KET #12

Bassett Gulch Mill Site
Ketchum, Idaho
Site Inspection Report

Contract: 53-84N8-6-007

February 2000

(Final)

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BASSETT GULCH MILL SITE
DRAFT SITE INSPECTION REPORT

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LIST OF ACRONYMS

Acronym	Definition
%R	percent recovery
bgs	belowground surface
cfs	cubic feet per second
DQOS	Data Quality Objectives
DL	Detection Limits
E & E	Ecology & Environment, Inc.
EPA	Environmental Protection Agency
GPS	global positioning system
IDW	investigation-derived waste
J	Estimated concentration
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
ppb	parts per billion
QA/QC	Quality assurance/quality control
RPD	relative percent difference
SQAP	Sampling Quality Assurance Plan
SQL	Sample quantitation limit
TAL	Target Analyte List
U	Not detected at sample quantitation limit

1. INTRODUCTION

The United States Department of Agriculture Forest Service (FS) has tasked Ecology and Environment, Inc., (E & E) to conduct a Site Inspection (SI) at the Bassett Gulch Mill site located near Ketchum, Idaho. E & E completed the SI activities under Contract 53-84N8-6-007. The specific goals for this SI were intended to address the following objectives:

- Provide FS with adequate information to determine whether the site is potentially eligible for placement on the National Priorities List by collecting sufficient information to develop a Hazard Ranking System score for the site;
- Define the nature of contamination, identify contaminant sources and characteristics, and notify FS of any immediate threats to public health or the environment; and
- Collect data to determine potential hazardous substance removal options at the site.

Completion of this SI included reviewing 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 protocols (Section 3), quality assurance/quality control (QA/QC) criteria (Section 4), analytical results reporting and background sampling (Section 5), potential sources (Section 6), migration/exposure pathways and targets (Section 7), removal considerations (Section 8), a summary and conclusions (Section 9), and references (Section 10).

2. SITE BACKGROUND

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

2.1 SITE LOCATION

Site Name:	Bassett Gulch Mill
CERCLA ID No.:	ID0001766815
Location:	Warm Springs Road Ketchum, Idaho
Latitude:	43° 39' 42" North
Longitude:	114° 26' 57" West
Legal Description:	Southeast Quarter of Section 20, Township 17 North, Range 4 East
Property Owner:	USDA Forest Service Sawtooth National Forest Contact: Pat Trainor (208) 634-0820
Mill Owner/Operator:	Quail Land Development/Rothschild Mining Company Contact: Jeff Connely, caretaker, (208) 754-5878

The Bassett Gulch Mill is located approximately 4 miles west of Ketchum, Idaho on public lands in the Sawtooth National Forest (USGS 1967; Figure 2-1). The site is located in a rural area, with several adjacent residences to the north and northeast. Other nearby land uses include campgrounds and small mines. The Sun Valley ski resort is located approximately 3 miles east of the site (USGS 1967).

2.2 SITE DESCRIPTION

The Bassett Gulch Mill is former barite and precious metals processing facility. The primary features at the site include three tailings ponds, termed the upper, middle, and lower ponds; a metal-sided

mill building; a caretakers house; a well serving the mill building (plant well); and a dirt access road from Warm Springs Road. In addition to these features, a pile of tailings exists in a riparian area north of the tailings ponds. These tailings were reportedly excavated from the tailings ponds to create additional storage capacity in the ponds, and subsequently deposited in their present location (Figure 2-2). Access to the site is controlled with a locked gate (SAIC 1998).

The mill area is situated at the mouth of the narrow Bassett Gulch valley, adjacent to the floodplain of Warm Springs Creek. The tailings ponds and mill building are on land that slopes gently toward the Warm Springs valley. An area of wetlands and dense vegetation exists between the tailings ponds and Warm Springs Creek (USGS 1967; E & E 1999a).

2.3 SITE OWNERSHIP HISTORY

The Bassett Gulch Mill was originally constructed in the early 1950s by the Sun Valley Lead and Silver Mines Company. Ownership of the mill changed frequently over the ensuing years in response to shifting ore types and availability, and the economic viability of the holding companies (FS 1997). The most recent operator to process ore at the mill was Rothschild Mining Corporation (RMC). In 1996, RMC transferred ownership of the mill to Quail Land Development Company (QLD). QLD reportedly has not processed any ore at the site, but employs an on-site caretaker to conduct periodic maintenance and security functions at the site (FS 1997; E & E 1999a).

