HARMONY MINE
9/21/99
CROSS
0-6" BGS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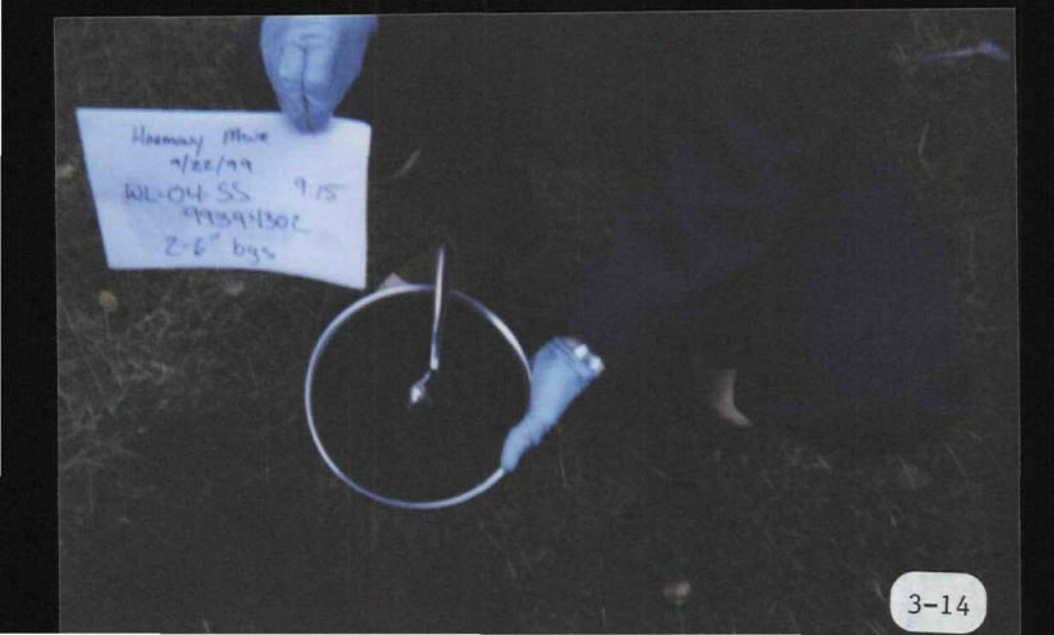
MINE
9/
CRGBSD
2-6" BGS


HARMONY MINE
9/22/99
NLØ355 99394303
D-6" BGS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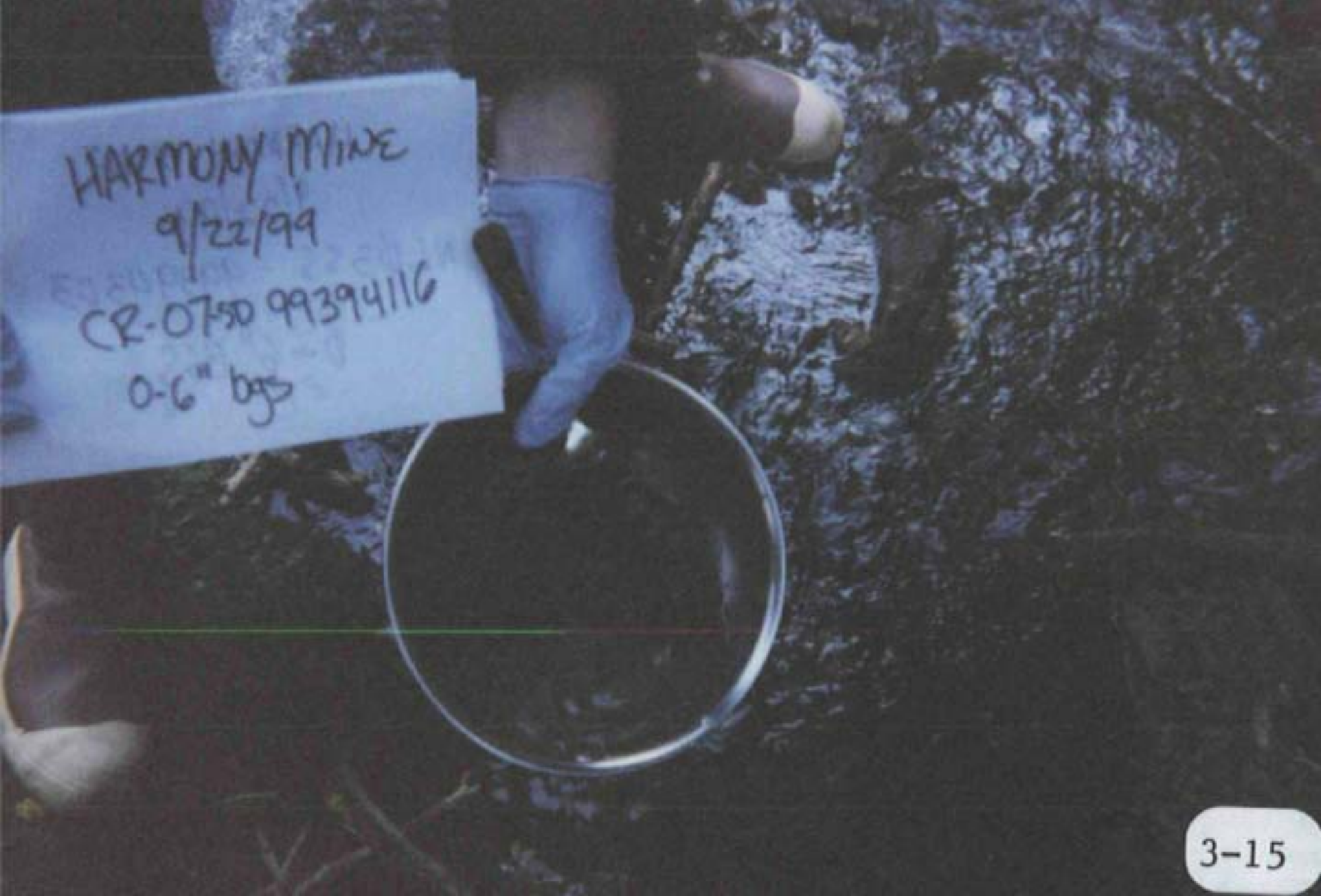
9/22/99
WL-0455 9.15
9939430E
2-6" bgs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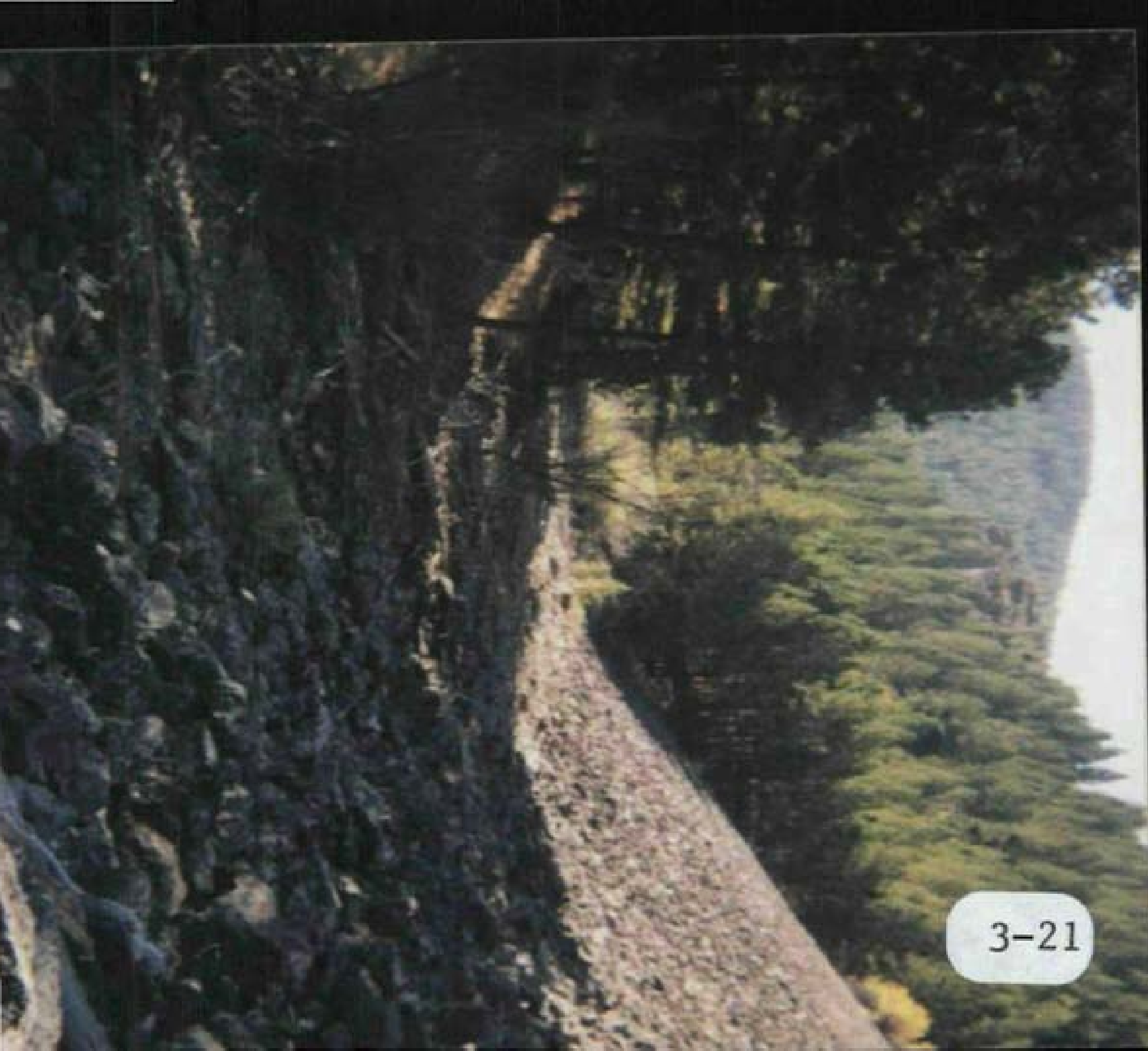
0-6" bgs

3-16


RAINBOW MINE
9/20/99
0-6" BGS




3-22


HEADWORKS MAE
4/22/99
0-6" BGS
4-1

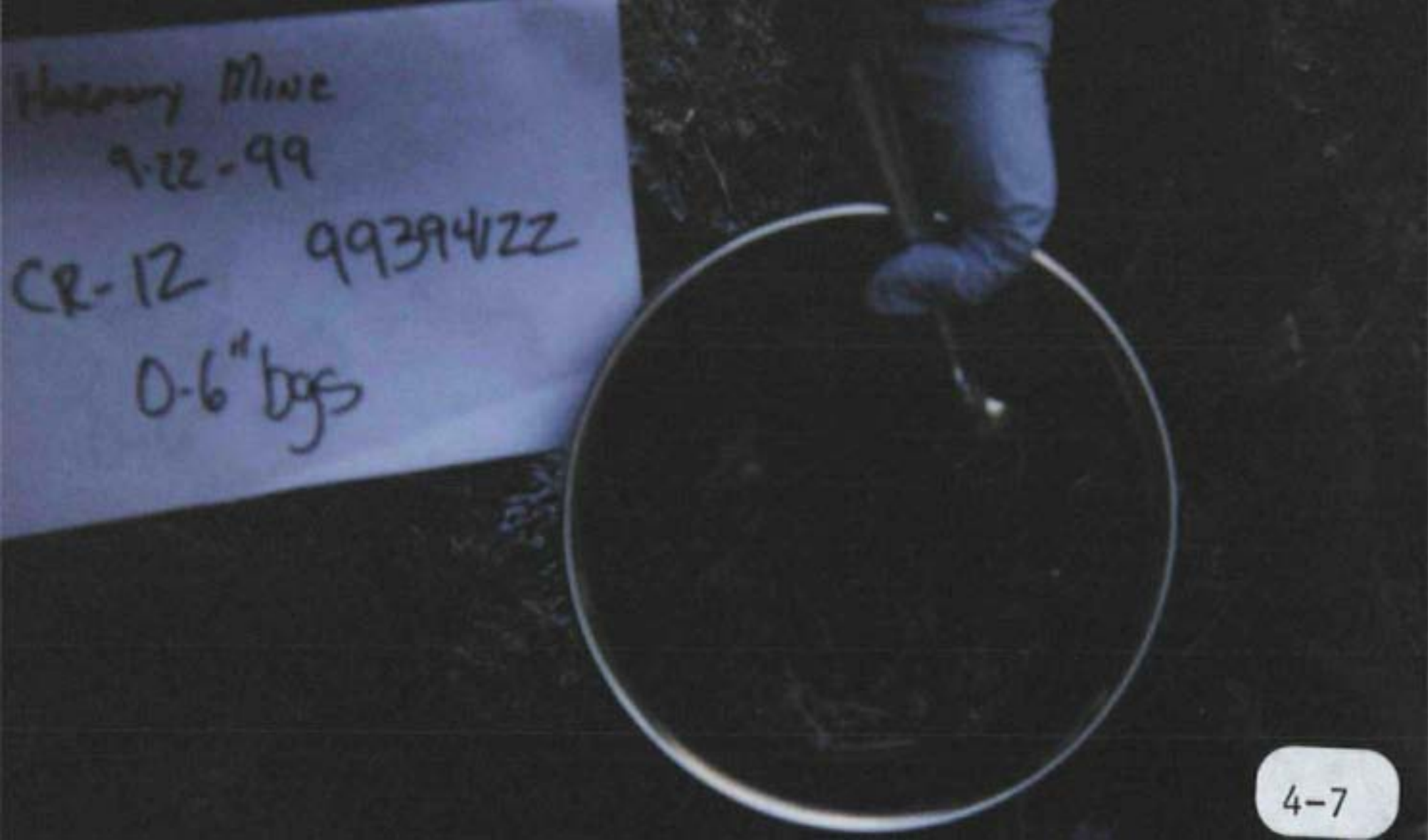

4-2


4-3

4-4


4-5


4-6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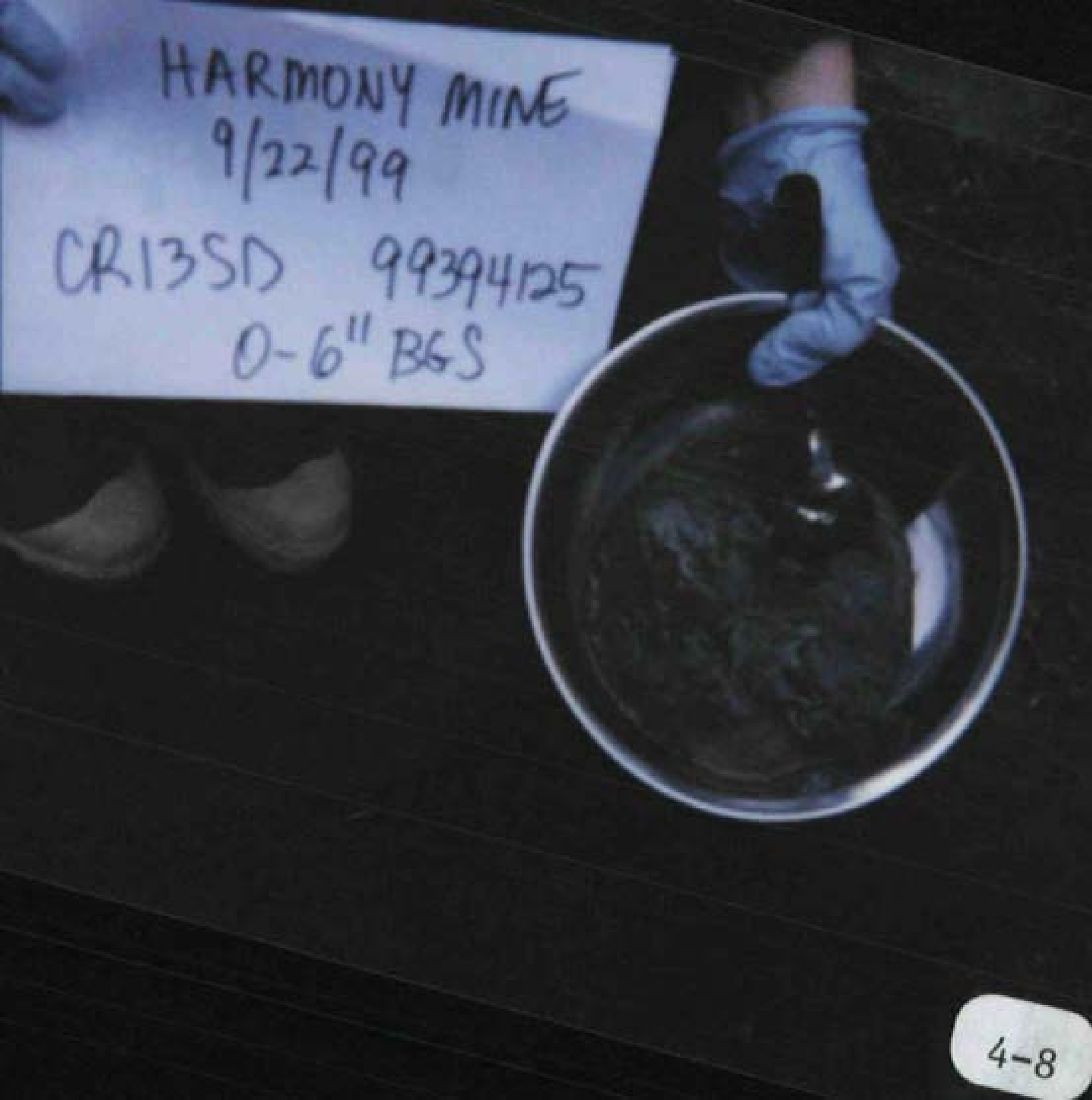
9-22-99
CR-12 9939422
0-6" bgs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9/22/99
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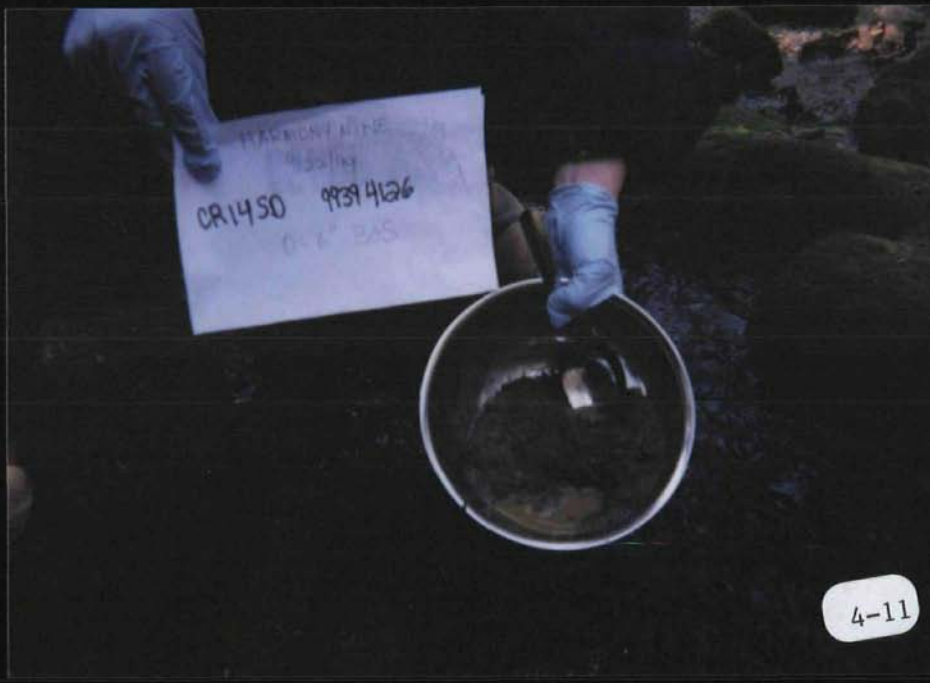
0-6" BGS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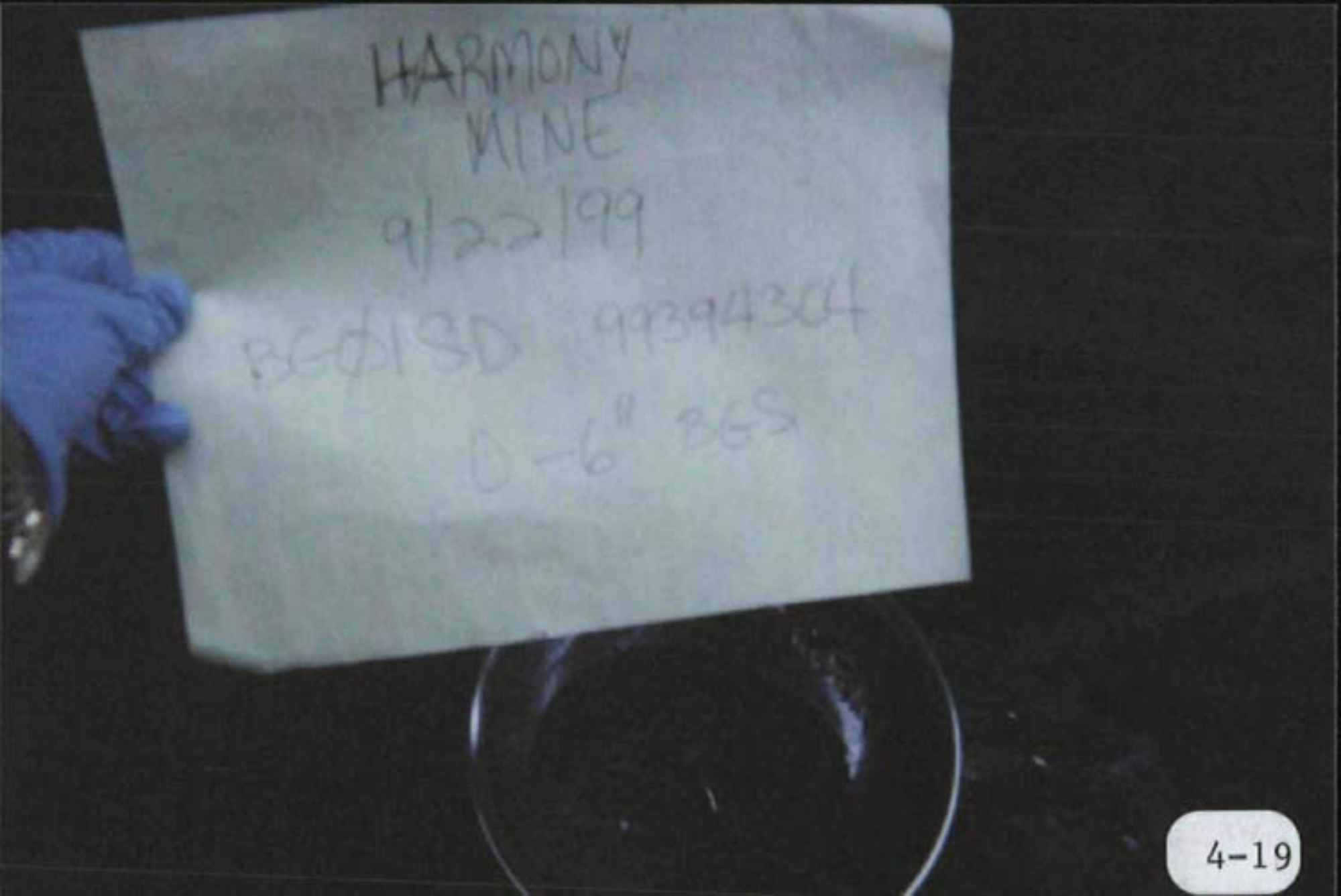
4-12


4-15


4-16


HARMONY
MINE
9/22/99
BG-1SD 99394304
0-6" BGS


HARMONY MINE
9/22/99
BG-155
9939430b
0-6" BGS


HARMONY
MINE
9/22/99
BG@2SS 9939 4149
0-6" BGS

APPENDIX B

GPS DATA

Harmony Mine
Preliminary Assessment / Site Inspection
GPS Locations

Sample	Decimal Degrees		Longitude			Latitude			Altitude
Locations	Longitude	Latitude	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds	Meters
BG-01	-113.8211	45.0153	-113	49	16.1217	45	0	55.0047	1798.9640
BG-02	-113.7849	45.0442	-113	47	5.6707	45	2	39.2761	1798.7450
CR-01	-113.7500	45.0581	-113	44	59.8510	45	3	29.2281	1485.5050
CR-02	-113.7814	45.0456	-113	46	53.1093	45	2	44.2389	1512.7050
CR-03	-113.7955	45.0424	-113	47	43.8947	45	2	32.7744	1649.5410
CR-04	-113.7956	45.0424	-113	47	44.2356	45	2	32.6259	1653.4780
CR-05	-113.7841	45.0439	-113	47	2.7798	45	2	37.9159	1824.3000
CR-06	-113.7846	45.0452	-113	47	4.7125	45	2	42.5958	1824.2800
CR-07	-113.7907	45.0434	-113	47	26.4758	45	2	36.1431	1627.4980
CR-08	-113.8013	45.0353	-113	48	4.7914	45	2	6.9273	1714.3340
CR-10	-113.8138	45.0259	-113	48	49.6311	45	1	33.2892	1843.7450
CR-11	-113.8140	45.0255	-113	48	50.3787	45	1	31.8555	1854.1870
CR-12	-113.8133	45.0214	-113	48	47.7752	45	1	17.1974	1854.1860
CR-13	-113.8151	45.0210	-113	48	54.1934	45	1	15.6967	1909.0470
CR-14	-113.8210	45.0196	-113	49	15.6835	45	1	10.5808	1798.9670
WL-01	-113.7864	45.0441	-113	47	10.9342	45	2	38.8654	1623.0230
WL-02	-113.7869	45.0439	-113	47	12.9283	45	2	38.0548	1618.0660
WL-03	-113.8084	45.0295	-113	48	30.3882	45	1	46.3056	1784.0600
WL-04	-113.8076	45.0301	-113	48	27.2244	45	1	48.5033	1775.9700
WL-05	-113.7814	45.0468	-113	46	52.9002	45	2	48.4499	1798.8840
WP-01	-113.8214	45.0172	-113	49	16.9065	45	1	1.9385	2075.0780
WP-02	-113.8215	45.0173	-113	49	17.2526	45	1	2.3813	2068.1070
WP-03	-113.8217	45.0176	-113	49	18.1615	45	1	3.2653	2072.0620

APPENDIX C

DATA VALIDATION MEMORANDA AND ANALYTICAL RESULTS

ecology and environment, inc.
International Specialists in the Environment

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

MEMORANDUM

DATE: December 21, 1999

TO: Lilin Li, START-Project Manager, Seattle, WA

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

SUBJ: **Data Quality Assurance Summary Check, Harmony Mine Site, Lemhi County, Idaho**

REF: TDD: 99020004 PAN: DB0401SADM

The data quality assurance summary check of 15 water samples collected from the Harmony Mine site located in Lemhi County, Idaho, has been completed. Analyses for sulfate and acidity following EPA Method 300 and 305.1, respectively, were performed at the Manchester Environmental Laboratory, Port Orchard, WA.

No discrepancies were noted.

T.T. 16-10-11

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

IN REPLY
REFER TO: OEA-095 December 8, 1999

MEMORANDUM

SUBJECT: Harmony Mine, Generals Analysis, Data Validation
Project Code: TEC-746A
Sample numbers: 99394101-4127 (odd numbers) & 99394305

FROM: Laura Castrilli, Chemist
Quality Assurance and Data Unit, OEA

TO: Monica Tonel, Site Assessment Manager
Office of Environmental Cleanup

CC: Katherine Parker, Work Assignment Manager, USEPA, Region 10
Tracy Trople, Ecology & Environment

The following is a validation of general chemistry [acidity and sulfate] analyses of fifteen water samples from the Harmony Mine site. The analyses were performed following USEPA and laboratory guidelines by the ESAT Team at the USEPA Manchester Environmental Laboratory, Port Orchard, WA. This validation was conducted for the following samples:

99394101	99394107	99394113	99394119	99394125
99394103	99394109	99394115	99394121	99394127
99394105	99394111	99394117	99394123	99394305

Data Qualifications

The following comments refer to the ESAT performance in meeting quality control specifications outlined in the *Manchester Environmental Laboratory Quality Assurance Manual, rev. 5/88,* and the QA plan. The comments presented herein are based on the information provided for the review.

1.0 Timeliness -

The technical (40 CFR part 136) holding time from the date of collection for sulfate in water is 28 days. The holding time for acidity in water is 14 days. A little over half of the acidity analyses were conducted one day outside the holding time. The remaining analyses were conducted with in the applicable holding times. Since the holding time for acidity was only missed by one day, no qualification was made based on holding time.

2.0 Sample Preparation - Acceptable

With the exception of preparing matrix spikes (if applicable) or preparing lab control samples, sulfate and acidity analyses are performed on sub-aliquots of the samples as they are received and therefore the analysis dates are the same as the 'preparation' dates. All sample preparation was in accordance with Manchester Laboratory protocols, EPA methods utilized, and ESAT preparation SOPs.

3.0 Calibrations -

The samples were analyzed for acidity by method 305.1 (titrimetric) on 10/06/99. The titrant was standardized prior to analysis. The pH meter was calibrated with pH 7 & 10 and 7 & 4 buffers prior to analysis.

The samples were analyzed for sulfate via method 300.0, ion chromatography on 10/07/99. The instrument was calibrated the day of analysis according to the analytical method with a matrix blank and five standards. The calibration curve was linear and had a correlation coefficient greater than 0.995.

All calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

4.0 Reference Control Samples/Calibration Verifications - Acceptable

Calibration verification (CV) samples are required before and after sample analysis and after every 10 samples during analysis for sulfate analyses. General recoveries must be within 90-110%. CVs are not required/applicable to acidity analyses.

All calibration verification samples bracketing reported sample results met the recovery and frequency criteria; therefore no qualification was made based on calibration verification.

A reference control sample was prepared and analyzed along with the sulfate samples to verify the efficiency of laboratory procedures. Reference control samples are not applicable to the acidity analysis. Acceptance control limits of recovery for reference control analyses are 80-120%. The sulfate recovery met the acceptance criteria for reference control samples.

5.0 Blanks - Acceptable

Procedural blanks were prepared with the samples to show potential contamination from the preparation and/or analytical procedure. If an analyte was found in the associated blank, the sample results were qualified if the analyte concentration was less than five times the analytical value in the blank.

For methods where the preparation blank and CCBs are indistinguishable, the first 'CCB' also served as the preparation

present.)

UJ - The material was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

At the request of the site assessment manager, bias for the data was qualitatively assessed and the following additional qualifiers were applied:

L - Low bias.

H - High bias.

K - Unknown Bias.

October-12-1999

Manchester Environmental Laboratory
General Chemistry Report

Project Name	HARMONY MINE	Site Manager	MONICA TONEL	Parameter	Sulfate
Project Code	TEC-746A	Date Promised	11/12/99	Matrix	Liquid
Account Code	99T10P50102D10ZZLA00				
Initials Prepped	A. M.	Reviewed	10/19/99	Tuf	Method 300.0
Initials Analyzed	A.M.	Final Review	1 1		Instrument

Sample	Type	Collection Date:	Prepped by	Prep Date:	Analyzed by:	Analysis Date:	Initial Weight	Final Volume	Dilution Factor	Instrument Response	Spike	Result	Units	Duplicate Qualifier	%RPD
99394101	0	9/21/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	5.056 ✓		5.06	mg/L		
99394103	0	9/21/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	5.260 ✓		5.26	mg/L		
99394105	0	9/21/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	6.420 ✓		6.42	mg/L		
99394107	0	9/21/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	2.857 ✓		2.86	mg/L		
99394109	0	9/21/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	5.210 ✓		5.21	mg/L		
99394111	0	9/21/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	4.851 ✓		4.85	mg/L		
99394113	0	9/21/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	5.595 ✓		5.59	mg/L		
99394115	0	9/21/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	2.776 ✓		2.78	mg/L		
99394117	0	9/22/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	2.679 ✓		2.68	mg/L		
99394119	0	9/22/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	2.540 ✓		2.54	mg/L		
99394121	0	9/22/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	2.538 ✓		2.54	mg/L		
99394123	0	9/22/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	1.537 ✓		1.54	mg/L		
99394125	0	9/22/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	3.236 ✓		3.24	mg/L		
99394127	0	9/22/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	3.294 ✓		3.29	mg/L		
99394305	0	9/22/99	SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	2.582 ✓		2.58	mg/L		
99394305	DU		SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	2.558 ✓		2.56	mg/L		0.9%
99394305	S1		SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	9.770 ✓	7.500	96.0	%Rec		
99394305	S2		SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	9.915 ✓	7.500	97.9	%Rec		
GXW991007	BL		SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	0.000 ✓		~~0.30~~ 1.0 MK	mg/L	U	
GXW991007	CO		SMONTEN	10/ 7/99	SMONTEN	10/ 7/99	5	5	1	3.871 ✓	4.000	96.8	%Rec		

October-19-1999

Manchester Environmental Laboratory
General Chemistry Report

Project Name	HARMONY MINE	Site Manager	MONICA TONEL	Parameter	Acidity
Project Code	TEC-746A	Date Promised	11/12/99	Matrix	Liquid
Account Code	99T10P50102D10ZZLA00				
Initials Prepped	TwP	Reviewed	10/19/99 S.Morton	Method	305.1
Initials Analyzed	TwP	Final Review	10/20/99 JW	Instrument	

mg/L Acidity

Sample	Type	Collection Date:	Prepped by	Prep Date:	Analyzed by:	Analysis Date:	Initial Weight	Final Volume	Dilution Factor	Instrument Response	Spike	Result	Units	Duplicate Qualifier	%RPD
99394101	0	9/21/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-42.98		10	mg/L	U	
99394103	0	9/21/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-29.91		10	mg/L	U	
99394105	0	9/21/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-23.57		10	mg/L	U	
99394107	0	9/21/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-13.87		10	mg/L	U	
99394109	0	9/21/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-28.52		10	mg/L	U	
99394111	0	9/21/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-27.93		10	mg/L	U	
99394113	0	9/21/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-30.70		10	mg/L	U	
99394115	0	9/21/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-13.08		10	mg/L	U	
99394117	0	9/22/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-11.30		10	mg/L	U	
99394119	0	9/22/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-8.52		10	mg/L	U	
99394121	0	9/22/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-7.53		10	mg/L	U	
99394123	0	9/22/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-8.52		10	mg/L	U	
99394125	0	9/22/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-6.35		10	mg/L	U	
99394127	0	9/22/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-5.16		10	mg/L	U	
99394305	0	9/22/99	TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-3.18		10	mg/L	U	
99394305	DU		TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	-5.75		10	mg/L	U	
GXW991006	BL		TPEARSO	10/ 6/99	TPEARSON	10/ 6/99	50	50	1	0.19		10	mg/L	U	

ecology and environment, inc.
International Specialists in the Environment

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

MEMORANDUM

DATE: December 8, 1999

TO: Lilin Li, START-Project Manager, Seattle, WA

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

SUBJ: **Data Quality Assurance Summary Check, Harmony Mine Site, Lemhi County, Idaho**

REF: TDD: 99020004 PAN: DB0401SADM

The data quality assurance summary check of 28 soil and 16 water samples collected from the Harmony Mine site located in Lemhi County, Idaho, has been completed. Analysis for Target Analyte List Inorganics following EPA CLP SOW ILM04.0 was performed by Southwest Laboratory of Oklahoma, Inc., Broken Arrow, OK.

The following discrepancy was noted:

In the November 29, 1999, validation memorandum for 17 soil samples, all antimony results were qualified as estimated quantities without an explanation.

The discrepancy was corrected after contact with the initial reviewer on December 8, 1999.

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 with an unknown bias that were less than the CRDL but greater than the IDL.

All bias qualifiers (L, K, and H) that were applied to results that were qualified "JB" were deleted by the secondary reviewer for clarity as "JB" results are not used for Hazard Ranking System scoring purposes.

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

Reply To
Attn Of: OEA-095

December 3, 1999

MEMORANDUM

Subject: Data Validation Report for the Total Inorganic Analyses of Samples from Harmony Mines
Case 27380 SDGs: MJCF15, MJCF16 and MJCF66

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

To: Monica Tonel, SAM, ECL

CC: Bruce Woods, Region 10 CLP TPO

The quality assurance (QA) review of 44 samples collected from the above referenced site has been completed. These samples were analyzed for full inorganic target compounds in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analyses (revision ILMO4.0). The analyses were performed by Southwest Laboratory of Oklahoma in Broken Arrow, OK. 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. Some of the data were qualified as estimated due to poor LCS and/or 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).

ENVIRONMENTAL SERVICES ASSISTANCE TEAMS - WESTERN ZONE

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: November 29, 1999

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

THROUGH: Dave Dobb, Team Manager, ESAT Region 10

FROM: Chris Pace, Task Lead, ESAT Region 10

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Harmony Mines Site.
Case: 27380 SDG: MJCF16

DOC: ESW10-3-1585
PWO: ESW72039
TDF: 3712
WA: 10-99-3-10

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

The quality assurance (QA) review of 16 water samples collected from the above referenced site has been completed. These samples were analyzed for total metals by Southwest Laboratory of Oklahoma of Broken Arrow, OK. The following samples were reviewed in this validation report:

MJCF16	MJCF26	MJCF36	MJCF70
MJCF18	MJCF28	MJCF38	
MJCF20	MJCF30	MJCF40	
MJCF22	MJCF32	MJCF42	
MJCF24	MJCF34	MJCF62	

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 (ILM04.0) 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

The suggested holding time for mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 9/21 and 9/22/99. The samples were analyzed for mercury within 7 days, except sample MJCF62 (35 days), and all other metals were analyzed within 9 days of the sample collection date. The non-detected mercury result in sample MJCF62 were qualified as estimated, "UJ".

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 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 the 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% and 80-120% for mercury. The recoveries ranged from 95-106% for ICP-AES and from 93-108% for mercury. 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
aluminum	MJCF18, MJCF20, MJCF22, MJCF24, MJCF30, MJCF32, MJCF40, MJCF42, MJCF70
calcium	MJCF62
lead	MJCF16, MJCF18, MJCF28, MJCF36, MJCF40

zinc	All

Aluminum yielded a negative response in the preparation blank and/or continuing calibration blank(s). Due to possible low bias, the aluminum results in the associated samples at concentrations comparable to or less than the absolute value of the blank(s) were qualified as estimated, "J/UJ". The following sample was qualified: MJCF62.

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 91-106%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis

Sample MJCF70 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 sodium. Results for sodium in all samples were qualified as estimated, "J". The "E" qualifiers applied by the laboratory were crossed-out by the reviewer.

Laboratory Control Sample - Acceptable

The frequency of analysis and the recovery criteria for the laboratory control sample were met. The recoveries ranged from 91-103%. None of the data were qualified on this basis.

Duplicate Sample Analysis - Acceptable

Sample MJCF70 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 MJCF70 was used for the spike analysis. The frequency of analysis and recovery criteria were met with the exception of mercury (132%) in the spike sample MJCF70S. Due to possible bias, the detected mercury results in the associated samples were qualified as estimated, "J", and the non-detected results were not qualified. All of the other spike recoveries were acceptable and ranged from 87-104%.

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.