2.4 SITE OPERATIONS AND SOURCE CHARACTERISTICS

The Bassett Gulch Mill was originally developed to process lead and silver ore. The mill processed these ores until 1979, when the site operator converted the mill to process barite ore. The barite ore was used primarily asa component in high density drilling needs. Due to the soft market for barite in 1982, the mill was converted to a 300-ton-per-day precious metals plant (FS 1997). The mill reportedly also processed lead-silver and gold-silver ores during the early 1980s (FS 1997). In 1983, the mill was converted to a floatation plant for processing precious metals ore. The last reported full-scale milling activities at the site were conducted in 1987. Since that time, the mill has been inactive except for occasional assay testing in the mill laboratory and test runs of the mill equipment for maintenance purposes (FS 1997; E & E 1999a).

According to available historical operations information, the milling process was modified several times, however, details regarding the specific types of milling equipment and/or the use of hazardous substances in the milling processes are lacking. During the SI fieldwork, a schematic of the

mill process was observed inside the mill building. The schematic, shows a floatation process, and indicates several process steps involving the introduction of "reagent". The type or constituents of the reagent are not specified. The field team also observed a material safety data sheet in the mill building for a substance with the trade name "CIANO-A". The components of this material are not listed, but the sheet does indicate CIANO-A contains hydrochloric acid, and the trade name suggests that this material contains cyanide (E & E 1999a). Cyanide commonly is used in gold and silver ore milling and concentrations operations.

2.5 PREVIOUS INVESTIGATIONS

In 1994, the Idaho Geological Survey (IGS), in cooperation with FS, conducted a site discovery investigation of the mill site as part of IGS's Abandonded and Inactive Mines Program. Results of the investigation are documented in a May 1994 IGS report. The report documented the presence, size, and condition of the tailings ponds, the mill buildings and related debris including approximately twelve 55-gallon drums of oil, and ore samples. No sampling was conducted during this investigation. The report recommended the site receive a medium to high priority ranking for further work and/or reclamation (IGS 1994).

In 1995, an engineering firm performed a hazardous materials survey of the mill site, presumably on behalf of the owner, RMC. The engineering firm reportedly found no environmental concerns at the site (FS 1997).

In 1996, FS collected a series of samples from the tailings ponds. In January of 1996, FS collected two samples from the tailings at a depth of 2 feet below ground surface (bgs), and a background soil sample. The samples were submitted for analyses of arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver using the Toxicity Characteristic Leaching Procedure (TCLP). The sample results indicated the tailings contain lead concentrations above the regulatory threshold for a characteristic hazardous waste. In October of 1996, FS collected three additional samples from the tailings ponds and from a background location, and submitted the samples for total metals analyses. The results from these samples indicated the concentrations of seven metals in the tailings are significantly higher than the background soil sample concentrations. The results of both FS sampling events are summarized in Table 2-1 (FS 1999).

In December, 1997, Science Applications International Corporation (SAIC) conducted a site characterization at the Bassett Gulch Mill on behalf of FS. SAIC installed four monitoring wells within and around the tailings ponds. Three of the four monitoring wells were dry at the time of their

installation, and never have contained water. SAIC did not collect any soil samples from the monitoring well borings, or a groundwater sample from the one well containing groundwater. SAIC's recommendations report concluded that installation of additional monitoring wells and sampling of springs in the site area should be conducted to assess the magnitude of potential contamination at the site (SAIC 1998).

2.6 SUMMARY OF SI INVESTIGATION LOCATIONS

Based on a review of historical and background information, areas and features within the site were identified for investigation as potential hazardous substance sources during the SI. 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:

- **Tailings Ponds.** Based on the samples collected by FS in 1996, the tailings ponds contain relatively high concentrations of heavy metals with respect to background concentrations, especially arsenic and lead.
- **Tailings in Riparian Area.** The tailings that were dumped in the riparian area likely contain similar hazardous substance concentrations as the tailings in the ponds, and likely represent a similar source of heavy metals.
- **Mill Building.** Mills are typically contain hazardous substance contamination, including heavy metals and cyanide from ore concentration operations, and organic compounds from solvents or petroleum products used in the milling operation.