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF16

Lab Name: SOUTHWEST_LAB_OF_OKLA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.02

Level (low/med): LOW Date Received: 09/24/99

% 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	117	B	J	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	35.2	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	11200			P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	16.0	B	J	P
7439-89-6	Iron	130			P
7439-92-1	Lead	1.3	B	U	P
7439-95-4	Magnesium	2830	B	J	P
7439-96-5	Manganese	5.2	B	J	P
7439-97-6	Mercury	0.10	U	M	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	1760	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	5360		B J	P L
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.5	B	U	P
	Cyanide				NR

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF18 ___

Lab Name: SOUTHWEST_LAB_OF_OKLA____ Contract: 68-D5-0136

Lab Code: SWOK__ Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.04

Level (low/med): LOW__ Date Received: 09/24/99

% 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	73.9	~~B~~	U	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	24.8	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	8280			P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	11.8	B	J	P
7439-89-6	Iron	54.3	B	J	P
7439-92-1	Lead	1.6	~~B~~	U	P
7439-95-4	Magnesium	2190	B	J	P
7439-96-5	Manganese	3.1	B	J	P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	1030	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	3150	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	4.0	~~B~~	U	P
_____	Cyanide	_____	_	_____	NR
_____	_____	_____	_	_____	_

KMW

CF 11.29.99

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Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF20

Lab Name: SOUTHWEST_LAB_OF_OKLA____ Contract: 68-D5-0136

Lab Code: SWOK__ Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.06

Level (low/med): LOW__ Date Received: 09/24/99

% 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	55.7	B	U	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	20.2	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	7620			P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	17.3	B	J	P
7439-89-6	Iron	43.5	B	J	P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	2180	B	J	P
7439-96-5	Manganese	1.1	B	J	P
7439-97-6	Mercury	0.10	U	M	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	910	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	2740	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	4.3	B	U	P
	Cyanide				NR

CF 11.25.99

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF22

Lab Name: SOUTHWEST_LAB_OF_OKLA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.08

Level (low/med): LOW Date Received: 09/24/99

% 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	67.3	B	U	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	16.8	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	3940	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	25.2			P
7439-89-6	Iron	48.3	B	J	P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	991	B	J	P
7439-96-5	Manganese	1.0	U		P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	850	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1720	B	B J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.7	B	U	P
	Cyanide				NR

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

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Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF24 ___

Lab Name: SOUTHWEST_LAB_OF_OKLA____ Contract: 68-D5-0136

Lab Code: SWOK__ Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.10

Level (low/med): LOW__ Date Received: 09/24/99

% 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	65.5	~~B~~ U	U	P	
7440-36-0	Antimony	3.0	U		P	
7440-38-2	Arsenic	3.0	U		P	
7440-39-3	Barium	23.9	B	J	P	
7440-41-7	Beryllium	1.0	U		P	
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium	7800			P	
7440-47-3	Chromium	1.0	U		P	
7440-48-4	Cobalt	1.0	U		P	
7440-50-8	Copper	13.6	B	J	P	
7439-89-6	Iron	64.8	B	J	P	
7439-92-1	Lead	1.0	U		P	
7439-95-4	Magnesium	2090	B	J	P	
7439-96-5	Manganese	4.4	B	J	P	
7439-97-6	Mercury	0.27		N J	CV	H
7440-02-0	Nickel	1.0	U		P	
7440-09-7	Potassium	997	B	J	P	
7782-49-2	Selenium	4.0	U		P	
7440-22-4	Silver	1.0	U		P	
7440-23-5	Sodium	2970	B	E J	P	~~Mn~~
7440-28-0	Thallium	3.0	U		P	
7440-62-2	Vanadium	1.0	U		P	
7440-66-6	Zinc	3.1	~~B~~ U	U	P	
	Cyanide				NR	

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF26 ___

Lab Name: SOUTHWEST_LAB_OF_OKLA____ Contract: 68-D5-0136

Lab Code: SWOK__ Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.12

Level (low/med): LOW__ Date Received: 09/24/99

% 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	131	~~U~~	BJ	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	25.5	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	8180			P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	11.9	B	J	P
7439-89-6	Iron	85.0	B	J	P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	1940	B	J	P
7439-96-5	Manganese	3.9	B	J	P
7439-97-6	Mercury	0.10	U	M	CV
7440-02-0	Nickel	1.2	B	J	P
7440-09-7	Potassium	1030	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	3280	B	~~E~~ J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.2	~~U~~		P
_____	Cyanide	_____	_	_____	NR
_____	_____	_____	_	_____	_

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF28

Lab Name: SOUTHWEST_LAB_OF_OKLA____ Contract: 68-D5-0136

Lab Code: SWOK__ Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.14

Level (low/med): LOW__ Date Received: 09/24/99

% 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	91.0	B	J	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	26.7	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	8560			P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	19.1	B	J	P
7439-89-6	Iron	100			P
7439-92-1	Lead	1.0	B	U	P
7439-95-4	Magnesium	2370	B	BJ	P
7439-96-5	Manganese	7.3	B	J	P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	1050	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	3060	B	EJ	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.3	B	U	P
	Cyanide				NR

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF30

Lab Name: SOUTHWEST_LAB_OF_OKLA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.16

Level (low/med): LOW Date Received: 09/24/99

% 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	81.5	B	U	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	17.3	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	3820	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	28.6			P
7439-89-6	Iron	53.4	B	J	P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	995	B	J	P
7439-96-5	Manganese	1.0	U		P
7439-97-6	Mercury	0.10	U	M	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	911	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1650	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.5	B	U	P
	Cyanide				NR

CP 11.25.99

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF32

Lab Name: SOUTHWEST_LAB_OF_OKLA____ Contract: 68-D5-0136

Lab Code: SWOK__ Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.18

Level (low/med): LOW__ Date Received: 09/24/99

% 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	83.1	B	U	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	12.0	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	2890	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	34.0			P
7439-89-6	Iron	74.5	B	J	P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	822	B	J	P
7439-96-5	Manganese	1.0	U		P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	789	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1400	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	2.6	B	U	P
	Cyanide				NR

CR 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF34

Lab Name: SOUTHWEST_LAB_OF_OKLA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.20

Level (low/med): LOW Date Received: 09/24/99

% 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	129	B	J	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	11.4	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	2350	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	40.3			P
7439-89-6	Iron	181			P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	777	B	J	P
7439-96-5	Manganese	1.0	B	J	P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	786	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1290	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.2	B	J	P
	Cyanide				NR

CP 11.25.99

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF36

Lab Name: SOUTHWEST_LAB_OF_OKLA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.22

Level (low/med): LOW Date Received: 09/24/99

% 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	159	B	J	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	10.6	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	2210	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	58.9			P
7439-89-6	Iron	275			P
7439-92-1	Lead	1.6	~~E~~	U	P
7439-95-4	Magnesium	743	B	J	P
7439-96-5	Manganese	1.5	B	J	P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.1	B	J	P
7440-09-7	Potassium	754	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1220	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.4	~~E~~	U	P
	Cyanide				NR

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments:

FORM I - IN

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF38 ___

Lab Name: SOUTHWEST_LAB_OF_OKLA____ Contract: 68-D5-0136

Lab Code: SWOK__ Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.24

Level (low/med): LOW__ Date Received: 09/24/99

% 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	103	B	J	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	27.2	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	2290	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	2.4	B	J	P
7439-89-6	Iron	52.1	B	J	P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	724	B	J	P
7439-96-5	Manganese	1.0	B	J	P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	845	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1400	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.5	~~B~~ U		P
	Cyanide				NR

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF40

Lab Name: SOUTHWEST_LAB_OF_OKLA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.26

Level (low/med): LOW Date Received: 09/24/99

% 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	26.0	~~B~~	U	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	3.6	~~B~~	BJ	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	2080	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	29.0			P
7439-89-6	Iron	25.2	B	J	P
7439-92-1	Lead	1.0	~~B~~	U	P
7439-95-4	Magnesium	669	B	J	P
7439-96-5	Manganese	1.0	U		P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	633	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1100	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	2.6	~~B~~	U	P
	Cyanide				NR

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF42

Lab Name: SOUTHWEST_LAB_OF_OKLA____ Contract: 68-D5-0136

Lab Code: SWOK__ Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.28

Level (low/med): LOW__ Date Received: 09/24/99

% 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	19.3	B	U	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	2.4	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	1900	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	50.5			P
7439-89-6	Iron	20.9	B	J	P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	526	B	J	P
7439-96-5	Manganese	1.0	U		P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.0	U		P
7440-09-7	Potassium	505	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	1030	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	2.5	B	U	P
	Cyanide				NR

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF62

Lab Name: SOUTHWEST_LAB_OF_OKLA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.29

Level (low/med): LOW Date Received: 09/24/99

% 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	9.0	U	UJ	P	K
7440-36-0	Antimony	3.0	U		P	
7440-38-2	Arsenic	3.0	U		P	
7440-39-3	Barium	1.0	U		P	
7440-41-7	Beryllium	1.0	U		P	
7440-43-9	Cadmium	1.0	U		P	
7440-70-2	Calcium	41.5	~~B~~ U		P	
7440-47-3	Chromium	5.6	B	J	P	
7440-48-4	Cobalt	1.0	U		P	
7440-50-8	Copper	1.3	B	J	P	
7439-89-6	Iron	162			P	
7439-92-1	Lead	1.0	U		P	
7439-95-4	Magnesium	11.0	U		P	
7439-96-5	Manganese	1.8	B	J	P	
7439-97-6	Mercury	0.20	U	UJN	CV	K
7440-02-0	Nickel	2.9	B	J	P	
7440-09-7	Potassium	34.0	U		P	
7782-49-2	Selenium	4.0	U		P	
7440-22-4	Silver	1.0	U		P	
7440-23-5	Sodium	193	B	EJ	P	~~K~~
7440-28-0	Thallium	3.0	U		P	
7440-62-2	Vanadium	1.0	U		P	
7440-66-6	Zinc	1.9	~~B~~ U		P	
	Cyanide				NR	

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF70

Lab Name: SOUTHWEST_LAB_OF_OKLA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380_ SAS No.: _____ SDG No.: MJCF16

Matrix (soil/water): WATER Lab Sample ID: 40437.37

Level (low/med): LOW Date Received: 09/24/99

% 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	24.8	B	J	P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	2.2	B	J	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	1.0	U		P
7440-70-2	Calcium	1700	B	J	P
7440-47-3	Chromium	1.0	U		P
7440-48-4	Cobalt	1.2	B	J	P
7440-50-8	Copper	174			P
7439-89-6	Iron	39.2	B	J	P
7439-92-1	Lead	1.0	U		P
7439-95-4	Magnesium	400	B	J	P
7439-96-5	Manganese	1.0	B	J	P
7439-97-6	Mercury	0.10	U	N	CV
7440-02-0	Nickel	1.4	B	J	P
7440-09-7	Potassium	432	B	J	P
7782-49-2	Selenium	4.0	U		P
7440-22-4	Silver	1.0	U		P
7440-23-5	Sodium	962	B	E J	P
7440-28-0	Thallium	3.0	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	2.8	B	J	P
	Cyanide				NR

CP 11.29.99

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

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ENVIRONMENTAL SERVICES ASSISTANCE TEAMS - WESTERN ZONE

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: November 29, 1999

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

THROUGH: Dave Dobb, Team Manager, ESAT Region 10

FROM: Chris Pace, Task Lead, ESAT Region 10

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Harmony Mines Site.
Case: 27380 SDG: MJCF15

DOC: ESW10-3-1584
PWO: ESW72039
TDF: 3712
WA: 10-99-3-10

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

The quality assurance (QA) review of 17 soil samples collected from the above referenced site has been completed. These samples were analyzed for total metals by Southwest Laboratory of Oklahoma of Broken Arrow, OK. The following samples were reviewed in this validation report:

MJCF15	MJCF25	MJCF35	MJCF64
MJCF17	MJCF27	MJCF37	MJCF65
MJCF19	MJCF29	MJCF39	
MJCF21	MJCF31	MJCF41	
MJCF23	MJCF33	MJCF63	

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 (ILM04.0) 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 mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 9/21 and 9/22/99. The samples were analyzed for mercury within 6 days and all other metals were analyzed within 8 days of the sample collection date.

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 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 the 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% and 80-120% for mercury. The recoveries ranged from 92-106% for ICP-AES and from 100-105% for mercury. 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": None.

Mercury yielded a negative response in the preparation blank and/or continuing calibration blank(s). Due to possible low bias, the mercury results in the associated samples at concentrations comparable to or less than the absolute value of the blank(s) were qualified as estimated, "J/UJ". The following sample was qualified: All except MJCF65.

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 91-115%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis - Acceptable

Sample MJCF65 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 (564%). Detected sodium results were qualified as estimated, "J". All other recoveries were acceptable and ranged from 77-106%.

Duplicate Sample Analysis

Sample MJCF65 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 arsenic, cadmium, calcium, chromium, iron, lead, manganese, mercury and thallium. Results for arsenic, cadmium, calcium, chromium, iron, lead, manganese, mercury and thallium in all samples were qualified as estimated, "J". The "*" qualifiers applied by the laboratory were crossed-out by the reviewer.

Matrix Spike Analysis

Sample MJCF65 was used for the spike analysis. The frequency of analysis and recovery criteria were met with the exception of antimony (63%) in the spike sample MJCF65S. Due to possible bias, the detected and non-detected antimony results in all samples were qualified as estimated, "J/UJ". The recovery for lead could not be accurately determined because the concentration native to the sample was greater than 4 times the amount of spike added to the sample. All other spike recoveries were acceptable and ranged from 87-108%.

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.

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF15

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.01
Level (low/med): LOW Date Received: 09/24/99
% Solids: 80.4

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	2850			P	
7440-36-0	Antimony	0.77	B	N J	P	K mn
7440-38-2	Arsenic	3.3		* J	P	K
7440-39-3	Barium	81.9			P	
7440-41-7	Beryllium	0.32	B	J	P	
7440-43-9	Cadmium	1.2	B	* J	P	K mk
7440-70-2	Calcium	1810		* J	P	K
7440-47-3	Chromium	5.9		* J	P	K
7440-48-4	Cobalt	4.3	B	J	P	
7440-50-8	Copper	57.8			P	
7439-89-6	Iron	8490		* J	P	K
7439-92-1	Lead	19.4		* J	P	K
7439-95-4	Magnesium	1070	B	J	P	
7439-96-5	Manganese	143		* J	P	K
7439-97-6	Mercury	0.06	U	* UJ	CV	K
7440-02-0	Nickel	3.6	B	J	P	
7440-09-7	Potassium	969	B	J	P	
7782-49-2	Selenium	0.98	U		P	
7440-22-4	Silver	0.24	U		P	
7440-23-5	Sodium	364	B	J	P	K mn
7440-28-0	Thallium	1.2	B	* J	P	K mk
7440-62-2	Vanadium	7.7	B	J	P	
7440-66-6	Zinc	57.7			P	

CP 11.24.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF17

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.03
Level (low/med): LOW Date Received: 09/24/99
% Solids: 79.1

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	4330			P	
7440-36-0	Antimony	1.0	B	N J	P	
7440-38-2	Arsenic	8.8		* J	P	K
7440-39-3	Barium	83.4			P	
7440-41-7	Beryllium	0.61	B	J	P	
7440-43-9	Cadmium	1.3		* J	P	K
7440-70-2	Calcium	1890		* J	P	K
7440-47-3	Chromium	6.7		* J	P	K
7440-48-4	Cobalt	13.4			P	
7440-50-8	Copper	314			P	
7439-89-6	Iron	15500		* J	P	K
7439-92-1	Lead	25.9		* J	P	K
7439-95-4	Magnesium	1600			P	
7439-96-5	Manganese	337		* J	P	K
7439-97-6	Mercury	0.06	U	* UJ	CV	K
7440-02-0	Nickel	5.5	B	J	P	
7440-09-7	Potassium	983	B	J	P	
7782-49-2	Selenium	0.99	U		P	
7440-22-4	Silver	0.25	U		P	
7440-23-5	Sodium	374	B	J	P	
7440-28-0	Thallium	1.8	B	* J	P	K
7440-62-2	Vanadium	9.7	B	J	P	
7440-66-6	Zinc	64.5			P	

cf 11.24.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF19

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL
Level (low/med): LOW
% Solids: 79.8
Lab Sample ID: 40437.05
Date Received: 09/24/99

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	6180			P	
7440-36-0	Antimony	0.74	U	~~N~~ UJ	P	K
7440-38-2	Arsenic	4.3		* J	P	K
7440-39-3	Barium	131			P	
7440-41-7	Beryllium	0.41	B	J	P	
7440-43-9	Cadmium	0.51	B	* J	P	~~K~~ MK
7440-70-2	Calcium	2380		* J	P	K
7440-47-3	Chromium	12.3		* J	P	K
7440-48-4	Cobalt	6.1	B	J	P	
7440-50-8	Copper	25.9			P	
7439-89-6	Iron	11900		* J	P	K
7439-92-1	Lead	31.0		* J	P	K
7439-95-4	Magnesium	3240			P	
7439-96-5	Manganese	428		* J	P	K
7439-97-6	Mercury	0.06	U	* UJ	CV	K
7440-02-0	Nickel	8.4	B	J	P	
7440-09-7	Potassium	1390			P	
7782-49-2	Selenium	0.98	U		P	
7440-22-4	Silver	0.25	U		P	
7440-23-5	Sodium	403	B	J	P	~~K~~ MK
7440-28-0	Thallium	1.1	B	* J	P	~~K~~ MK
7440-62-2	Vanadium	13.1			P	
7440-66-6	Zinc	76.7			P	

CP 11.24.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF21

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.07
Level (low/med): LOW Date Received: 09/24/99
% Solids: 81.2

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	2920			P	
7440-36-0	Antimony	0.71	U	MUJ	P	K
7440-38-2	Arsenic	5.2		*J	P	K
7440-39-3	Barium	86.3			P	
7440-41-7	Beryllium	0.38	B	J	P	
7440-43-9	Cadmium	0.53	B	*J	P	K
7440-70-2	Calcium	1280		*J	P	K
7440-47-3	Chromium	2.6		*J	P	K
7440-48-4	Cobalt	8.2	B	J	P	
7440-50-8	Copper	219			P	
7439-89-6	Iron	15700		*J	P	K
7439-92-1	Lead	6.9		*J	P	K
7439-95-4	Magnesium	930	B	J	P	
7439-96-5	Manganese	324		*J	P	K
7439-97-6	Mercury	0.06	U	*UJ	CV	K
7440-02-0	Nickel	4.4	B	J	P	
7440-09-7	Potassium	1440			P	
7782-49-2	Selenium	0.95	U		P	
7440-22-4	Silver	0.24	U		P	
7440-23-5	Sodium	295	B	J	P	K
7440-28-0	Thallium	1.6	B	*J	P	K
7440-62-2	Vanadium	5.7	B	J	P	
7440-66-6	Zinc	21.4			P	

11.24.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF23

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF15
Matrix (soil/water): SOIL
Level (low/med): LOW
% Solids: 73.1
Lab Sample ID: 40437.09
Date Received: 09/24/99

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7580			P	
7440-36-0	Antimony	0.94	B	* J	P	K
7440-38-2	Arsenic	6.5		* J	P	K
7440-39-3	Barium	148			P	
7440-41-7	Beryllium	0.55	B	J	P	
7440-43-9	Cadmium	0.68	B	* J	P	K
7440-70-2	Calcium	3350		* J	P	K
7440-47-3	Chromium	9.1		* J	P	K
7440-48-4	Cobalt	15.3			P	
7440-50-8	Copper	677			P	
7439-89-6	Iron	14900		* J	P	K
7439-92-1	Lead	17.8		* J	P	K
7439-95-4	Magnesium	2420			P	
7439-96-5	Manganese	423		* J	P	K
7439-97-6	Mercury	0.07	U	* UJ	CV	K
7440-02-0	Nickel	7.9	B	J	P	
7440-09-7	Potassium	1490			P	
7782-49-2	Selenium	1.0	U		P	
7440-22-4	Silver	0.26	U		P	
7440-23-5	Sodium	430	B	J	P	K
7440-28-0	Thallium	1.3	B	* J	P	K
7440-62-2	Vanadium	10.7	B	J	P	
7440-66-6	Zinc	51.4			P	

CP 11.24.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF25

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.11
Level (low/med): LOW Date Received: 09/24/99
% Solids: 77.0

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	5460			P	
7440-36-0	Antimony	0.76	U	N UJ	P	K
7440-38-2	Arsenic	3.6		* J	P	K
7440-39-3	Barium	115			P	
7440-41-7	Beryllium	0.42	B	J	P	
7440-43-9	Cadmium	0.56	B	* J	P	K
7440-70-2	Calcium	2050		* J	P	K
7440-47-3	Chromium	9.4		* J	P	K
7440-48-4	Cobalt	13.2			P	
7440-50-8	Copper	273			P	
7439-89-6	Iron	13300		* J	P	K
7439-92-1	Lead	20.4		* J	P	K
7439-95-4	Magnesium	2390			P	
7439-96-5	Manganese	348		* J	P	K
7439-97-6	Mercury	0.06	U	* UJ	CV	K
7440-02-0	Nickel	7.4	B	J	P	
7440-09-7	Potassium	1280			P	
7782-49-2	Selenium	1.0	U		P	
7440-22-4	Silver	0.25	U		P	
7440-23-5	Sodium	404	B	J	P	K
7440-28-0	Thallium	1.3	B	* J	P	K
7440-62-2	Vanadium	11.5	B	J	P	
7440-66-6	Zinc	53.3			P	

CR 11.24.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF27

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.13
Level (low/med): LOW Date Received: 09/24/99
% Solids: 46.9

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	8680			P	
7440-36-0	Antimony	1.7	B	N J	P	K
7440-38-2	Arsenic	6.4		* J	P	K
7440-39-3	Barium	163			P	
7440-41-7	Beryllium	0.68	B	J	P	
7440-43-9	Cadmium	0.93	B	* J	P	K
7440-70-2	Calcium	6830		* J	P	K
7440-47-3	Chromium	9.4		* J	P	K
7440-48-4	Cobalt	10.8	B	J	P	
7440-50-8	Copper	1240			P	
7439-89-6	Iron	12500		* J	P	K
7439-92-1	Lead	24.0		* J	P	K
7439-95-4	Magnesium	2240			P	
7439-96-5	Manganese	512		* J	P	K
7439-97-6	Mercury	0.11	U	* UJ	CV	K
7440-02-0	Nickel	10.5	B	J	P	
7440-09-7	Potassium	1340	B	J	P	
7782-49-2	Selenium	1.7	U		P	
7440-22-4	Silver	0.43	U		P	
7440-23-5	Sodium	570	B	J	P	K
7440-28-0	Thallium	1.8	B	* J	P	K
7440-62-2	Vanadium	9.4	B	J	P	
7440-66-6	Zinc	68.6			P	

CP 11.24.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF29

ab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
ab Code: SWOK__ Case No.: 27380 SAS No.: _____ SDG No.: MJCF15
atrix (soil/water): SOIL_ Lab Sample ID: 40437.15
evel (low/med): LOW__ Date Received: 09/24/99
Solids: _37.7

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	9990			P	
7440-36-0	Antimony	2.2	B	N J	P	K MW
7440-38-2	Arsenic	9.9		* J	P	K
7440-39-3	Barium	205			P	
7440-41-7	Beryllium	0.80	B	J	P	
7440-43-9	Cadmium	0.52	B	* J	P	K MW
7440-70-2	Calcium	4970		* J	P	K
7440-47-3	Chromium	7.7		* J	P	K
7440-48-4	Cobalt	19.9	B	J	P	
7440-50-8	Copper	3170			P	
7439-89-6	Iron	17300		* J	P	K
7439-92-1	Lead	10.4		* J	P	K
7439-95-4	Magnesium	1820	B	J	P	
7439-96-5	Manganese	323		* J	P	K
7439-97-6	Mercury	0.13	U	* UJ	CV	K
7440-02-0	Nickel	8.9	B	J	P	
7440-09-7	Potassium	1060	B	J	P	
7782-49-2	Selenium	2.1	U		P	
7440-22-4	Silver	0.52	U		P	
7440-23-5	Sodium	745	B	J	P	K MW
7440-28-0	Thallium	1.7	B	* J	P	K MW
7440-62-2	Vanadium	7.3	B	J	P	
7440-66-6	Zinc	30.9			P	

cp 11.24.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF31

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF15
Matrix (soil/water): SOIL
Level (low/med): LOW
% Solids: 77.8
Lab Sample ID: 40437.17
Date Received: 09/24/99

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	8260			P	
7440-36-0	Antimony	3.0	B	N J	P	K
7440-38-2	Arsenic	13.5		* J	P	K
7440-39-3	Barium	88.4			P	
7440-41-7	Beryllium	0.37	B	J	P	
7440-43-9	Cadmium	0.97	B	* J	P	K
7440-70-2	Calcium	936	B	* J	P	K
7440-47-3	Chromium	5.0		* J	P	K
7440-48-4	Cobalt	39.2			P	
7440-50-8	Copper	1710			P	
7439-89-6	Iron	25800		* J	P	K
7439-92-1	Lead	9.1		* J	P	K
7439-95-4	Magnesium	2160			P	
7439-96-5	Manganese	350		* J	P	K
7439-97-6	Mercury	0.06	U	* UJ	CV	K
7440-02-0	Nickel	4.2	B	J	P	
7440-09-7	Potassium	1140	B	J	P	
7782-49-2	Selenium	1.0	U		P	
7440-22-4	Silver	0.25	U		P	
7440-23-5	Sodium	341	B	J	P	K
7440-28-0	Thallium	2.8		* J	P	K
7440-62-2	Vanadium	6.9	B	J	P	
7440-66-6	Zinc	24.8			P	

11.24.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF33

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.19
Level (low/med): LOW Date Received: 09/24/99
% Solids: 77.0

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	13700			P	
7440-36-0	Antimony	6.3	B	N J	P	K MW
7440-38-2	Arsenic	33.5		* J	P	K
7440-39-3	Barium	21.5	B	J	P	
7440-41-7	Beryllium	0.31	B	J	P	
7440-43-9	Cadmium	1.7		* J	P	K
7440-70-2	Calcium	291	B	* J	P	K MW
7440-47-3	Chromium	9.6		* J	P	K
7440-48-4	Cobalt	28.9			P	
7440-50-8	Copper	1460			P	
7439-89-6	Iron	48700		* J	P	K
7439-92-1	Lead	21.7		* J	P	K
7439-95-4	Magnesium	3870			P	
7439-96-5	Manganese	206		* J	P	K
7439-97-6	Mercury	0.06	B	* J	CV	K MW
7440-02-0	Nickel	5.7	B	J	P	
7440-09-7	Potassium	662	B	J	P	
7782-49-2	Selenium	2.4			P	
7440-22-4	Silver	0.25	U		P	
7440-23-5	Sodium	303	B	J	P	H MW
7440-28-0	Thallium	5.6		* J	P	K
7440-62-2	Vanadium	10.1	B	J	P	
7440-66-6	Zinc	31.4			P	

cf 11.24.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF35

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL
Level (low/med): LOW
% Solids: 76.5
Lab Sample ID: 40437.21
Date Received: 09/24/99

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	14000			P	
7440-36-0	Antimony	5.7	B	N J	P	~~K~~ MW
7440-38-2	Arsenic	38.1		* J	P	K
7440-39-3	Barium	22.2	B	J	P	
7440-41-7	Beryllium	0.25	B	J	P	
7440-43-9	Cadmium	1.5		* J	P	K
7440-70-2	Calcium	273	B	* J	P	~~K~~ MW
7440-47-3	Chromium	9.6		* J	P	K
7440-48-4	Cobalt	32.4			P	
7440-50-8	Copper	1840			P	
7439-89-6	Iron	54500		* J	P	K
7439-92-1	Lead	18.1		* J	P	K
7439-95-4	Magnesium	3920			P	
7439-96-5	Manganese	188		* J	P	K
7439-97-6	Mercury	0.07	B	* J	CV	~~K~~ MW
7440-02-0	Nickel	5.6	B	J	P	
7440-09-7	Potassium	668	B	J	P	
7782-49-2	Selenium	3.9			P	
7440-22-4	Silver	0.43	B	J	P	
7440-23-5	Sodium	315	B	J	P	~~H~~ MW
7440-28-0	Thallium	6.3		* J	P	K
7440-62-2	Vanadium	10.8	B	J	P	
7440-66-6	Zinc	30.7			P	

CP 11.24.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF37

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.23
Level (low/med): LOW Date Received: 09/24/99
% Solids: 79.4

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	3440			P	
7440-36-0	Antimony	1.2	B	N J	P	K mw
7440-38-2	Arsenic	2.4	B	* J	P	K mw
7440-39-3	Barium	100			P	
7440-41-7	Beryllium	0.61	B	J	P	
7440-43-9	Cadmium	0.40	B	* J	P	K mw
7440-70-2	Calcium	703	B	* J	P	K mw
7440-47-3	Chromium	3.5		* J	P	K
7440-48-4	Cobalt	16.5			P	
7440-50-8	Copper	907			P	
7439-89-6	Iron	12500		* J	P	K
7439-92-1	Lead	6.6		* J	P	K
7439-95-4	Magnesium	714	B	J	P	
7439-96-5	Manganese	389		* J	P	K
7439-97-6	Mercury	0.06	U	* UJ	CV	K
7440-02-0	Nickel	5.8	B	J	P	
7440-09-7	Potassium	1730			P	
7782-49-2	Selenium	0.96	U		P	
7440-22-4	Silver	0.24	U		P	
7440-23-5	Sodium	361	B	J	P	K mw
7440-28-0	Thallium	1.2	B	* J	P	K mw
7440-62-2	Vanadium	5.3	B	J	P	
7440-66-6	Zinc	15.8			P	

CP 11.24.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF39

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.25
Level (low/med): LOW Date Received: 09/24/99
% Solids: 70.2

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	14100			P	
7440-36-0	Antimony	3.4	B	N J	P	K mw
7440-38-2	Arsenic	25.3		* J	P	K
7440-39-3	Barium	47.3	B	J	P	
7440-41-7	Beryllium	0.42	B	J	P	
7440-43-9	Cadmium	1.3	B	* J	P	K mw
7440-70-2	Calcium	1390		* J	P	K
7440-47-3	Chromium	11.3		* J	P	K
7440-48-4	Cobalt	37.9			P	
7440-50-8	Copper	3430			P	
7439-89-6	Iron	43500		* J	P	K
7439-92-1	Lead	14.2		* J	P	K
7439-95-4	Magnesium	3410			P	
7439-96-5	Manganese	440		* J	P	K
7439-97-6	Mercury	0.07	B	* J	CV	K mw
7440-02-0	Nickel	8.6	B	J	P	
7440-09-7	Potassium	1080	B	J	P	
7782-49-2	Selenium	2.8			P	
7440-22-4	Silver	0.32	B	J	P	
7440-23-5	Sodium	375	B	J	P	H mw
7440-28-0	Thallium	4.6		* J	P	K
7440-62-2	Vanadium	11.7	B	J	P	
7440-66-6	Zinc	33.6			P	

CP 11.24.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF41

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF15

Matrix (soil/water): SOIL Lab Sample ID: 40437.27

Level (low/med): LOW Date Received: 09/24/99

% Solids: 73.3

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	12600			P	
7440-36-0	Antimony	3.9	B	N J	P	Kmn
7440-38-2	Arsenic	28.1		* J	P	K
7440-39-3	Barium	23.9	B	J	P	
7440-41-7	Beryllium	0.30	B	J	P	
7440-43-9	Cadmium	1.5		* J	P	K
7440-70-2	Calcium	291	B	* J	P	Kmn
7440-47-3	Chromium	9.1		* J	P	K
7440-48-4	Cobalt	34.6			P	
7440-50-8	Copper	2340			P	
7439-89-6	Iron	47100		* J	P	K
7439-92-1	Lead	13.0		* J	P	K
7439-95-4	Magnesium	3210			P	
7439-96-5	Manganese	468		* J	P	K
7439-97-6	Mercury	0.06	U	* UJ	CV	K
7440-02-0	Nickel	7.1	B	J	P	
7440-09-7	Potassium	1010	B	J	P	
7782-49-2	Selenium	3.2			P	
7440-22-4	Silver	0.30	B	J	P	
7440-23-5	Sodium	354	B	J	P	Kmn
7440-28-0	Thallium	5.3		* J	P	K
7440-62-2	Vanadium	10.7	B	J	P	
7440-66-6	Zinc	35.0			P	

CR 11.24.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

EPA SAMPLE NO.

MJCF63

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.30
Level (low/med): LOW Date Received: 09/24/99
% Solids: 89.6

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	7170			P	
7440-36-0	Antimony	0.67	U	N UJ	P	K
7440-38-2	Arsenic	4.7		* J	P	K
7440-39-3	Barium	186			P	
7440-41-7	Beryllium	0.63	B	J	P	
7440-43-9	Cadmium	0.41	B	* J	P	~~K~~
7440-70-2	Calcium	2730		* J	P	K
7440-47-3	Chromium	4.8		* J	P	K
7440-48-4	Cobalt	6.2	B	J	P	
7440-50-8	Copper	339			P	
7439-89-6	Iron	9870		* J	P	K
7439-92-1	Lead	10.3		* J	P	K
7439-95-4	Magnesium	1500			P	
7439-96-5	Manganese	342		* J	P	K
7439-97-6	Mercury	0.08	B	* J	CV	~~K~~
7440-02-0	Nickel	3.5	B	J	P	
7440-09-7	Potassium	1880			P	
7782-49-2	Selenium	0.89	U		P	
7440-22-4	Silver	0.22	U		P	
7440-23-5	Sodium	389	B	J	P	~~K~~
7440-28-0	Thallium	0.86	B	* J	P	~~K~~
7440-62-2	Vanadium	5.7	B	J	P	
7440-66-6	Zinc	29.7			P	

CP 11.24.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF64

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF15
Matrix (soil/water): SOIL Lab Sample ID: 40437.31
Level (low/med): LOW Date Received: 09/24/99
% Solids: 67.4

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	5050			P	
7440-36-0	Antimony	0.89	U	N UJ	P	K
7440-38-2	Arsenic	1.0	B	* J	P	KMW
7440-39-3	Barium	198			P	
7440-41-7	Beryllium	1.7			P	
7440-43-9	Cadmium	0.30	U	* UJ	P	K
7440-70-2	Calcium	5400		* J	P	K
7440-47-3	Chromium	2.8	B	* J	P	KMW
7440-48-4	Cobalt	0.94	B	J	P	
7440-50-8	Copper	7.8			P	
7439-89-6	Iron	3730		* J	P	K
7439-92-1	Lead	6.6		* J	P	K
7439-95-4	Magnesium	1030	B	J	P	
7439-96-5	Manganese	200		* J	P	K
7439-97-6	Mercury	0.07	U	* UJ	CV	K
7440-02-0	Nickel	2.1	B	J	P	
7440-09-7	Potassium	1430	B	J	P	
7782-49-2	Selenium	1.2	U		P	
7440-22-4	Silver	0.30	U		P	
7440-23-5	Sodium	555	B	J	P	KMW
7440-28-0	Thallium	1.2	B	* J	P	KMW
7440-62-2	Vanadium	5.1	B	J	P	
7440-66-6	Zinc	19.0			P	

CP 11.24.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF65

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF15
Matrix (soil/water): SOIL
Level (low/med): LOW
% Solids: 69.2
Lab Sample ID: 40437.32
Date Received: 09/24/99

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	11500			P	
7440-36-0	Antimony	2.1	B	N J	P	K
7440-38-2	Arsenic	7.3		J	P	K
7440-39-3	Barium	178			P	
7440-41-7	Beryllium	0.57	B	J	P	
7440-43-9	Cadmium	1.3	B	J	P	K
7440-70-2	Calcium	14300		J	P	K
7440-47-3	Chromium	9.3		J	P	K
7440-48-4	Cobalt	11.9	B	J	P	
7440-50-8	Copper	144			P	
7439-89-6	Iron	30900		J	P	K
7439-92-1	Lead	89.8		J	P	K
7439-95-4	Magnesium	2380			P	
7439-96-5	Manganese	566		J	P	K
7439-97-6	Mercury	0.43		J	CV	K
7440-02-0	Nickel	13.2			P	
7440-09-7	Potassium	1650			P	
7782-49-2	Selenium	1.2	U		P	
7440-22-4	Silver	0.29	U		P	
7440-23-5	Sodium	461	B	J	P	K
7440-28-0	Thallium	2.4	B	J	P	K
7440-62-2	Vanadium	11.9	B	J	P	
7440-66-6	Zinc	53.2			P	

11/24/99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

ENVIRONMENTAL SERVICES ASSISTANCE TEAMS - WESTERN ZONE

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: November 29, 1999

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

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

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

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Harmony Mines Site.
Case: 27380 SDG: MJCF66

DOC: ESW10-3-1586
PWO: ESW72039
TDF: 3712
WA: 10-99-3-10

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 by Southwest Laboratory of Oklahoma of Broken Arrow, OK. The following samples were reviewed in this validation report:

MJCF66	MJCF72	MJCF77
MJCF67	MJCF73	
MJCF68	MJCF74	
MJCF69	MJCF75	
MJCF71	MJCF76	

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 (ILM04.0) 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 mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 9/20, 9/21 and 9/22/99. The samples were analyzed for mercury within 7 days and all other metals were analyzed 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 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 the 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% and 80-120% for mercury. The recoveries ranged from 92-107% for ICP-AES and from 100-105% for mercury. 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
antimony	MJCF73, MJCF75, MJCF76, MJCF77

Mercury yielded a negative response in the preparation blank and/or continuing calibration blank(s). Due to possible low bias, the mercury results in the associated samples at concentrations comparable to or less than the absolute value of the blank(s) were qualified as estimated, "J/UJ". The following samples were qualified: MJCF68, MJCF69, MJCF71, MJCF76, MJCF77.

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 94-108%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis - Acceptable

Sample MJCF69 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 83-547%. None of the data were qualified on this basis.

Duplicate Sample Analysis

Sample MJCF69 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 zinc. Results zinc in all samples were qualified as estimated, "J". The "*" qualifiers applied by the laboratory were crossed-out by the reviewer.

Matrix Spike Analysis

Sample MJCF69 was used for the spike analysis. The frequency of analysis and recovery criteria were met with the exception of arsenic (172%), lead (135%) and manganese (370%) in the spike sample MJCF69S. Due to possible bias, the detected arsenic, lead and manganese results in all samples were qualified as estimated, "J", and the non-detected results were not qualified. The recovery for copper could not be accurately determined because the concentration native to the sample was greater than 4 times the amount of spike added to the sample. All of the other spike recoveries were acceptable and ranged from 76-114%.

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.

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF66

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK__ Case No.: 27380 SAS No.: _____ SDG No.: MJCF66
Matrix (soil/water): SOIL_ Lab Sample ID: 40437.33
Level (low/med): LOW__ Date Received: 09/24/99
% Solids: _94.9

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	9.0	B	J	P	
7440-38-2	Arsenic	36.7		W J	P	H
7440-39-3	Barium	6.4	B	J	P	
7440-41-7	Beryllium	0.20	U		P	
7440-43-9	Cadmium	2.0			P	
7440-70-2	Calcium	42.1	B	J	P	
7440-47-3	Chromium	10.2			P	
7440-48-4	Cobalt	26.3			P	
7440-50-8	Copper	1400			P	
7439-89-6	Iron	72000			P	
7439-92-1	Lead	14.8		W J	P	H
7439-95-4	Magnesium	4110			P	
7439-96-5	Manganese	127		W J	P	H
7439-97-6	Mercury	0.39			CV	
7440-02-0	Nickel	4.4	B	J	P	
7440-09-7	Potassium	705	B	J	P	
7782-49-2	Selenium	7.2			P	
7440-22-4	Silver	2.2			P	
7440-23-5	Sodium	259	B	J	P	
7440-28-0	Thallium	7.0			P	
7440-62-2	Vanadium	10.1	B	J	P	
7440-66-6	Zinc	37.5		W J	P	K

CP 11.29.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF67

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF66
Matrix (soil/water): SOIL Lab Sample ID: 40437.34
Level (low/med): LOW Date Received: 09/24/99
% Solids: 46.8

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	16500			P	
7440-36-0	Antimony	4.2	B	J	P	
7440-38-2	Arsenic	28.4		N J	P	H
7440-39-3	Barium	168			P	
7440-41-7	Beryllium	0.93	B	J	P	
7440-43-9	Cadmium	1.3	B	J	P	
7440-70-2	Calcium	4130			P	
7440-47-3	Chromium	13.4			P	
7440-48-4	Cobalt	35.4			P	
7440-50-8	Copper	5720			P	
7439-89-6	Iron	43600			P	
7439-92-1	Lead	18.0		N J	P	H
7439-95-4	Magnesium	3670			P	
7439-96-5	Manganese	375		N J	P	H
7439-97-6	Mercury	0.31			CV	
7440-02-0	Nickel	11.6	B	J	P	
7440-09-7	Potassium	1480	B	J	P	
7782-49-2	Selenium	3.5			P	
7440-22-4	Silver	0.42	U		P	
7440-23-5	Sodium	641	B	J	P	
7440-28-0	Thallium	5.0			P	
7440-62-2	Vanadium	12.8	B	J	P	
7440-66-6	Zinc	54.2		N J	P	K

11.29.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 4

MJCF68

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK__ Case No.: 27380 SAS No.: _____ SDG No.: MJCF66
Matrix (soil/water): SOIL_ Lab Sample ID: 40437.35
Level (low/med): LOW__ Date Received: 09/24/99
% Solids: _49.6

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	14900			P	
7440-36-0	Antimony	2.6	B	J	P	
7440-38-2	Arsenic	16.5		N J	P	H
7440-39-3	Barium	170			P	
7440-41-7	Beryllium	0.87	B	J	P	
7440-43-9	Cadmium	1.00	B	J	P	
7440-70-2	Calcium	3800			P	
7440-47-3	Chromium	11.8			P	
7440-48-4	Cobalt	22.5			P	
7440-50-8	Copper	2930			P	
7439-89-6	Iron	32600			P	
7439-92-1	Lead	16.2		N J	P	H
7439-95-4	Magnesium	3130			P	
7439-96-5	Manganese	316		N J	P	H
7439-97-6	Mercury	0.18	B	J	CV	
7440-02-0	Nickel	12.5	B	J	P	
7440-09-7	Potassium	1500	B	J	P	
7782-49-2	Selenium	2.2			P	
7440-22-4	Silver	0.38	U		P	
7440-23-5	Sodium	546	B	J	P	
7440-28-0	Thallium	3.1	B	J	P	
7440-62-2	Vanadium	12.1	B	J	P	
7440-66-6	Zinc	39.9		* J	P	K

CP 11.25.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF69

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF66
Matrix (soil/water): SOIL Lab Sample ID: 40437.36
Level (low/med): LOW Date Received: 09/24/99
% Solids: 80.4

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	6930			P	
7440-36-0	Antimony	2.8	B	J	P	
7440-38-2	Arsenic	19.5		N J	P	H
7440-39-3	Barium	45.9	B	J	P	
7440-41-7	Beryllium	0.45	B	J	P	
7440-43-9	Cadmium	0.62	B	J	P	
7440-70-2	Calcium	802	B	J	P	
7440-47-3	Chromium	6.9			P	
7440-48-4	Cobalt	22.2			P	
7440-50-8	Copper	2380			P	
7439-89-6	Iron	21600			P	
7439-92-1	Lead	5.8		N J	P	H
7439-95-4	Magnesium	1560			P	
7439-96-5	Manganese	449		N J	P	H
7439-97-6	Mercury	0.06	U	UJ	CV	K
7440-02-0	Nickel	8.0	B	J	P	
7440-09-7	Potassium	720	B	J	P	
7782-49-2	Selenium	1.00	U		P	
7440-22-4	Silver	0.25	U		P	
7440-23-5	Sodium	354	B	J	P	
7440-28-0	Thallium	2.5	B	J	P	
7440-62-2	Vanadium	8.8	B	J	P	
7440-66-6	Zinc	19.1		+ J	P	K