Potential Receptors:

- **Warm Springs Creek.** Surface runoff from the site area flows into Warm Springs Creek, approximately 0.25 mile north of the tailings ponds. Warm Springs Creek may be impacted by contaminant migration via surface runoff or springs, which may discharge contaminated groundwater to the creek.
- **Groundwater.** Groundwater underlying the site and the alluvial floodplain north of the tailings ponds may be impacted by downward infiltration of heavy metals-contaminated water from the tailings ponds or mill building.

Table 2-1

SUMMARY OF JANUARY AND OCTOBER 1996 TAILINGS SAMPLES ANALYTICAL RESULTS

BASSETT GULCH MILL

KETCHUM, IDAHO

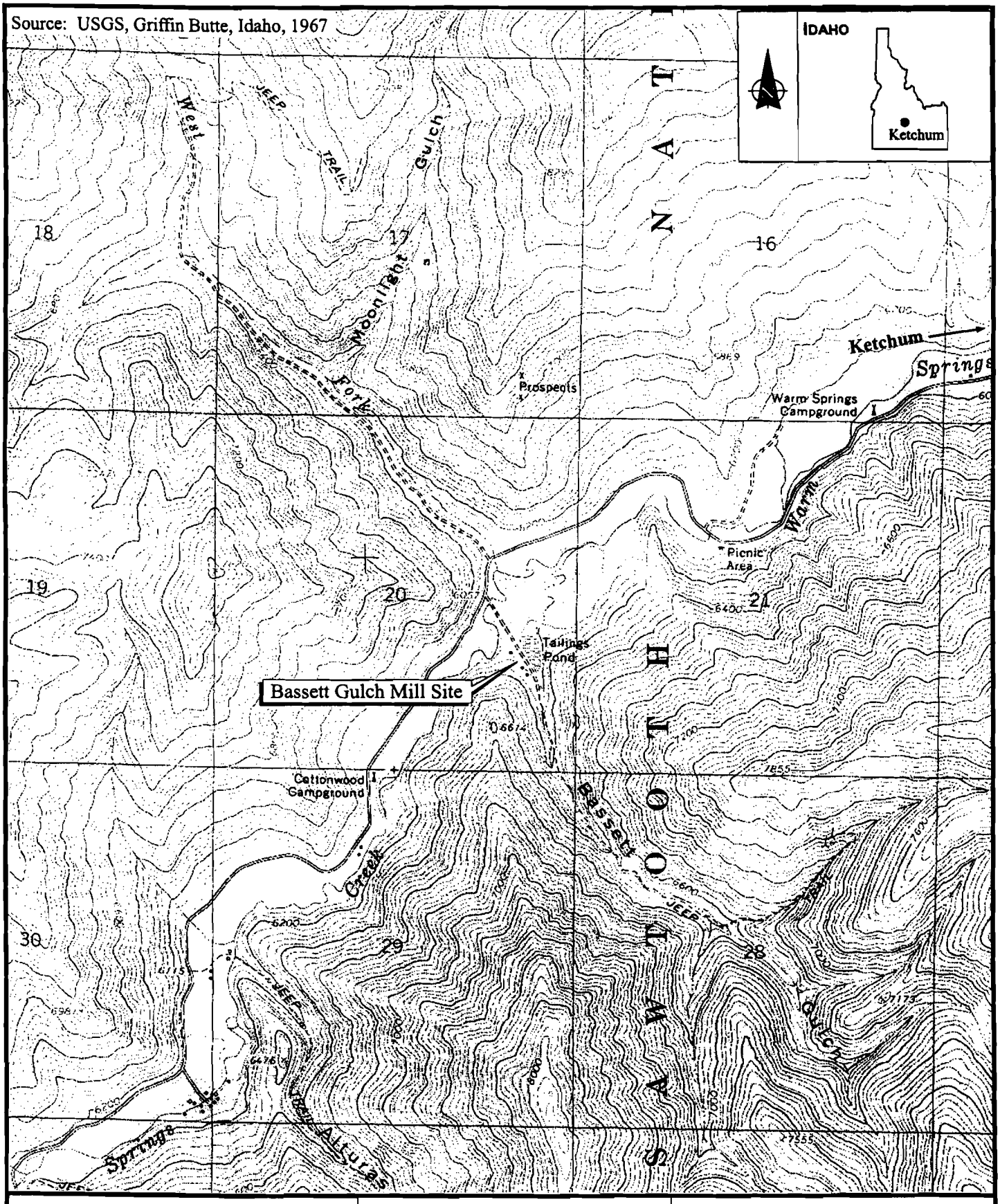
Analyte	Background Sample JG-R-1 (TCLP)	Tailings Sample JG-R-2 (TCLP)	Tailings Sample JG-R-3 (TCLP)	Background Sample BG-S-1 (Total Metals)	Tailings Sample BG-S-2 (Total Metals)	Tailings Sample BG-S-3 (Total Metals)	Tailings Sample BG-S-4 (Total Metals)