11.29.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF71

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK__ Case No.: 27380 SAS No.: _____ SDG No.: MJCF66
Matrix (soil/water): SOIL_ Lab Sample ID: 40437.38
Level (low/med): LOW__ Date Received: 09/24/99
% Solids: _77.9

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	9470			P	
7440-36-0	Antimony	2.3	B	J	P	
7440-38-2	Arsenic	13.1		N J	P	H
7440-39-3	Barium	166			P	
7440-41-7	Beryllium	0.56	B	J	P	
7440-43-9	Cadmium	1.2	B	J	P	
7440-70-2	Calcium	3820			P	
7440-47-3	Chromium	11.1			P	
7440-48-4	Cobalt	17.7			P	
7440-50-8	Copper	1130			P	
7439-89-6	Iron	21600			P	
7439-92-1	Lead	26.3		N J	P	H
7439-95-4	Magnesium	3090			P	
7439-96-5	Manganese	408		N J	P	H
7439-97-6	Mercury	0.08	B	J	CV	KMW
7440-02-0	Nickel	9.0	B	J	P	
7440-09-7	Potassium	1960			P	
7782-49-2	Selenium	1.00	U		P	
7440-22-4	Silver	0.25	U		P	
7440-23-5	Sodium	416	B	J	P	
7440-28-0	Thallium	2.4	B	J	P	
7440-62-2	Vanadium	12.4	B	J	P	
7440-66-6	Zinc	54.1		N J	P	K

KP 11-25-99

Color Before: BROWN____ Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW___ Clarity After: CLEAR_ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF72

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF66
Matrix (soil/water): SOIL Lab Sample ID: 40437.39
Level (low/med): LOW Date Received: 09/24/99
% Solids: 85.2

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	16000			P	
7440-36-0	Antimony	5.8	B	J	P	
7440-38-2	Arsenic	69.4		N J	P	H
7440-39-3	Barium	125			P	
7440-41-7	Beryllium	0.29	B	J	P	
7440-43-9	Cadmium	1.8			P	
7440-70-2	Calcium	321	B	J	P	
7440-47-3	Chromium	15.3			P	
7440-48-4	Cobalt	19.5			P	
7440-50-8	Copper	680			P	
7439-89-6	Iron	64500			P	
7439-92-1	Lead	27.1		N J	P	H
7439-95-4	Magnesium	3140			P	
7439-96-5	Manganese	190		N J	P	H
7439-97-6	Mercury	0.37			CV	
7440-02-0	Nickel	11.6			P	
7440-09-7	Potassium	1980			P	
7782-49-2	Selenium	6.1			P	
7440-22-4	Silver	0.98	B	J	P	
7440-23-5	Sodium	363	B	J	P	
7440-28-0	Thallium	7.1			P	
7440-62-2	Vanadium	20.7			P	
7440-66-6	Zinc	40.1		J	P	K

CP 11.29.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF73

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF66
Matrix (soil/water): SOIL Lab Sample ID: 40437.40
Level (low/med): LOW Date Received: 09/24/99
% Solids: 91.6

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	19000			P	
7440-36-0	Antimony	3.0	B	U	P	
7440-38-2	Arsenic	21.9		N J	P	H
7440-39-3	Barium	10.6	B	J	P	
7440-41-7	Beryllium	0.22	U		P	
7440-43-9	Cadmium	1.9			P	
7440-70-2	Calcium	62.0	B	J	P	
7440-47-3	Chromium	12.9			P	
7440-48-4	Cobalt	23.9			P	
7440-50-8	Copper	500			P	
7439-89-6	Iron	72300			P	
7439-92-1	Lead	12.4		N J	P	H
7439-95-4	Magnesium	5580			P	
7439-96-5	Manganese	206		N J	P	H
7439-97-6	Mercury	0.18			CV	
7440-02-0	Nickel	7.2	B	J	P	
7440-09-7	Potassium	462	B	J	P	
7782-49-2	Selenium	4.6			P	
7440-22-4	Silver	0.54	B	J	P	
7440-23-5	Sodium	271	B	J	P	
7440-28-0	Thallium	6.3			P	
7440-62-2	Vanadium	14.1			P	
7440-66-6	Zinc	25.3		J	P	K

11.29.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

EPA SAMPLE NO.

INORGANIC ANALYSES DATA SHEET

MJCF74

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136

Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF66

Matrix (soil/water): SOIL Lab Sample ID: 40437.41

Level (low/med): LOW Date Received: 09/24/99

% Solids: 80.5

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	24500			P	
7440-36-0	Antimony	6.7	B	J	P	
7440-38-2	Arsenic	44.0		N J	P	H
7440-39-3	Barium	15.0	B	J	P	
7440-41-7	Beryllium	0.24	U		P	
7440-43-9	Cadmium	2.7			P	
7440-70-2	Calcium	63.8	B	J	P	
7440-47-3	Chromium	19.5			P	
7440-48-4	Cobalt	68.1			P	
7440-50-8	Copper	5870			P	
7439-89-6	Iron	103000			P	
7439-92-1	Lead	37.0		N J	P	H
7439-95-4	Magnesium	6330			P	
7439-96-5	Manganese	184		N J	P	H
7439-97-6	Mercury	0.70			CV	
7440-02-0	Nickel	10.1			P	
7440-09-7	Potassium	1640			P	
7782-49-2	Selenium	8.8			P	
7440-22-4	Silver	2.6			P	
7440-23-5	Sodium	321	B	J	P	
7440-28-0	Thallium	9.7			P	
7440-62-2	Vanadium	16.4			P	
7440-66-6	Zinc	55.8		J	P	K

CP 11.29.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM

Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF75

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: SDG No.: MJCF66
Matrix (soil/water): SOIL Lab Sample ID: 40437.42
Level (low/med): LOW Date Received: 09/24/99
% Solids: 97.7

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	16200			P	
7440-36-0	Antimony	2.9	B	U	P	
7440-38-2	Arsenic	13.8		N J	P	H
7440-39-3	Barium	5.2	B	J	P	
7440-41-7	Beryllium	0.20	U		P	
7440-43-9	Cadmium	1.9			P	
7440-70-2	Calcium	36.1	B	J	P	
7440-47-3	Chromium	10.1			P	
7440-48-4	Cobalt	14.4			P	
7440-50-8	Copper	491			P	
7439-89-6	Iron	73400			P	
7439-92-1	Lead	7.8		N J	P	H
7439-95-4	Magnesium	4750			P	
7439-96-5	Manganese	169		N J	P	H
7439-97-6	Mercury	0.38			CV	
7440-02-0	Nickel	4.3	B	J	P	
7440-09-7	Potassium	396	B	J	P	
7782-49-2	Selenium	4.9			P	
7440-22-4	Silver	0.76	B	J	P	
7440-23-5	Sodium	252	B	J	P	
7440-28-0	Thallium	6.9			P	
7440-62-2	Vanadium	13.7			P	
7440-66-6	Zinc	27.0		J	P	K

CP 11.29.99

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MJCF76

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF66
Matrix (soil/water): SOIL Lab Sample ID: 40437.43
Level (low/med): LOW Date Received: 09/24/99
% Solids: 95.2

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	9060			P	
7440-36-0	Antimony	2.6	B	N U	P	
7440-38-2	Arsenic	16.1		N J	P	H
7440-39-3	Barium	117			P	
7440-41-7	Beryllium	0.40	B	J	P	
7440-43-9	Cadmium	0.81	B	J	P	
7440-70-2	Calcium	1530			P	
7440-47-3	Chromium	6.6			P	
7440-48-4	Cobalt	26.0			P	
7440-50-8	Copper	1420			P	
7439-89-6	Iron	26900			P	
7439-92-1	Lead	13.0		N J	P	H
7439-95-4	Magnesium	2340			P	
7439-96-5	Manganese	365		N J	P	H
7439-97-6	Mercury	0.06	B	J	CV	Low
7440-02-0	Nickel	5.3	B	J	P	
7440-09-7	Potassium	1480			P	
7782-49-2	Selenium	1.4			P	
7440-22-4	Silver	0.20	U		P	
7440-23-5	Sodium	297	B	J	P	
7440-28-0	Thallium	2.3			P	
7440-62-2	Vanadium	8.6	B	J	P	
7440-66-6	Zinc	28.3		* J	P	K

CP 11.25.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

U.S. EPA - CLP

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.
MJCF77

Lab Name: SOUTHWEST_LAB_OF_OKLAHOMA Contract: 68-D5-0136
Lab Code: SWOK Case No.: 27380 SAS No.: _____ SDG No.: MJCF66
Matrix (soil/water): SOIL Lab Sample ID: 40437.44
Level (low/med): LOW Date Received: 09/24/99
% Solids: 96.0

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

CAS No.	Analyte	Concentration	C	Q	M	
7429-90-5	Aluminum	9190			P	
7440-36-0	Antimony	1.1		U	P	
7440-38-2	Arsenic	9.3		N J	P	H
7440-39-3	Barium	174			P	
7440-41-7	Beryllium	0.46	B	J	P	
7440-43-9	Cadmium	0.69	B	J	P	
7440-70-2	Calcium	2950			P	
7440-47-3	Chromium	11.7			P	
7440-48-4	Cobalt	14.3			P	
7440-50-8	Copper	699			P	
7439-89-6	Iron	19300			P	
7439-92-1	Lead	23.0		N J	P	H
7439-95-4	Magnesium	3320			P	
7439-96-5	Manganese	344		N J	P	H
7439-97-6	Mercury	0.05	U	U J	CV	K
7440-02-0	Nickel	8.5			P	
7440-09-7	Potassium	1920			P	
7782-49-2	Selenium	0.82	U		P	
7440-22-4	Silver	0.20	U		P	
7440-23-5	Sodium	381	B	J	P	
7440-28-0	Thallium	2.0	B	J	P	
7440-62-2	Vanadium	13.2			P	
7440-66-6	Zinc	61.4		J	P	K

11.29.99

Color Before: BROWN Clarity Before: _____ Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts: _____

Comments:

APPENDIX D

POTENTIALLY RESPONSIBLE PARTY SEARCH FOR THE HARMONY MINE SITE, SALMON-CHALLIS NATIONAL FOREST, LEMHI COUNTY, IDAHO

POTENTIALLY RESPONSIBLE PARTY SEARCH FOR THE HARMONY MINE SITE SALMON-CHALLIS NATIONAL FOREST LEMHI COUNTY, IDAHO

Contract No.: 53-84N8-6-008

Submitted to:

United States Department of Agriculture
Forest Service
Boise National Forest

Submitted by:

Science Applications International Corporation
999 18th Street
Suite 855, North Tower
Denver, Colorado 80202

December 1999

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APPENDICES

1.0 INTRODUCTION

1.1 Project Background

The Harmony mine is located in the Salmon-Challis National Forest, McDevitt Mining District, in Lemhi County, Idaho. For the purposes of this project, the Harmony mine comprises five patented and 68 unpatented lode mining claims in Township 20 North, Range 22 East, Sections 34 and 35, and Township 19 North, Range 22 East, Sections 2 and 3. The patented claims are the Harmony millsite, Contention No. 1, Contention, and Bunker Hill No. 2 and No. 4 lode claims (Patent No. 1019652; Mineral Survey (MS) No. 3121 A, B). The unpatented claims include three claims associated with the above patented claims (Alfred N No. 2, and Bunker Hill No. 1 and No. 5), and a large group of more recent claims surrounding the patented properties in the same township, range, and sections. The more recent claims are the SAL Lode Claim Nos. 14 – 32 (19 claims), and H Lode Claim Nos. 1 - 20 except H-11, 23, 25, and 27 – 51 (46 claims).

Lode claims were first located at the Harmony mine in 1907, and the first claims were patented in 1926. The mine and its associated mill produced primarily copper, along with small quantities of gold and silver. Available documentation addressing waste generation and disposal practices at the mine includes a 1930 report on mining and milling practices at the Harmony mine and a 1994 Idaho Geological Survey (IGS) report which identifies environmental effects potentially dating to the 1930s, as cited in more detail in section 2.0 of this report. Waste generation and disposal practices of later mine owners and operators, or the environmental effects of these wastes were not available in the historical record.

1.2 Methodology

The USDA Forest Service requested that SAIC conduct research to identify parties responsible for the release of hazardous substances at the Harmony mine pursuant to section 107(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. section 9601, *et seq.* The USDA Forest Service Primary Contact for this work assignment, Mr. Ray Henderson, was contacted to discuss the history and research objectives for this assignment and to obtain specific directions regarding the information to be developed. Mr. Henderson provided SAIC with copies of site files maintained by the USDA Forest Service office in Salmon, Idaho. He further indicated that research should focus on the patented claims of the Harmony mine, and the unpatented claims in the immediate vicinity.

The SAIC Primary Investigator for this work assignment is Mr. Reed Haddock. The title search was conducted by Ms. Christa Stumpf. Ms. Stumpf researched pertinent real property records filed with the Lemhi County Recorder's Office, the Lemhi County Assessor's Office, the Lemhi County Treasurer's office, and the U. S. Department of Interior Bureau of Land Management (BLM) in Boise, Idaho. Historical research and additional records research was conducted by Ms. Claudia Druss who reviewed records held by the Idaho State Library and Archives, a division of the Idaho State Historical Society in Boise, Idaho; the University of Idaho Library Special Collections Department, Moscow, Idaho; Albertson Library at Boise State University, Boise; the

Boise Public Library; the National Archives and Records Administration (NARA) National Archives Information Locator (NAIL) database; the Environmental Protection Agency (EPA) Idaho Operations Office, Boise; and the Idaho Geological Survey (IGS), Moscow, Idaho.

SAIC conducted corporate and financial research using the online information service CDB Infotek (*www.cdb.com/public*), Hoover's Online (*www.hoovers.com*) and Hoover's Telebase (WinStar Business Research Center) Databases (*www.hoovers.telebase.com*), and the Noranda, Inc. website (*www.noranda.com*). SAIC also contacted the Idaho Secretary of State, Corporations Division; the Arizona Corporation Commission; the Nevada Secretary of State, Status Division; the Montana Secretary of State, Business Services Division; and the Delaware Secretary of State, Department of State, Division of Corporations by telephone.

Finally, SAIC staff conducted Internet name and address research using GTE's SuperPages (Bigbook) Yellow Pages (*www.bigbook.com*) and Infospace (*www.infospace.com*) White Pages databases to research addresses and telephone numbers for companies and individuals. SAIC staff also reviewed the following publications at the Denver Public Library:

-- The Mines Register, successor to The Mines Handbook, 1937, 1942, and 1949.
-- The Mines Handbook, 1922, 1924, and 1931.
-- Moody's International Manual, 1998.
-- E&MJ International Directory of Mining, 1996.

Information obtained from the source and title documents is referenced in this report. Source documents are listed in Appendix A. Title documents are listed in Appendix B. A chain-of-title for the patented and unpatented lode claims is provided in Appendix C. Source documents are cited throughout this report as A-1, A-2, A-3, etc. Title documents are cited as B-1, B-2, B-3, etc. References to specific page numbers in the source and title documents are cited using the page number as well as the document number (*e.g.*, A-1 at p.1; B-1 at p. 1).

1.3 Sources Contacted

Mr. Ray Henderson
On-Scene Coordinator
USDA Forest Service
Salmon-Challis National Forest
RR 2 Box 600
Salmon, ID 83467
(208) 756-5212

Idaho State Office, Public Room
Bureau of Land Management
1387 Vinnel Way
Boise, ID 83709
(208) 373-4000

National Archives and Records
Administration, Pacific Alaska Region
6125 Sand Point Way NE
Seattle, WA 98115-7999
(206) 526-6501
NAIL Database
www.nara.gov/regional/seattle.html

Mr. David Tomten, Mining Coordinator
Idaho Operations Office
Environmental Protection Agency
1435 North Orchard Street
Boise, ID 83706
(208) 378-5763

Idaho State Library and Archives
Idaho State Historical Society
450 N. 4th St.
Boise, ID 83702
(208) 334-3356

Ms. Victoria Mitchell, Library Information Specialist
Idaho Geological Survey
Morrill Hall, Room 332
University of Idaho
Moscow, ID 83844-3014
(208) 885-7991

Secretary of State
Corporations Division
P. O. Box 83720
700 West Jefferson
Boise, ID 83720-0800
(208) 334-2301

Arizona Corporation Commission
Records Division
1300 West Washington, Room 101
Phoenix, AZ 85007-2929
(602) 542-3026

Nevada Secretary of State
101 North Carson Street, Suite 3
Carson City, NV 89701-4786
Nevada Offices: (775) 684-5708
Corporate Status Line: (900) 535-3355

Ms. Laura Aultman
Montana Secretary of State
Business Services Division
Capitol Building, Room 225
P. O. Box 202801
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Department of State
Division of Corporations
401 Federal Street, Suite 4
Dover, DE 19901
(302) 739-3073

Lemhi County Assessor's Office
Lemhi County Courthouse
206 Courthouse Drive
Salmon, ID 83467
(208) 756-2815

Lemhi County Recorder's Office
Lemhi County Courthouse
206 Courthouse Drive
Salmon, ID 83467
(208) 756-2815

Lemhi County Treasurer's Office
Lemhi County Courthouse
206 Courthouse Drive
Salmon, ID 83467
(208) 756-2815

Mr. Robert Wiederrick
Lemhi County Historical Society
Lemhi County Museum
Salmon, Idaho 83467
(208) 756-3342

University of Idaho Library
Special Collections Department
Moscow, Idaho 83844
(208) 885-6584
www.lib.uidaho.edu/special-collections

Albertson Library
Boise State University
1910 University Dr.
Boise, ID 83725
(208) 426-3301

Boise Public Library
715 S. Capitol Blvd.
Boise, ID 83702
(208) 384-4340

Denver Public Library
10 West 14th Avenue Parkway
Denver, CO 80204
(303) 640-6220

2.0 OPERATIONAL HISTORY

The Harmony mine is in the McDevitt Mining District at the head of Withington Creek (sometimes misspelled as Worthington Creek), about 12 miles south of Salmon, Idaho. The mine is on the east slope of the Lemhi Range at an elevation of 7000 to 8200 feet. Ore was discovered in the district beginning in the 1870s (A-13 at p. 4). The first lode claims associated with the Harmony mine were located in 1907 by William Anderson of Salmon, Idaho when he filed location notices on the Bunker Hill Claim Nos. 1, 2, 3, 4, and 5 (B-1 – B-4). Of these claims, Bunker Hill Claim Nos. 1, 2, 4, and 5 are within the study area. Anderson worked Bunker Hill Nos. 1 - 4 through 1915 (B-5 – B-7, B-8, B-10). That same year, George Hanson of Salmon, Idaho filed location notices on the Bunker Hill No. 2 claim and others in the group that are outside the present study area (B-9). Earl F. Nieman of Salmon located the Alfred N No. 2 claim, adjoining the Bunker Hill claims, in 1916 (B-11 - B-13).

Work on the property was limited until the Harmony Mines Company took over Anderson's claims following its incorporation in 1916 (A-1 at p. 71; A-18). Harmony Mines Company originally incorporated in Nevada (A-18 at p. 2). Its directors were based in Chicago, Illinois, but Earl Nieman was its local manager and agent. During the last four months of 1917, the company shipped 10 carloads of crude ore with six to 12 percent copper per ton (A-1 at p. 71).

Harmony Mines worked a series of five parallel fissures near the mountain top with a cross-cut tunnel 800 to 900 feet deep (A-3 at p. 100). Later, ore was transported down to a millsite in the canyon 1200 feet below by an aerial tramway (A-2 at p. 77). The 50 to 100-ton mill featured a rock breaker Hardinge mill, Dorr classifiers, and six Wilfley tables (A-3 at p. 10; A-4 at p. 7). The Contention and Contention No. 1 claims (overlapping the previous Bunker Hill No. 5 and Alfred N No. 2 claims) were added to the Harmony mine group when they were transferred from Earl Nieman in 1919 (B-14 - B-15). Bunker Hill Nos. 1, 2, and 3 were transferred to Harmony Mines Company in 1919 by George Hanson (B-16); also in 1919, the Harmony Mill Site was located by the Harmony Mines Company (B-20).

The mill closed in 1921 because of low copper prices, but resumed work the following year (A-16 at p. 6). In 1922, Harmony Mines Company's property consisted of 17 claims in the Withington Creek District. At that time the Harmony mine opened on two veins, the Leap Year, which averaged 5.5% copper ore, and the Contention, which averaged 5% copper ore (A-22 at p. 754). Development work for 1922 included 162 feet on the 200- and 300-foot levels. The mill, which had a 100-ton capacity, treated 2,000 tons of ore in 1922 and produced 1,227 tons of dry concentrate assaying 21.87% copper (A-23 at p. 904).