Date	January 1996	January 1996	January 1996	October 1996	October 1996	October 1996	October 1996
Arsenic	**0.05 mg/L**	<0.04 mg/L	<0.04 mg/L	**4.56 mg/kg**	**533 mg/kg**	**2,260 mg/kg**	**96.6 mg/kg**
Barium	**0.33 mg/L**	**0.026 mg/L**	**0.044 mg/L**	**300 mg/kg**	<0.50 mg/kg	**49.2 mg/kg**	**35.9 mg/kg**
Cadmium	**0.979 mg/L**	**0.806 mg/L**	**0.0196 mg/L**	**0.326 mg/kg**	**7.69 mg/kg**	**14.8 mg/kg**	**5.96 mg/kg**
Chromium	**0.04 mg/L**	**0.006 mg/L**	**0.009 mg/L**	**5.78 mg/kg**	**8.46 mg/kg**	**20.4 mg/kg**	**7.15 mg/kg**
Lead	**14.2 mg/L**	**19.3 mg/L**	<0.04 mg/L	**24.2 mg/kg**	**649 mg/kg**	**1,570 mg/kg**	**285 mg/kg**
Mercury	<0.0002 mg/L	<0.0002 mg/L	<0.0002 mg/L	<0.0005 mg/kg	**0.719 mg/kg**	**0.438 mg/kg**	**0.332 mg/kg**
Selenium	<0.04 mg/L	<0.04 mg/L	<0.04 mg/L	**9.36 mg/kg**	**3.77 mg/kg**	**61.9 mg/kg**	**2.45 mg/kg**
Silver	<0.003 mg/L	<0.003 mg/L	**0.008 mg/L**	**0.303 mg/kg**	**3.77 mg/kg**	**6.83 mg/kg**	**2.25 mg/kg**

Source: FS 1999

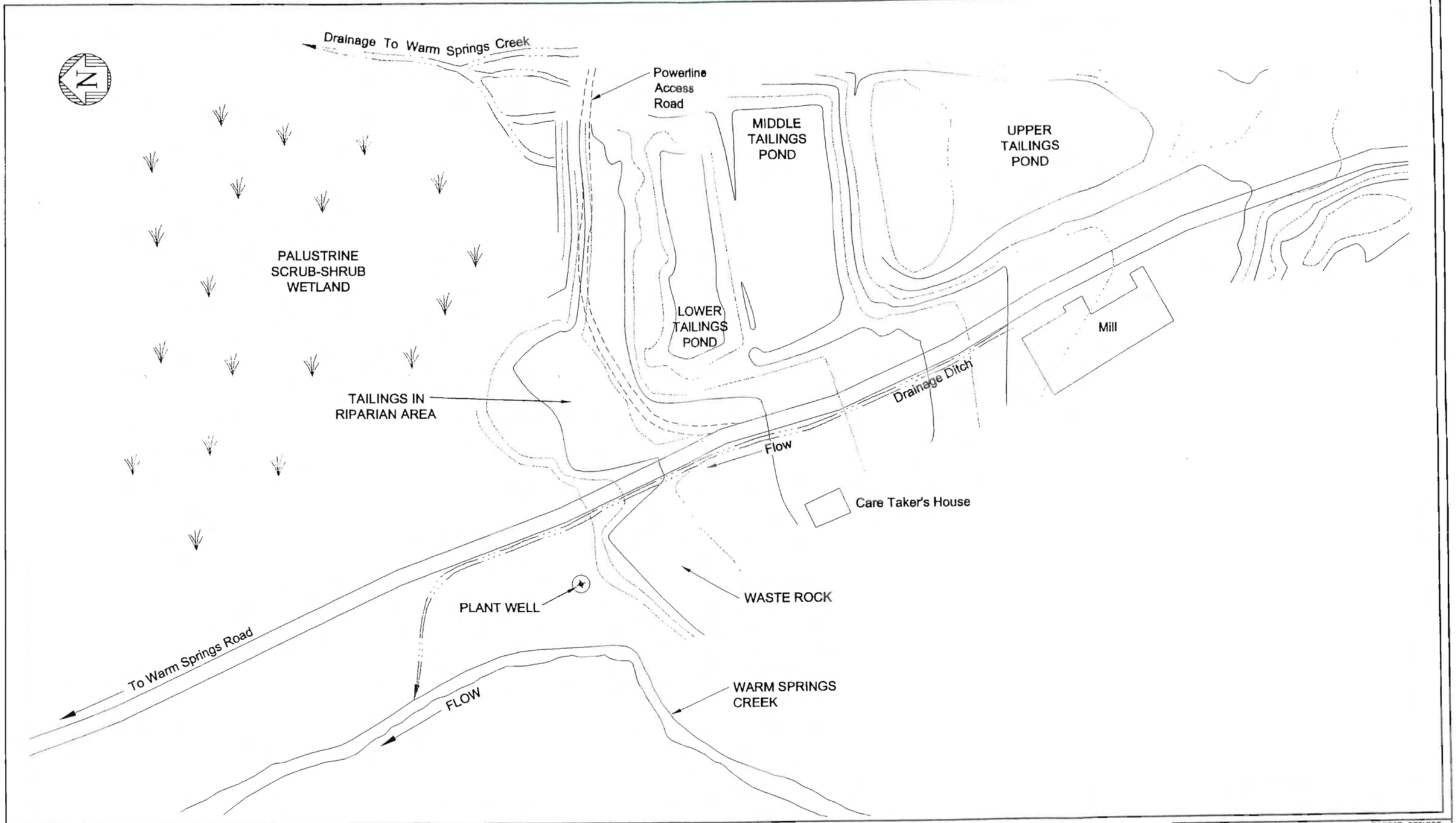
Underlined results represent TCLP concentrations above the RCRA threshold for a characteristic hazardous waste, and total metals concentrations greater than 3-times the background total metals concentration.
Bold type indicates positively detected concentrations.

Key:

mg/kg = Milligrams per kilogram.
mg/L = Milligrams per liter.
RCRA = Resource Conservation and Recovery Act.
TCLP = Toxicity Characteristic Leaching Procedure.



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	BASSETT GULCH MILL SITE INSPECTION Ketchum, Idaho	Figure 2-1 SITE LOCATION MAP			
	0 .25 .5 Approximate Scale in Miles	Drawn: AES	DATE: 12/9/99	JOB NO. 000625VU07000100	Dwg.No. VU07 2-1



SCALE IN FEET
0 100 200 300

U.S. DEPT. OF AGRICULTURE — FOREST SERVICE

FIGURE 2-2
SITE MAP
BASSETT GULCH MILL SITE INSPECTION

SAWTOOTH NATIONAL FOREST — KETCHUM, IDAHO

SCALE	DATE	C.A.D. FILE NO.	FIGURE NO.
1"=100'	12-10-99	VU07F02_2B.DWG	2-2

SEA PLOTTED: 12-10-99 BEM

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International Specialists in the Environment
Seattle, Washington

3. FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

A Sampling and Quality Assurance Plan (SQAP; E & E 1999b) was developed by E & E before field sampling. The SQAP was based upon a review of background information and conversations with FS staff. The SQAP describes the sampling strategy, sampling methodology, and analytical program to investigate potential hazardous substance sources and potential targets. With few exceptions, the SI field activities were conducted in accordance with the approved SQAP. Deviations from the SQAP were approved by the FS OSC and are described when applicable in the sampling location discussions in Sections 6 (potential sources) and 7 (target areas).

The SI field sampling event was conducted between October 18 and 21, 1999. Twenty one samples, including background and field quality control (QC) samples, were collected from on-site and off-site locations. In addition, two monitoring wells were installed during the SI. Sample types and the methods of collection are described below. A list of all samples collected for laboratory analysis under the SI is contained in Table 3-1. Photographic documentation of SI field activities is contained in Appendix A.

Alphanumeric identification numbers applied by E & E to each sample location (e.g., 99BGMTP01SS) are the sample location identifiers used in the report. Sample locations are provided in Figures 3-1 and 3-2.