By 1923, the property held by the Harmony Mines Company consisted of 24 unpatented claims in the Harmony group worked with five tunnels, cuts and shafts totaling 6000 feet in length (A-5 at p. 126). Among the mine's several groups of workings, most of the early development took place on the Contention claim (A-15 at p. 8). The mill expanded to a 175-ton capacity, and the property was considered to be one of the most completely equipped mines and the largest copper

producer in Lemhi County (A-5 at p. 126; A-6 at p. 134). Copper concentrate from the mine was shipped to a smelter in International, Utah.

A storage-battery locomotive was installed in 1926 and five claims were patented (A-8 at p. 153; B-28). The mine was worked only for three months early in 1927 before operations were suspended pending the acquisition of additional financing through the sale of bonds (A-9 at p. 159). In 1929, however, a new power plant with an eight-mile transmission line to the mine was constructed at Baker (A-10 at p. 176) and the mill was expanded to a capacity of 200 tons (A-10 at p. 176), treating 200 tons of copper ore per day (A-13 at p. 1). Figure 2-1 on page 7 is a 1926 map of the patented portions of the Harmony mine.

Local folklore suggests that Al Capone used the Harmony mine as a hideout at some point. Capone did go into hiding for three months in the summer of 1926, following the shooting of a Chicago prosecutor (A-17 at p. 2). In an effort to verify this connection, SAIC contacted Robert Wiederrick, of the Lemhi County Historical Society, who said that he knew of no documentary evidence linking Capone to the mine. He suggested that the rumor may have been started by a local character called "Machine Gun Mary," who claimed she knew Capone's Chicago group.

A description of the mill in 1930 indicated that it included a concentrator using the flotation process with water obtained from a spring above the mill through a 500-foot pipeline (A-13 at p. 1). Tailings from the flotation machine were run by launders to two cone-type classifiers at the lower end of a tailings pond (A-13 at p. 14). The thick tailings product gradually built a dam across the tailings dump and the overflow from the classifiers was deposited about 20 feet back of the dam. After the sediment settled, the clear water was carried under the dam by a trough and discharged on the canyon floor at the foot of the dam (A-13 at p. 14). During part of the winter, a portion of the tailings was filtered and the water reclaimed (A-13 at p. 14). At full capacity, the mill used 33,000 gallons of water every 24 hours (A-13 at p. 16). Finished concentrates were hauled by wagon to the railhead at the town of Baker (A-13 at p. 5).

By 1930, the Harmony Mines Company had expanded its holdings at the head of Withington Creek to 24 claims. During that year, work at the mine decreased, but the company listed ore reserves of 80,000 tons (A-11 at p. 181, A-24 at p. 998). The following year, only a small amount of work was completed by lessees (A-12 at p. 172). From 1932, when copper prices bottomed out, to 1935, the Harmony mine is listed as idle in the reports of the state mining inspector, and was no longer listed after 1935. The generator was dismantled and removed in 1932. The mine was reported as inactive from then at least until 1956 (A-14 at pp. 87-88). The Harmony Mines Company forfeited its status in 1936 and the mine equipment was sold for back taxes at Sheriff's auction in 1937. Lemhi County does not hold records of who purchased the equipment at that time. Between 1916 and 1931, the Harmony mine yielded more than 1.8 million pounds of copper and small quantities of gold and silver (A-15 at p. 11).

By 1943, the Harmony mine claims were held by Gold Standard Mines Corporation, also based in Illinois. The Lemhi County Recorder's records do not provide evidence of a transfer in ownership from Harmony Mines Company to Gold Standard Mines, an Arizona corporation.

However, the 1924 edition of *The Mines Handbook* lists Richard De Smet as a director of Harmony Mines Company; the 1937 *Mines Register* also lists R. De Smet as vice president and general manager of Gold Standard Mines Corporation (A-23 at p. 903, A-25 at p. 368). By 1942, Richard De Smet is listed as manager and purchasing agent of Gold Standard Mines Corporation (A-26 at p. 134). It is possible that Richard De Smet, as purchasing agent, acquired the properties for Gold Standard Mines Corporation following the forfeiture of Harmony in 1936.

Following cessation of operations by Harmony Mines Company and the possible conveyance to Gold Standard Mines Corporation described above, the Harmony mine property was conveyed through several transactions over the next several decades to a number of individuals, some of whom still own the property today. These transactions are described in more detail in section 3.1 of this report, beginning on page 12 below. However, no further mining operations occurred at the Harmony mine site until the early 1990s, as described below. The State of Idaho also resurveyed the corners of Mineral Survey No. 3121 B (the Harmony mine patented properties) in 1991 and 1992 (A-19, A-20, A-21 at p. 1).

A large number of lode claims were located in the early 1990s surrounding the patented Harmony mine and millsite. In 1990, Noranda Exploration, Inc., of Denver, Colorado, located the SAL group of 169 lode claims, some of which fall within the present study area surrounding the patented properties of the Harmony mine (SAL 14 - 32) (B-39 – B-57). The next year, they submitted a plan of operation to drill a single core hole at the Harmony mine (A-15 at p. 11). Figure 2-2 on page 9 is a map of the SAL lode claims in 1990.

Also in 1990, Peter W. Laczay of Coeur d'Alene, both as an individual and as an agent for Helena Silver Mines, Inc., located the H series of claims adjacent to the SAL claims, primarily in Section 35 (B-58 – B-118). Of these, H Lode Nos. 1 - 20 except H No. 11, and H Nos. 23, 25, and 27 – 51 were located within the present study area. Figures 2-3 and 2-4 on pages 10 and 11 are maps of the H lode claims located by Laczay and Helena Silver Mines.

An affidavit of labor dated September 26, 1991 describes $29,800 worth of work on the H series and SAL series of lode claims, including geologic mapping, rock geochemical sampling, I. P. survey, line cut, and rock samples (B-121). By 1993, both the SAL and H lode groups of claims were deemed abandoned and void by the BLM (B-122 - B-123), after which no further actions on these claims appear in the public record.

The Harmony mine was visited by the IGS in 1994 in a program to evaluate the environmental status of inactive and abandoned mines (A-16 at p. 11). The evaluation identified a breached tailings dam which may have occurred in the 1930s and damaged a nearby riparian area over the decades (A-16 at p. 6). Discussions with John Hammond, USFS Salmon Ranger District, during the IGS study indicated that the mine and affected areas of Withington Creek appeared to be much the same in 1994 as they had been in 1971 (A-16 at p. 6).

3.0 TITLE SEARCH

The United States Department of Agriculture (USDA) Forest Service requested that SAIC conduct a title search on the unpatented lode mining claims and the patented Mineral Survey No. 3121 A & B lode mining claims that comprised the Harmony mine site. SAIC's objective was to identify Potentially Responsible Parties (PRPs) which owned or operated the site from the beginning of mining operations at the site to the present. At the direction of Mr. Ray Henderson, On-Scene Coordinator, USDA Forest Service, the Title Search section of this report addresses the patented and unpatented mining claims in Sections 34 and 35 in Township 20 North, Range 22 East, and Sections 2 and 3 in Township 19 North, Range 22 East.

SAIC obtained all of the maps included in this report from the BLM Idaho State Office in Boise, Idaho. Figure 2-1 is Mineral Survey No. 3121 A & B, which consists of the patented Harmony Mill Site, Contention No. 1 Lode, Contention Lode, Bunker Hill No. 2 Lode, and Bunker Hill No. 4 Quartz Lode. Mineral Survey No. 3121 A & B also contains three unpatented claims, the Bunker Hill No. 1 Quartz Lode, Bunker Hill No. 5 Lode, and Alfred N. No. 2 Lode. Adjacent to Mineral Survey No. 3121 A & B are the following unpatented lode claims: SAL Lode Claims Nos. 14 – 32 (19 claims) (Figure 2-2); H Lode Claims Nos. 1-20 except H-11, H-23, H-25 (Figure 2-3), and H Lode Mining Claims H-27–51 (46 claims) (Figure 2-4).

A chain-of-title summary developed by SAIC from collected title documents concerning the Harmony mine site is located in Appendix C. Referenced title documents include recorded documents such as Quartz Location Notices, Mill Site Location Notices, Notices of Amended Location, Amended Location Certificates, Proofs of Labor, Affidavits of Annual Representation, Affidavits of Work Performed or Improvements Made, Affidavits of Annual Assessment Work, Notices of Intention to Hold Mining Claims, Mining Claim Deeds, Mining Claim Patents, Tax Assessment Records, and Redemption Deeds. These documents affect the Harmony mine claims from the first location in 1907 through 1999. The title documents, numbered B-1 through B-138, are listed in Appendix B and included in Attachment 2.

3.1 Harmony Mine Claims

On July 11, 1907, William Anderson located the Bunker Hill No. 1 and Bunker Hill No. 2 lode claims (B-1, B-2). Bunker Hill Nos. 4 and 5 were located by William Anderson on July 24, 1907 and August 20, 1908, respectively (B-3, B-4). An Affidavit of Annual Representation for Bunker Hill Nos. 1-4 was recorded August 31, 1908 (B-5).

On September 27, 1913 and October 21, 1914, Affidavits of Annual Representation were recorded for the Bunker Hill claims (B-6, B-7, B-8). On June 22, 1915, George Hanson recorded a Lode Location Notice for the Bunker Hill No. 2 lode claim (B-9). Later the same year, A. C. Wills recorded an Affidavit of Annual Representation on the Bunker Hill Nos. 1, 4, and 5 lode claims (B-10). On September 22, 1916, Earl F. Nieman recorded a Lode Location Notice for the Alfred N. No. 2 lode claim (B-11). E. F. Nieman for the Harmony Mines Company recorded an Affidavit of Annual Representation for Bunker Hill Nos. 1-6 and the Alfred N. Nos. 1-2 on

December 28, 1917 (B-12). On August 15, 1918, E. F. Nieman recorded a Notice of Lode Location for the Contention Lode (B-13).

Harmony Mines Company purchased the Harmony mine claims from several individuals through four separate conveyances, all recorded on January 31, 1919. First, Earl F. Nieman and Sarah Nieman conveyed the Alfred N., Alfred N. No. 2, and the Contention lode claims to the Harmony Mines Company (B-14). Through a second conveyance, the Niemans also conveyed the Contention No. 1 and No. 2 lode claims to the Harmony Mines Company (B-15). Third, George Hanson conveyed the Bunker Hill Nos. 1, 2, and 3 lode claims to the Harmony Mines Company (B-16). Fourth, William Anderson and Ida Anderson quit claimed the Bunker Hill Nos. 4, 5, 6, and 7 lode claims to the Harmony Mines Company (B-17). Harmony Mines Company recorded an Affidavit of Annual Representation on the Bunker Hill Nos. 1-7 and the Alfred N. Nos. 1-2 lode claims on February 3, 1919 (B-18). On June 9, 1919, Harmony Mines Company recorded a Lode Location Notice for the Contention No. 1 Lode claim (B-19). Harmony Mines Company also recorded a Notice of Mill Site for the Harmony Mine Mill on November 18, 1919 (B-20).

On January 8, 1920, and over the next five years, E. F. Nieman recorded Affidavits of Annual Representation for the Harmony Mines Company on the Bunker Hill Nos. 1-7, the Alfred N. Nos. 1-2, the Contention, and the Contention No. 1 lode claims (B-21, B-22, B-23, B-24, B-25). Harmony Mines Company recorded a Location Certificate for the Harmony Tunnel and Tunnel Site on June 30, 1925 (B-26). On August 16, 1927, E. F. Nieman recorded an Affidavit of Annual Representation for the Harmony Mines Company on the Bunker Hill Nos. 1-7, the Alfred N. Nos. 1-2, the Contention, and the Contention No. 1 lode claims (B-27). On October 5, 1928, the United States of America granted to the Harmony Mines Company a patent for Mineral Survey No. 3121A & B, consisting of the Bunker Hill Nos. 1, 2, 4, 5 lode claims, the Alfred N. No. 2 lode, the Contention lode, the Contention No. 1 lode, and the Harmony Mill Site, recorded on February 1, 1928 (B-28).

On November 2, 1937, T. J. Stroud, Sheriff of Lemhi County, through a Sheriff's Sale, sold all the personal property of the Harmony Mines Company for unpaid taxes for the years 1932, 1934, 1935, 1936, and 1937 (B-29). Lemhi County was the highest bidder and paid $7,288.55 for the property.

SAIC noted a gap in the chain-of-title between 1938 and 1944. On August 18, 1944, Gold Standard Mines Corporation quitclaimed Mineral Survey No. 3121A & B, consisting of the Bunker Hill Nos. 1, 2, 4, 5 lode claims, the Alfred N. No. 2 lode, the Contention lode, the Contention No. 1 lode, and the Harmony Mill Site, to Richard De Smet (B-30). No title documents were recorded in Lemhi County indicating how or when Mineral Survey No. 3121A & B was conveyed from Harmony Mines Company to Gold Standard Mines Corporation. However, as stated on page 8 above, Richard De Smet was associated with both companies, and was purchasing agent for Gold Standard Mines Corporation (A-23 at p. 903, A-25 at p. 368, A-26 at p. 134). It is possible that Richard De Smet, as purchasing agent, acquired the properties for Gold Standard Mines Corporation.

A Certificate of Sale Under Foreclosure is recorded in Lemhi County, by Robert Isley, Sheriff of Lemhi County on November 1, 1948 (B-31). The document indicates that a Final Judgement and Decree of the District Court of the Sixth Judicial District, Lemhi County, Idaho, ordered the sale of Mineral Survey No. 3121A & B. This Order stems from a lawsuit against Harmony Mines Company (then a defunct corporation) by Richard De Smet which resulted in a Sheriff's Sale of the patented Harmony mine properties to Richard De Smet for $12,372.69.

On February 24, 1950, Robert Isley, Sheriff of Lemhi County, conveyed Mineral Survey No. 3121A & B to Richard De Smet through a Sheriff's Deed (B-32).

On April 30, 1971, Richard De Smet and Emma De Smet convey an undivided one-third interest each in Mineral Survey No. 3121 A & B to Richard M. De Smet, George C. De Smet, and Mary B. Saylor (B-33).

Through the mid-seventies and the 1980s, Richard M. De Smet, George C. De Smet, and Mary B. Saylor paid taxes on Mineral Survey No. 3121 A & B (B-35, B-36, B-37).

On September 14, 1989, Richard M. De Smet, Grantor, conveyed his undivided one-third interest in Mineral Survey No. 3121 A & B to Frederic A. De Smet, Sylvia De Smet Deakin, and Stephen R. De Smet, Grantees (B-38). The Grantees each own an undivided one-ninth interest in Mineral Survey No. 3121 A & B.

On January 3, 1991, Mary B. Saylor conveyed her undivided one-third interest in Mineral Survey No. 3121 A & B to The Mary B. Saylor Loving Trust (B-119). As of October 1999, the Lemhi County Assessor's 1999 tax records indicate that the following individuals own and pay taxes on Mineral Survey No. 3121 A & B:

George C. De Smet, 33.33% interest; 43.696 acres; market value $1,092.00 (B-134).
Mary B. Saylor Loving Trust, 33.33% interest; 43.696 acres; market value $1,092.00 (B-135).
Frederic A. De Smet, 11.11% interest; 14.566 acres; market value $364.00 (B-136).
Stephen R. De Smet, 11.11% interest; 14.566 acres; market value $364.00 (B-137).
Sylvia De Smet Deakin, 11.11% interest; 14.566 acres; market value $364.00 (B-138).

3.2 Unpatented SAL Lode Claims

On September 17, 1990, Noranda Exploration, Inc., recorded Lode Location Notices for the unpatented SAL Nos. 14-32 lode claims (B-39, B-40, B-41, B-42, B-43, B-44, B-45, B-46, B-47, B-48, B-49, B-50, B-51, B-52, B-53, B-54, B-55, B-56, B-57). On March 3, 1993, the Bureau of Land Management deemed that the Noranda Exploration, Inc. lode claims were abandoned and void, because no yearly Proof of Labor documents had been filed with the Bureau of Land Management (B-123).

As of October 1999, no company(ies) or individual(s) have been identified as working these unpatented lode claims.

3.3 Unpatented H Lode Claims

On October 23, 1990, Peter W. Laczay recorded Lode Location Notices for the unpatented H Nos. 1-10, 15-20, 23, and 25 lode mining claims (B-58, B-59, B-60, B-61, B-62, B-63, B-64, B-65, B-66, B-67, B-68, B-69, B-70, B-71, B-72, B-73, B-74, B-75).

On December 24, 1990, Helena Silver Mines, Inc., recorded Lode Location Notices for the unpatented H Nos. 12-14 and H Nos. 27-51 lode mining claims (B-76, B-77, B-78, B-79, B-80, B-81, B-82, B-83, B-84, B-85, B-86, B-87, B-88, B-89, B-90, B-91, B-92, B-93, B-94, B-95, B-96, B-97, B-98, B-99, B-100, B-101, B-102, B-103). On the same day, Peter W. Laczay recorded Amended Lode Location Notices for the unpatented H Nos. 1-10, 15-17, 20, and 25 lode mining claims (B-104, B-105, B-106, B-107, B-108, B-109, B-110, B-111, B-112, B-113, B-114, B-115, B-116, B-117, B-118).

Helena Silver Mines, Inc., through its "duly authorized agent," Noranda Exploration, Inc., recorded a Notice of Intent to Hold Unpatented Mining Claims for H Nos. 12-14, and H Nos. 27-51 lode claims on September 3, 1991 (B-120). On October 7, 1991, Noranda Exploration, Inc., recorded an Affidavit of Value of Labor and Improvements on H Nos. 1-15, 17-18, 20, 23, 25, and SAL Nos. 1-66 lode claims (B-121).

On February 16, 1993, the Bureau of Land Management deemed that the Helena Silver Mines, Inc. lode claims were abandoned and void, because no yearly Proof of Labor documents had been filed with the Bureau of Land Management (B-122).

As of October 1999, no company(ies) or individual(s) have been identified as working these unpatented lode claims.

4.0 POTENTIALLY RESPONSIBLE PARTIES

Section 107(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. section 9607(a), sets out those parties which are liable for response costs, health assessment costs, and natural resource damages associated with a release or a threatened release of a hazardous substance. The Statement of Work provided to SAIC by USDA Forest Service does not request an analysis of the potential liability of parties associated with the Harmony mine site pursuant to CERCLA section 107(a); therefore, SAIC has not included such an analysis in this report. As requested, this section presents current or last known names and addresses, as well as publicly available corporate and financial information, as appropriate, for all known parties associated with the Harmony mine site. For purposes of this report, SAIC has assumed that all individuals who were associated with the site prior to 1920 are deceased. In addition, because these parties are individuals, they may not be viable PRPs. Financial information, as available, is presented only for currently active corporations and for individuals who are still living.

HARMONY MINES COMPANY

Incorporated:	In Nevada on January 22, 1916	
Qualified in Idaho:	On April 18, 1916	
Current Status (ID):	Forfeited November 30, 1936	
Current Status (NV):	Unknown; no longer on computer database	
Capital Stock:	$ 1 million	
Officers:	1920s: A.W. Nieman, President, Chicago, IL	
	Gladys Nieman, Secretary, Chicago, IL	
	Mrs. O.K. Mitchell, Secretary, Chicago, IL	
Other Principals:	1916:	P.B. Ellis, incorporator
		Joseph Smyth, incorporator
		William Muller, incorporator
	1920s:	E. F. Nieman, Manager/Agent
		Salmon, ID
Years at the Mine:	1916 - 1936	

The Idaho qualification date and current status of Harmony Mines Company was obtained by telephone from the Idaho Secretary of State's Division of Corporations. This company no longer appears on the Nevada Secretary of State's computer database. The original incorporation date, capitalization, and historic officers and other principals were obtained the *Annual Reports of the Mining Industry of Idaho* (A-5 at p. 120, A-6 at p. 134, A-7 at p. 156, A-8 at p. 153, A-9 at p. 159, A-10 at p. 176, A-18 at pp. 1-8) and from the articles of incorporation of Harmony Mines Company, obtained by SAIC from the Lemhi County Clerk and Recorder (A-18 at pp 1, 2, 8). SAIC also used these historic mining journals and the title documents to determine the years that the company was associated with the Harmony mine.

Following its incorporation in 1916, Harmony Mines Company took over operation of the Bunker Hill Nos. 1-5 claims from William Anderson (A-1 at p. 71, A-18). The company later purchased the Contention and Contention No. 1 claims from Earl Nieman in 1919 (B-14, B-15) and purchased the Bunker Hill Nos. 1, 2, and 3 claims from George Hanson the same year (B-16). Harmony Mines Company operated the Harmony mine and mill until 1936 or 1937, during its only period of extensive development (see, *e.g.*, A-1 at p. 71, A-3 at p. 100, A-2 at p. 77, A-4 at p. 7, A-16 at p. 6, A-5 at p. 126, A-15 at p. 8, A-6 at p. 134, A-8 at p. 153, A-9 at p. 159, A-10 at p. 176, A-13 at p. 1). The 1924 edition of *The Mines Handbook* lists Earl F. Nieman as general superintendent and Richard De Smet as director of Harmony Mines Company (A-23 at p. 903). Richard De Smet's individual association with the Harmony mine is discussed separately on page 23 below.

Harmony Mines Company was forfeited by the Idaho Secretary of State in 1936. The following year, the mine equipment was sold for back taxes at a Sheriff's auction. The purchaser is not noted (B-29). A 1948 lawsuit by Richard De Smet against Harmony Mines Company resulted in the sale of the Harmony mine property to Richard De Smet in 1950 for $12,000 (B-32).

GOLD STANDARD MINES CORPORATION

Incorporated:	In Arizona in 1933	
Current Status:	Inactive as of 1949	
Officers:	1937:	Charles De Mund, President R. De Smet, Vice President and General Manager
	1942:	Frank J. Liska, President Richard De Smet, Manager and Purchasing Agent N. K. Avery, Secretary-Treasurer
	1943-1944:	James P, Pearson, Vice President, Peoria, Illinois N. Kirk Avery, Secretary, Peoria, Illinois
Years at the Mine:	1943	

This information obtained from the 1937, 1942, and 1949 editions of the *Mines Register* (A-25 at p. 368, A-26 at p. 134, A-27 at p. 464) and from a September 2, 1943 deed involving Gold Standard Mines Corporation (B-30).

Gold Standard Mines Corporation owned the Harmony mine claims by 1943 (B-30), although Lemhi County records include no evidence of a conveyance of this property to the company. The 1937 *Mines Register* lists R. De Smet as vice president and general manager of Gold Standard Mines Corporation (A-25 at p. 368). By 1942, Richard De Smet is listed as manager and purchasing agent of Gold Standard Mines Corporation (A-236 at p. 134). As stated above, Richard De Smet also was associated with Harmony Mines Company (A-23 at p. 903). It is possible that Richard De Smet, as purchasing agent, acquired the properties for Gold Standard Mines Corporation following the forfeiture of Harmony in 1936.

On September 2, 1943, Gold Standard Mines Company sold the Harmony mine claims to Richard De Smet of Pasadena, California (B-30). Richard De Smet's individual association with the Harmony mine is discussed separately on page 23 below.

The 1937 and 1942 editions of the *Mines Register* indicate that Gold Standard Mines Corporation was incorporated in 1933, and list a business address of P. O. Box 151, Kingman, Arizona. These documents also list Richard De Smet as an officer or manager of Gold Standard Mines Corporation, as shown on page 17 above (A-25 at p. 368, A-26 at p. 134). The computerized database maintained by the Idaho Secretary of State's Corporations Division includes no record of an Arizona corporation known as Gold Standard Mines Corporation ever operating in Idaho. This office does list Gold Standard Mining Company, incorporated in Idaho on May 31, 1934 and forfeited on November 30, 1934. According to staff from this office, forfeiture in Idaho simply means that the company is no longer in good standing to do business in Idaho, but it may continue operating. Following a forfeiture, the company must reinstate to reactivate the original filing and

restore its good standing. The 1949 *Mines Register* lists "Gold Standard Mng. Co., Ariz." as an inactive mining company (A-27 at p. 464).

The Arizona Corporation Commission's computerized database also includes no record of a company incorporated in 1933 that was known as Gold Standard Mines Corporation. However, these records do include two revoked corporations and one currently active corporation of the same name. The first Gold Standard Mines Corporation listed in the Arizona Corporation Commission's computerized database was incorporated in Arizona on January 17, 1980 and revoked in October 1989. A second company, also called Gold Standard Mines Corporation, was incorporated in Arizona on June 30, 1992 and revoked on December 10, 1994. No further information for either of these companies is listed on the computerized database.

The Arizona Corporation Commission also lists Gold Standard Mines Corporation as an active company incorporated in Arizona on July 2, 1998 and currently in good standing. This company's business address is 554 Windsor Avenue, Kingman, AZ 86401, and its director and registered agent is Howard Sadlier, at the corporate address. No other officers or directors are listed.

Note that both the 1933 corporation known as Gold Standard Mines Corporation which was associated with Richard De Smet and the currently active Arizona corporation of the same name list a business address in Kingman, Arizona. This 1933 corporation may be related to the 1934 Idaho corporation of the same name or to one or more of the Arizona corporations also known as Gold Standard Mines Corporation. However, SAIC has found no information confirming these possible relationships.

NORANDA EXPLORATION, INC.

Incorporated:	In Delaware on August 24, 1974
Qualified in Idaho:	On November 24, 1973
Current Status:	Active and in Good Standing in Idaho. Delaware charges a $10 fee to confirm current status.
Address (DE):	Toronto, Ontario
Mailing Address (ID):	c/o R. A. Krizner 1000 Corporate Center Drive Franklin, TN 37067
Registered Agent (DE):	Corporation Trust Company 1209 Orange Street Wilmington, DE 19805
Registered Agent (ID):	CT Corporation System 300 North 6th Street Boise, ID 83701

Officers (DE):	M. J. Knuckey, President D. L. Stevens, Vice President
Officers (ID):	M. J. Knuckey, President H. J. Pinna, Secretary D. L. Stevens, Vice President J. F. Minogue, Assistant Secretary S. A. Hamilton, Treasurer
Directors (DE):	Not listed.
Directors (ID):	H. J. Pinna M. J. Knuckey D. L. Stevens
Historic Officers:	J. O. Hinds, President
Historic Principals:	Boyce Cook, agent
Years at the Mine:	1990 – 1993?

The current corporate information listed above was obtained by telephone and telefax from the Idaho Secretary of State, Corporations Division and from the Delaware Secretary of State, Department of State, Division of Corporations. The Idaho Secretary of State has no listing for Noranda, Inc. The on-line GTE SuperPages Yellow Pages service shows "Noranda, Inc." currently located at 600 Van Dreff St., Salmon, ID 83467. No listings were found for Noranda Exploration, Inc. The names of the company's historic officers and principles were obtained from title documents involving Noranda Exploration, Inc. (B-39 through B-57). SAIC also used these documents to determine the years that the company was associated with the Harmony mine.

Noranda Exploration, Inc. located the SAL group of 169 lode claims in 1990 (B-39 through B-57). As shown in Figure 2-2 on page 9 above, the SAL Nos. 14-32 lode claims fall within the present study area surrounding the patented properties of the Harmony mine.

In 1991, Noranda Exploration, Inc. submitted a plan of operations to drill a single core hold at the Harmony mine (A-15 at p. 11). An August 8, 1991 Notice of Intent to Hold Unpatented Mining Claims identifies Noranda Exploration, Inc. as "a duly authorized agent" of Helena Silver Mines, Inc., owner of the H-12 through H-14 and H-27 through H-51 claims (B-120). A September 26, 1991 Affidavit of Labor signed by an agent for Noranda Exploration, Inc. describes extensive geologic mapping and sampling activities conducted by two geologists, at the company's expense (B-121). By 1993, the SAL group of claims were declared abandoned and void by the Bureau of Land Management (B-123).

Noranda Exploration, Inc. likely is a subsidiary or predecessor of the Canadian company Noranda, Inc. Noranda, Inc. was incorporated as Noranda Mines, Inc. on May 1, 1922 (A-28 at pp. 1, 3; A-29 at p. 7). Its corporate headquarters are located at BCE Place, 181 Bay Street, Suite 4100,

P. O. Box 755, Toronto, Ontario, Canada M5J 2T3 (A-29 at pp. 1, A-30 at p. 7, A-31 at p. 1). As shown on page 18 above, the Delaware Secretary of State's Corporations Division also lists "Toronto, Ontario" as the address of Noranda Exploration, Inc. A detailed corporate history of Noranda, Inc. states that in 1964, "Mining Corporation of Canada (1964) Limited is formed by Noranda to carry on exploration programs. Five years later, the staff will be merged with Noranda Exploration Co." (A-28 at p. 7). This detailed corporate history includes no further references to Noranda Exploration Company.

However, the current corporate structure of Noranda, Inc. includes an Exploration group (A-29 at p. 2). This group has 12 regional offices, including 4 in Canada and others in Mexico, Peru, Chile, Brazil, Ireland, England, and Australia. M. J. Knuckey, listed on page 19 above as president and a director of Noranda Exploration, Inc., also is executive vice president of Exploration and Project Development for Noranda, Inc. (A-29 at p. 7). The 1998 *Moody's International Manual* also lists Micheal [*sic.*] J. Knuckey as an executive vice president of Noranda, Inc. (A-32 at p. 1866). The 1999 budget for the Exploration business unit was $50 million; $20 million of this is allocated in Canada (A-29 at p. 3). Noranda's Exploration group currently consists of 112 employees, including 62 geologists and geophysicists (A-29 at p. 4). The company as a whole has 18,000 employees in 20 countries, with a 1-year employee growth of 16.7% (A-29 at p. 8, A-31 at p. 1).

Neither the 1998 *Moody's International Manual* or the 1996 *E&MJ International Directory of Mining* list Noranda Exploration, Inc. as a subsidiary of Noranda, Inc. However, these sources do list a similarly named company, Noranda Mining & Exploration, Inc., incorporated in 1986 in Ontario, as a wholly owned subsidiary of Noranda, Inc. (A-32 at p. 1866, A-33). Michael J. Knuckey also is listed as president and CEO of Noranda Mining & Exploration, Inc. (A-33). The 1996 *E&MJ International Directory of Mining* listing for Noranda Mining & Exploration, Inc. states that "Exploration activities are conducted through Noranda Mining & Exploration, Inc. from offices in Canada, the United States and Latin America" (A-33). The Delaware Secretary of State's Division of Corporations has no listing for Noranda Mining & Exploration, Inc. and lists no name changes for the Delaware corporation known as Noranda Exploration, Inc. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Noranda Exploration, Inc. to more clearly establish the possible relationships between Noranda Exploration, Inc., Noranda, Inc., and Noranda Mining & Exploration, Inc.

According to Noranda's website, in July 1999, Noranda, Inc. was listed among the top 10 mining and metals companies, the top 10 by profits, and the top 25 by revenues in *The Financial Post 500*. The company also was listed among the top five leading exporters, the top 20 by profits, and the top 40 employers in *The Globe and Mail Report on Business Magazine*. This source does not indicate whether the point of reference is worldwide or for Canada only. Noranda, Inc. also was listed among the top 1,000 Canadian corporations, and in August 1999 was named the "#1 Canadian Mining Company" by the *Canadian Mining Journal* (A-29 at p. 1).

Noranda, Inc. is listed on the Toronto Stock Exchange, the Vancouver Stock Exchange, and The Montreal Exchange (A-29 at p. 10, A-34 at p. 5). In 1998, Noranda, Inc. listed 238,234,000

shares of common stock and 12,000,000 shares of preferred stock outstanding. The company's principal shareholder, EdperBrascan Corporation, owns approximately 40% of Noranda, Inc. common stock (A-29 at p. 10). The company's common stock showed earnings of $2.68 per share and a book value of $15.91 in 1998. (A-34 at p. 3). A Noranda, Inc. share history for 1989 through 1998 appears on page 3 of source document A-34. Noranda, Inc. has paid dividends to its shareholders during every year since 1929 (A-34 at p. 2).

As of December 1998, Noranda, Inc. had total assets of $11,175 billion, total liabilities of $6,988 billion, with total shareholders' equity of $4,187 billion (A-30 at pp. 1, 2). The company's total 1998 revenues were $6,030 billion, including $6,013 billion from sales and $17 million from dividends and other income. The company showed total earnings of $658 million for 1998, including $1 million from its continuing operations and $74 million from its discontinued operations, with a $583 million gain on the sale of its discontinued operations (A-29 at p. 8, A-30 at pp. 3, 4). Noranda's 1998 sales totaled $6 billion (A-29 at p. 7). More detailed annual financial information for Noranda, Inc. for 1998 is included in the company's 1998 annual report (A-30 at pp. 1-7). For the quarter ending September 30, 1999, Noranda, Inc. reports total revenues of $1,673 billion and total earnings of $63 million. The company's website describes this as "the highest quarterly earnings from continuing operations since the first quarter of 1996." Noranda, Inc. also reports cash generation of more than $500 million for the first 9 months of 1999, "more than double the previous year's nine month results" (A-34 at p. 3).

HELENA SILVER MINES, INC.

Incorporated:	In Montana on May 25, 1888
Incorporated as:	Helena and Livingston Smelting and Reduction Company
Name Changed to:	Helena Silver Mines, Inc. on June 19, 1970
Qualified in Idaho:	On February 16, 1971
Current Status (MT):	Active and in Good Standing
Current Status (ID):	Forfeited December 1, 1993
Mailing Address (ID):	P.O. Box 488 Coeur d'Alene, ID 83814
Registered Agent (MT):	Bart Campbell 2221 Gold Rush Avenue Helena, MT 59601
Registered Agent (ID):	Herbert Sanderson 111 North 2nd 202 Johnston Building Coeur d'Alene, ID 83814
Officers and Directors (ID):	William L. Campbell, President and Director Travis W. Campbell, Vice President and Director Fred C. Rahn, Secretary and Director
Historic Officers:	J. O. Hinds, President

Historic Principals:	Peter W. Laczay, agent
Years at the Mine:	1990 – 1993?

The current corporate information listed above was obtained by telephone from the Idaho Secretary of State, Division of Corporations, and by telephone and from corporate documents obtained from the Montana Secretary of State, Business Services Division (A-35 at pp. 1, 4; A-36 at pp. 1, 2; A-37 at pp. 1, 2). SAIC's on-line address research yielded no current Yellow Pages listings for Helena Silver Mines, Inc. However, the company's mailing address is the same as the current mailing address for Peter W. Laczay, discussed separately beginning on page 28 below. The Montana Secretary of State lists no corporate address for Helena Silver Mines, Inc. except the registered agent's address. The names of the company's historic officers and principles were obtained from title documents involving Helena Silver Mines, Inc. (B-76 through B-103). SAIC also used these documents to determine the years that the company was associated with the Harmony mine.

Helena Silver Mines, Inc. located a portion of the H group of lode claims, adjacent to the SAL claims, in 1990 (B-76 through B-103, B-115). Of these, lode claims H Nos. 1-10, 12-20, 23, 25, and 27-51 were located within the present study area (see Figure 2-4 on page 11). By 1993, the H group of lode claims were declared abandoned and void by the Bureau of Land Management (B-122). Although the company was forfeited by the Idaho Secretary of State's Corporations Division in 1993, it is still active and in good standing in Montana. These claims were located by Peter W. Laczay as agent of Helena Silver Mines, Inc. (B-76 through B-103, B-115). Mr. Laczay's involvement in the senior management of Helena Silver Mines, Inc. is discussed separately on pages 28 and 29 below. The current or former management of Helena Silver Mines, Inc. also shows some commonalities with two active Idaho corporations associated with Mr. Laczay, as discussed on pages 31 and 32 below.

The capitalization of Helena Silver Mines, Inc. has been steadily reduced throughout its existence, until recently. Helena and Livingston Smelting and Reduction Company was originally capitalized at $5 million, divided into 1 million shares at $5 each. This stock was further divided into 200,000 shares of preferred stock and 800,000 shares of common stock (A-35 at p. 2). By 1928, the company's capitalization had been reduced to $3 million (A-41 at pp. 1, 2). At a special meeting of the stockholders held on April 4, 1928, the company's capital stock was further reduced from $3 million to $600,000, and the par value was reduced from $5 per share to 10 cents per share (A-41 at pp. 1, 2). At the time of the corporate name change to Helena Silver Mines, Inc., the company's capitalization was further reduced to $250,000, divided into 5,000,000 shares at 5 cents par value. All of this stock was to be common stock; there is no reference to preferred stock (A-36 at p. 3). This capitalization also is reflected on the company's annual report filed with the Montana Secretary of State on March 2, 1971 (A-40 at p. 2). However, by 1993, Helena Silver Mines, Inc. lists a total of $10 million authorized shares of common stock at 5 cents par value, resulting in a total capitalization of $500,000 (A-42 at p. 2). The company's 1999 annual report, filed with the Montana Secretary of State on March 11, 1999, also reflects this increased capitalization (A-37 at p. 2).

Detailed financial information regarding the current financial status of Helena Silver Mines, Inc. was not available from public sources. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Helena Silver Mines, Inc. to obtain this information.

RICHARD AND EMMA L. DE SMET

Years at the Mine: 1943-1971

The 1924 edition of *The Mines Handbook* lists Richard De Smet as a director of Harmony Mines Company; the 1937 *Mines Register* also lists R. De Smet as vice president and general manager of Gold Standard Mines Corporation (A-23 at p. 903, A-25 at p. 368). By 1942, Richard De Smet was manager and purchasing agent for Gold Standard Mines Corporation (A-26 at p. 134). These companies' associations with the Harmony mine are discussed separately on pages 16 and 17 above.

On September 2, 1943, Gold Standard Mines Company sold the Harmony mine claims to Richard De Smet of Pasadena, California (B-30). Richard De Smet purchased additional Harmony mine claims in 1948 for approximately $12,000, through a Sheriff's sale following a lawsuit by Mr. De Smet against Harmony Mines Company (B-32). Richard and Emma L. De Smet owned this property until 1971, when they sold it to Richard M. De Smet, George C. De Smet, and Mary B. Saylor (B-33).

The Warranty Deed by which Richard and Emma L. De Smet conveyed the Harmony mine property indicates that Richard and Emma L. De Smet lived in Pasadena, California in 1971 (B-33). SAIC's on-line research did not confirm this address and found no California listings for Emma L. De Smet. However, the following similar listings were found:

Richard De Smet	R. A. De Smet
Palo Alto, CA 94303	Sacramento, CA 95814
(650) 462-9509	(916) 457-2274

Because SAIC was unable to identify a definitive address for Richard and Emma L. De Smet, and because they are individuals and may not be viable PRPs, SAIC did not conduct financial research on these individuals. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Frederic A. De Smet or Sylvia De Smet Deakin, whose addresses SAIC has positively identified, to obtain a current address for Richard and Emma L. De Smet.

RICHARD M. DE SMET

Years at the Mine: 1971-1989

Richard M. De Smet purchased a 1/3 interest in the Harmony mine property from Richard and Emma L. De Smet in 1971 (B-33). He retained this partial ownership interest until 1989, when he sold it to Frederic A. De Smet, Sylvia De Smet Deakin, and Stephen R. De Smet in 1989 (B-38).

The Quit Claim Deed by which the 1/3 interest in Harmony mine property was conveyed to Richard M. De Smet indicates that Richard M. De Smet lived in Sierra Madre, California in 1989 (B-38). SAIC's on-line research did not confirm this address; however, the following similar listing was found:

Richard De Smet
Palo Alto, CA 94303
(650) 462-9509

Because SAIC was unable to positively link this address to either Richard M. De Smet or Richard De Smet (listed above), and because they are individuals and may not be viable PRPs, SAIC did not conduct financial research on these parties. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Frederic A. De Smet or Sylvia De Smet Deakin, whose addresses SAIC has positively identified, to obtain a current address for Richard M. De Smet.

MARY B. SAYLOR AND THE MARY B. SAYLOR LOVING TRUST

Mary B. Saylor Loving Trust
1526 Cypress Point Drive
Medford, OR 97504
Years at the Mine: 1971-1999

The address listed above was obtained from the 1999 tax records held by the Lemhi County Treasurer's Office (B-135). These tax records listed the Mary B. Saylor Loving Trust at 2333 East, 3225 South, Salt Lake City, Utah 84109 in 1998 (B-127, B-131). Note that this Salt Lake City address is the same as the current address of Frederic A. De Smet, discussed in detail beginning on page 26 below.

Mary B. Saylor purchased a 1/3 interest in the Harmony mine property from Richard and Emma L. De Smet in 1971 (B-33). Twenty years later, in 1991, Mary B. Saylor conveyed this interest to the Mary B. Saylor Loving Trust (B-119). Lemhi County records indicate that the trust still owns and is paying taxes on the Contention; Contention No. 1; Bunker Hill Nos. 1, 2, 4, and 5; and Alfred N. No. 2 claims and the Harmony millsite. The trust currently owns a 33.33% interest in this property. The current market value of the Trust's interest in this property is $1,092.00 (B-135).

The Quit Claim Deed by which Mary B. Saylor conveyed her 1/3 interest in the Harmony mine property to the Trust indicates that Mary B. Saylor lived at 333 Mountain View Dr. No. 163, Talent, Oregon 97540 in 1991 (B-119). SAIC's on-line address research found M. B. Saylor in Phoenix, Oregon 97535, phone (541) 535-2145. Phoenix, Oregon is just 2.2 miles and a 2-minute drive from Talent, Oregon. Based on the close proximity of these addresses, SAIC ran a CDB Infotek Discovery search on M. B. Saylor in Oregon. The CDB Infotek Discovery search yielded no listings for an M. Saylor in Oregon, but did identify a Mary Saylor (now deceased) in Kentucky [CDB Infotek, M. Saylor, at p. 13]. Because SAIC could not identify a definitive address for Mary B. Saylor, and because she is an individual and may not be a viable PRP, SAIC conducted no further financial research on this individual. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Frederic A. De Smet or Sylvia De Smet Deakin, whose addresses SAIC has positively identified, to obtain a current address for Mary B. Saylor.

In addition, SAIC has been unable to confirm the current address listed above for the Mary B. Saylor Loving Trust through its on-line address research. SAIC recommends that the USDA Forest Service send CERCLA section 104(e) requests to the trust address in Medford, Oregon, as shown on 1999 Lemhi County tax records, and also to Frederic A. De Smet, another current property owner, who resides at the address listed for the Trust in 1998.

GEORGE C. DE SMET

2333 East 3225 South
Salt Lake City, UT 84109
(801) 485-9245
Years at the Mine: 1971-1999

The address listed above was obtained from the 1999 tax records held by the Lemhi County Treasurer's office (B-134). CDB Infotek Discovery research identifies this address as that of Frederic A. De Smet, discussed in detail below [CDB Infotek, Frederic A. De Smet, at pp. 29, 30]. Title documents also indicate that George C. De Smet lived in Pasadena, CA in 1971 (B-33). A CDB Infotek Discovery search for George C. De Smet in Utah yielded no listings, and no links could be found to CDB Infotek listings for other states [CDB Infotek, George C. De Smet, at pp. 16-28].

George C. De Smet purchased a 1/3 interest in the Harmony mine property from Richard and Emma L. De Smet in 1971 (B-33). Lemhi County Treasurer's records indicate that George C. De Smet still owns and is paying taxes on the Contention, Contention No. 1, Bunker Hill Nos. 1, 2, 4, and 5; and Alfred N. No. 2 claims and the Harmony millsite. George C. De Smet currently owns a 33.33% interest in this property. The current market value of George C. De Smet's interest is $1,092.00 (B-134).

Because SAIC has been unable to confirm that George C. De Smet still resides at the address listed above, and because he is an individual and may not be a viable PRP, SAIC conducted no

further financial research on this individual. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Frederic A. De Smet or Sylvia De Smet Deakin, whose addresses SAIC has positively identified, to obtain a current address for George C. De Smet.

FREDERIC A. DE SMET

2333 East 3225 South
Salt Lake City, UT 84109
(801) 485-9245
Years at the Mine: 1989-1999

The address listed above was obtained from the 1999 tax records held by the Lemhi County Treasurer's Office (B-136) and was confirmed by a Discovery search on Frederic A. De Smet using the on-line research service CDB Infotek [CDB Infotek, Frederic A. De Smet, at pp. 29-33 and pp. 21-24] and by the on-line Infospace White Pages research service.

Frederic A. De Smet, along with Sylvia De Smet Deakin and Stephen R. De Smet, purchased a 1/3 interest in the Harmony mine property from Richard M. De Smet in 1989 (B-38). Lemhi County Treasurer's records indicate that he still owns and is paying taxes on the Contention; Contention No. 1; Bunker Hill Nos. 1, 2, 4, and 5; and Alfred N. No. 2 claims and the Harmony millsite. Frederic A. De Smet currently owns an 11.11% interest in this property. The current market value of Frederic A. De Smet's interest is $364.00 (B-136).

Frederic A. De Smet (SSN 570-62-8119) was born on March 31, 1944 and currently resides at the address listed above [CDB Infotek, Frederic A. De Smet, at pp. 29, 30]. Residential demographic information for this address lists the median income as $34,167, and the median home value as $79,700 [CDB Infotek, Frederic A. De Smet, at p. 32]. The Discovery search confirms that Frederic A. and Madaline De Smet own the property associated with the residence address listed above, identified as Parcel No. 1627403024000 in Salt Lake County, Utah. The assessed value of this property is $208,200; Assessor's information reported by CDB Infotek indicates that there is a conventional loan on this property, but does not indicate the amount of the loan [CDB Infotek, Frederic A. De Smet, at pp. 21-24]. The Discovery search identified no UCC filings and no corporate associations for Frederic A. De Smet, either in Utah or nationwide [CDB Infotek, Frederic A. De Smet, at pp. 3, 4, 25, 26, 33].

SYLVIA DE SMET DEAKIN

2631 Chadwick
Salt Lake City, UT 84109
(801) 487-9611
Years at the Mine: 1989-1999

The address listed above was obtained from the 1999 tax records held by the Lemhi County Treasurer's office (B-138) and was confirmed by a Discovery search on Sylvia De Smet Deakin

using the on-line research service CDB Infotek [CDB Infotek, Sylvia De Smet Deakin, at pp. 34-43 and pp. 17-20]. SAIC's on-line address research identified this address as that of John N. Deakin, at the listed telephone number. John N. Deakin likely is the husband of Sylvia De Smet Deakin.

Sylvia De Smet Deakin, along with Frederic A. De Smet and Stephen R. De Smet, purchased a 1/3 interest in the Harmony mine property from Richard M. De Smet in 1989 (B-38). Lemhi County Treasurer's records indicate that she still owns and is paying taxes on the Contention; Contention No. 1; Bunker Hill Nos. 1, 2, 4, and 5; and Alfred N. No. 2 claims and the Harmony millsite. Sylvia De Smet Deakin currently owns an 11.11% interest in this property. The current market value of Sylvia De Smet Deakin's interest is $364.00 (B-138).

Sylvia De Smet Deakin (SSN 573-70-5`07) was born on April 17, 1947 and currently resides at the address listed above. [CDB Infotek, Sylvia De Smet Deakin, at pp. 34-37 and 39-40]. Residential demographic information for this address lists the median income as $31,573, and the median home value as $73,300 [CDB Infotek, Sylvia De Smet Deakin, at pp. 37, 42]. The Discovery search confirms that Sylvia D. and John N. Deakin own the property associated with the residence address listed above, identified as Parcel No. 16213540070000 in Salt Lake County, Utah. The assessed value of this property is $144,000; Assessor's information reported by CDB Infotek indicates that there is a conventional loan on this property, but does not indicate the amount of the loan [CDB Infotek, Sylvia D. Deakin, at pp. 17-20]. The Discovery search identified no UCC filings and no corporate associations for Sylvia D. Deakin, either in Utah or nationwide [CDB Infotek, Sylvia D. Deakin, at pp. 5, 6, 10, 27, 28, 32].

STEPHEN R. DE SMET

2715 E. Grand View Drive
Sandy, UT 84029
Years at the Mine: 1989-1999

The address listed above was obtained from the 1999 tax records held by the Lemhi County Treasurer's Office (B-137). Title documents also show Stephen R. De Smet at 7104 Chris Lane, Salt Lake City, Utah in 1989 (B-38).

Stephen R. De Smet, along with Frederic A. De Smet and Sylvia De Smet Deakin, purchased a 1/3 interest in the Harmony mine property from Richard M. De Smet in 1989 (B-38). Lemhi County Treasurer's records indicate that he still owns and is paying taxes on the Contention; Contention No. 1; Bunker Hill Nos. 1, 2, 4, and 5; and Alfred N. No. 2 claims and the Harmony millsite. Stephen R. De Smet currently owns an 11.11% interest in this property. The current market value of Stephen R. De Smet's interest is $364.00 (B-137).

Stephen R. De Smet, a/k/a Stephen Richard or Richard Stephen (SSN 556-74-6940) was born in either 1950 or September 1949; CDB Infotek Discovery search results do not include a specific

date [CDB Infotek, Stephen R. De Smet, at pp. 44-46]. These results also list Mr. De Smet's employer as Vennco, Inc. [CDB Infotek, Stephen R. De Smet, at p. 46]. SAIC found no current Yellow Pages listings for Vennco, Inc. in Utah, California, or Idaho. The Discovery search still lists Stephen R. De Smet at the 1989 address listed above, and also lists an address of 70 East Highland Avenue, Sierra Madre, CA 91024, as of September 1994 [CDB Infotek, Stephen R. De Smet, at p. 46]. Note that Richard M. De Smet also lived in Sierra Madre, CA in 1989 (B-38).

CDB Infotek property ownership research confirms that Stephen R. De Smet owns the property located at 2715 E. Grand View Drive, Sandy, Utah 84029. This property is known as Parcel No. 28111010080000, in Salt Lake County, Utah; its assessed value is listed as $174,000. There is a single family residence located on this property. The most recent information for this property indicates the refinancing of a grant/trust deed in the amount of $15,000 on June 16, 1995, followed by a second refinancing of a grant/trust deed for $41,000 on August 25, 1997 [CDB Infotek, Stephen R. De Smet, at pp. 12-16]. However, the owners' mailing address associated with the CDB Infotek property ownership information lists Stephen R. and Karen De Smet at 2707 Grandview Drive in Sandy, Utah [CDB Infotek, Stephen R. De Smet, at pp. 44 and 12-16]. SAIC has been unable to confirm either Sandy, Utah address through its on-line address research.

PETER W. LACZAY

Peter Laczay
1228 East McFarland Ave.
Coeur d'Alene, ID 83814-4864
(208) 765-0509
(208) 769-7103

Mailing Address: P. O. Box 488
Coeur d'Alene, ID 83816
Years at the Mine: 1990-?

The current street address and telephone numbers listed above for Peter Laczay were obtained from the Infospace on-line White Pages service. The mailing address was obtained from a Discovery search on Peter Laczay using the on-line research service CDB Infotek [CDB Infotek, Peter Laczay, at pp. 24, 25].

Peter W. Laczay, individually and as agent for Helena Silver Mines, Inc., located the H series of lode claims, adjacent to the SAL claims, in 1990 (B-58 through B-118). Of these, H Lode Nos. 1-20 except H No. 11, plus H No. 23, H No. 25, and H Nos. 27-51 were located within the present study area (see Figures 2-3 and 2-4 on pages 10 and 11 above). By 1993, the H group of lode claims was declared abandoned and void by the Bureau of Land Management (B-122).

In addition to his role as agent, Peter W. Laczay was part of the senior management of Helena Silver Mines, Inc. and its predecessor, Helena and Livingston Smelting and Reduction Company, for a number of years. Beginning with the company's 1969 and 1970 annual reports, filed on

November 17, 1969 and March 5, 1970, respectively, Peter W. Laczay is listed as vice president and a director of Helena and Livingston Smelting and Reduction Company (A-38 at p. 1, A-39 at p. 1). Just one month later, the Articles of Amendment which changed the corporate name to Helena Silver Mines, Inc. are signed by Peter W. Laczay as the company's president (A-36 at p. 2). Peter W. Laczay also is listed as president of Helena Silver Mines, Inc. on the company's 1971 annual report and on a document dated September 12, 1983 which changes the company's registered agent (A-40 at p. 1, A-43). The 1993 annual report of Helena Silver Mines, Inc. reflects a change in the company's president from Peter W. Laczay to William L. Campbell, and a change in directors from Peter W. Laczay to William C. Campbell (A-42 at pp. 1, 2). Peter W. Laczay is not listed among the new management reflected on this document, nor among the company's current management, as listed on its 1999 annual report (A-42 at pp. 1, 2; A-37 at pp. 1, 2). However, his current mailing address still matches the company's mailing address (see pages 21 and 28 above). Mr. Laczay's current role in Helena Silver Mines, Inc. is not known. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Mr. Laczay to obtain this information.

Peter William Laczay (SSN 516-56-9903) was born on June 24, 1934, and resides at the address listed above [CDB Infotek, Peter Laczay, pp. 24-26]. A CDB Infotek Discovery search yields no bankruptcies, liens, or judgments against Peter Laczay [CDB Infotek, Peter Laczay, at p. 26].

The Kootenai County Assessor confirms that Peter Laczay owns the property associated with his address in Coeur d'Alene, ID. Kootenai County Assessor's records identify this property as Parcel No. B-0405-002-002-0; the land is valued at $18,009, and the house on this property is valued at $71,521, for a total value of $89,530. The Kootenai County Assessor's office lists the mailing address for Peter Laczay as P. O. Box 787, Coeur d'Alene, ID 83816. A CDB Infotek Discovery search also lists this address for Peter Laczay as of March 1996 [CDB Infotek, Peter Laczay, at p. 25]. A second P. O. Box address listed in the Discovery search results for Peter Laczay is P. O. Box 488, Coeur d'Alene, ID 83816, as of March 1996. The CDB Infotek search also identifies this as the most current address, as listed above [CDB Infotek, Peter Laczay, at p. 25].

The CDB Infotek Discovery search also lists Peter W. Laczay, at the Idaho street address listed above, as the owner of Parcel No. 20941215 and Parcel No. 2094 1216 in Yuma County, AZ [CDB Infotek, Peter Laczay, at p. 27]. The Yuma County Assessor's office confirms that Peter Laczay, at the Idaho street address, owns both parcels, which currently are vacant lots. Assessor's records list the total assessed cash value of each lot as $900. An on-line White Pages search for Peter Laczay in Arizona yields no listings.

The CDB Infotek Discovery search lists Peter Laczay's employer as "Silver Mine" [CDB Infotek, Peter Laczay, at p. 26]. In addition to his former association with Helena Silver Mines, Inc., as described above, the Idaho Secretary of State's Corporations Division confirms that Peter W. Laczay is associated with 19 active Idaho corporations, listed below in chronological order by incorporation date [CDB Infotek, Peter Laczay, at pp. 28-39]:

- Signal Silver-Gold, Inc., incorporated June 16, 1906; Peter W. Laczay, director and registered agent.

- Big Sky Silver, Inc., incorporated June 6, 1907; Peter W. Laczay, director and registered agent.

- Lookout Mountain Mining and Milling Company, incorporated June 2, 1916; Peter W. Laczay, director and registered agent.

- Silver Bowl, Inc., incorporated July 18, 1930; Peter W. Laczay, director and registered agent.

- United Mines, Inc., incorporated October 16, 1947; Peter W. Laczay, director and registered agent.

- New Era Mines, Inc., incorporated October 29, 1951; Peter W. Laczay, director and registered agent.

- Resource Engineering, Inc., incorporated March 29, 1954; Peter W. Laczay, director and registered agent.

- Phillida Mines, Inc., incorporated March 25, 1966; Peter W. Laczay, director and registered agent.

- Western Continental, Inc., incorporated September 11, 1967; Peter W. Laczay, registered agent.

- Summit Silver, Inc., incorporated December 26, 1968; Peter W. Laczay, director and registered agent.

- Epic Silver, Inc., incorporated February 10, 1969; Peter W. Laczay, director and registered agent.

- American Health Providers Corp., incorporated August 20, 1969 as Idora Silver Mines, Inc., name changed to American Health Providers Corp. on November 23, 1998; Peter W. Laczay, registered agent.

- Gold Cache, Inc., incorporated February 2, 1995; Peter W. Laczay, former registered agent.

- Central Silver Corporation, incorporated January 9, 1997; Peter W. Laczay, secretary, director, and registered agent.

- Ashington Mining Corporation, incorporated November 24, 1997; Peter W. Laczay, secretary, director, and registered agent.

- Pannonia Investments, L.L.C., formed June 8, 1998 as Demott-Laczay Investments, L.L.C., name changed to Pannonia Investments, L.L.C. on June 7, 1999; Peter W. Laczay, manager.

- Kimberly Gold Mines, Inc., incorporated April 12, 1999; Peter W. Laczay, incorporator and registered agent.

- Travel Planners, Inc., incorporated May 17, 1999; Peter W. Laczay, incorporator and registered agent.

- Idaho Land and Resources, Inc., incorporated June 9, 1999, Peter W. Laczay, incorporator and registered agent.

Through telephone conversations with the Idaho Secretary of State's Corporations Division, SAIC determined that many of these corporations share the same officers and directors. For example, William C. Harrison is president and director, M. J. Bashore is secretary and director, and Peter W. Laczay is director and registered agent of nine of these corporations. Five other individuals, John Ryan, Raymond Demott, Joan Grovin, Howard Crosby, and William Guy, are associated with more than one corporation. Similarly, many share the same corporate address. Four of these companies list Peter Laczay's home address on McFarland Avenue as the corporate address [CDB Infotek, Peter Laczay, at pp. 35-37]; three other companies list one of the two P. O. Box addresses associated with Peter Laczay as the corporate address [CDB Infotek, Peter Laczay, at pp. 34, 38]. Finally, nine corporations list one of two addresses in Spokane, Washington as the corporate address [CDB Infotek, Peter Laczay, at pp.28-33]. These two addresses, West 421 Riverside No. 502 and 502 Paulsen Building, both in Spokane, Washington 99201, likely refer to the same location.

SAIC's on-line Yellow Pages research on these companies yielded extremely limited information. A search in Idaho by company name yielded no listings. Only one exact company name was found in Washington: Western Continental, Inc., at 905 North Pines Road, Spokane, WA 99206, phone (509) 922-3035. No current Yellow Pages listings were found in either state for the other corporations.

The current or former management of Helena Silver Mines, Inc. shows commonalities with the current management of two of the Idaho corporations associated with Peter Laczay, American Health Providers Corp. and Western Continental, Inc. The 1993 annual report for Helena Silver Mines, Inc., which changes the company president from Peter W. Laczay to William L. Campbell, also appoints Fred C. Rahn as the company's secretary/treasurer and director (A-42 at pp. 1, 2). Mr. Rahn also is listed as secretary and a director of Helena Silver Mines, Inc. on the company's 1999 annual report, although the treasurer position is vacant (A-37 at pp. 1, 2). On the 1993 annual report for Helena Silver Mines, Inc., Loren Denbrook of Tacoma, WA is listed as the

previous vice president and director, and the 1999 annual report for Helena Silver Mines, Inc. lists Travis W. Campbell as the company's vice president and a director (A-37 at pp. 1, 2). The Idaho Secretary of State's Corporations Division confirms that Loren Denbrook currently is a director of American Health Providers Corp. In addition, the current management of Western Continental, Inc. includes W. L. Campbell, president, Travis Campbell, vice president, and Fred C. Rahn, secretary. As shown on page 21 above, these three individuals currently hold the same positions with Helena Silver Mines, Inc.

The specific financial interests of Peter Laczay in Helena Silver Mines, Inc. and the Idaho corporations listed above are not documented in corporate documents for Helena Silver Mines, Inc. or in the CDB Infotek Discovery search. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Mr. Laczay to obtain personal or corporate tax returns or other financial statements that should contain this information.

5.0 RECOMMENDATIONS

The following avenues of research may yield additional operational, title, or corporate information related to the Harmony mine site:

1. Noranda Exploration, Inc. likely is a subsidiary or predecessor of the Canadian mining company Noranda, Inc. It also may be related to the similarly named Noranda, Inc. subsidiary, Noranda Mining & Exploration, Inc. However, SAIC has found no documentation of these possible relationships. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Noranda Exploration, Inc. to more clearly establish these possible relationships.

2. Detailed financial information regarding the current financial status of Helena Silver Mines, Inc. was not available from public sources. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Helena Silver Mines, Inc. to obtain this information.

3. Although Peter W. Laczay no longer appears in the management of Helena Silver Mines, Inc., the company's current mailing address still matches Mr. Laczay's current P. O. Box address. In addition, the specific financial interests of Peter W. Laczay in Helena Silver Mines, Inc. and the Idaho corporations associated with him are not documented in corporate documents for Helena Silver Mines, Inc. or the results of the CDB Infotek Discovery search conducted by SAIC. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Mr. Laczay to clarify Mr. Laczay's current involvement with Helena Silver Mines, Inc. and to obtain personal or corporate tax returns or other financial statements that should document his financial interests in Helena Silver Mines, Inc. and the 19 Idaho corporations associated with him.

4. SAIC was unable to identify definitive addresses for Richard and Emma L. De Smet, Richard M. De Smet, and George C. De Smet. In addition, because these parties are individuals and may not be viable PRPs, SAIC conducted no financial research on these individuals. SAIC

recommends that the USDA Forest Service send a CERCLA section 104(e) request to Frederic A. De Smet or Sylvia De Smet Deakin, whose addresses SAIC has positively identified, to obtain a current address for these individuals.

5. SAIC also was unable to confirm a definitive address for Mary B. Saylor or the Mary B. Saylor Loving Trust. In addition, because Mary B. Saylor is an individual and may not be a viable PRP, SAIC conducted no financial research on this individual. SAIC recommends that the USDA Forest Service send a CERCLA section 104(e) request to Frederic A. De Smet or Sylvia De Smet Deakin, whose addresses SAIC has positively identified, to obtain a current address for Mary B. Saylor. SAIC also recommends that the USDA Forest Service send CERCLA section 104(e) requests to the trust address in Medford, Oregon, as shown on the 1999 Lemhi County tax records, and also to Frederic A. De Smet, another current property owner, who resides at the address listed for the trust in 1998.