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

3.1 SAMPLING METHODOLOGY

Grass, leaves, and other vegetative material; rocks; and other debris unsuitable for analysis were removed from samples before the samples were placed into sample containers. Following collection, all samples were stored on ice in coolers continuously maintained under the custody of E & E personnel. Media specific sampling procedures used during the SI are discussed in the section below.

3.1.1 Soil and Mill Sump Sediment Samples

Five soil samples, including a background soil sample, and a sump sediment sample at the mill building were collected from a depth of 0 to 6 inches. Collected material for inorganic elements and cyanide analyses was placed into pre-cleaned, dedicated stainless steel bowls, thoroughly homogenized, and transferred to pre-labeled sample containers. Material collected for BTEX analyses was placed directly into sample containers without the homogenization step described above.

3.1.2 Sediment Samples

Three sediment samples, including one background sample, were collected from Warm Springs Creek (Figure 3-2), and one sediment sample was collected from a spring near the lower tailings pond (Figure 3-1). The sediment samples were collected from 0 to 2 inches bgs. Collected material for inorganic elements and cyanide analyses was placed into pre-cleaned, dedicated stainless steel bowls, thoroughly homogenized, and transferred to pre-labeled containers. Sediment samples collected from Warm Springs Creek were collected at the most downstream locations first moving upstream to avoid disturbing or changing the characteristics of the other sediment sample locations.

3.1.3 Surface Water Samples

Three surface water samples, including one background sample, were collected from Warm Springs Creek (Figure 3-2) and spring water sample was collected from a spring near the lower tailings pond (Figure 3-1). The surface water samples were collected by hand dipping the sample containers directly into the water to a maximum depth of 12 inches, taking care not to disturb the substrate. The samples were preserved immediately following collection. The surface water samples were collected at the most downstream locations first, and prior to the collection of associated collocated sediment samples.

3.1.4 Monitoring Well Groundwater Samples

Two monitoring well groundwater samples were collected from existing monitoring well MW-4 and a monitoring well installed for the SI, MW-5. The monitoring well groundwater samples were collected after purging each well of 3 static casing volumes of water and after field parameters of pH, conductivity, and temperature had stabilized. The groundwater samples were obtained using a dedicated teflon bailer, which was used to transfer groundwater to pre-labeled sample containers. The samples

were preserved immediately following collection. Purging and sample collection information for these groundwater samples are contained in Appendix B.

3.1.5 Domestic Well and Plant Well Groundwater Samples

Three private domestic well samples and a groundwater sample from the on-site plant well were collected (Figure 3-1). The samples were collected following a minimum purging time of 20 minutes, and after field parameters of pH, conductivity, and temperature had stabilized. The samples were collected directly into pre-labeled sample containers from a spigot or outlet as close to the well head as possible. The samples were preserved immediately following collection. Purging and sample collection information for these groundwater samples are contained in Appendix B.

3.2 ANALYTICAL PROTOCOL

Samples collected during the SI were analyzed for TAL inorganic elements (EPA Method 6000/7000 series) and cyanide (EPA Method 9012). Selected samples were also analyzed for TCLP-metals (EPA Method 1311/6000/7000 series), and benzene, toluene, ethylbenzene, and xylenes (BTEX; EPA Method 8021). All analyses were conducted by Sound Analytical Services, Inc., located in Tacoma, Washington.

3.3 MONITORING WELL INSTALLATION

Two monitoring wells were installed at the site during the SI (Figure 3-1). MW-5 was installed north of the lower tailings pond, immediately above the marshy riparian area surrounding Warm Springs Creek. MW-6 was installed south of the upper tailings pond, approximately 50 feet from pre-existing monitoring well MW-1. MW-6 was dry at the time of installation. Figures 3-3 and 3-4 illustrate the well construction details for MW-5 and MW-6, respectively.

3.4 GLOBAL POSITIONING SYSTEM AND LAND SURVEY

Trimble Pathfinder Professional GPS survey units and Corvalis data loggers were used by E & E personnel to determine the horizontal location coordinates of the SI sample locations, and other on-site features. Sample GPS coordinates were not plotted onto figures for this SI Report because a digitized base map of appropriate scale was not available. GPS coordinates by sample point are listed in Appendix C.

E & E personnel conducted a level survey of the newly installed monitoring wells MW-5 and MW-6. Elevations of the new monitoring wells were determined using the nearby pre-existing monitoring wells as local elevation control.

3.5 INVESTIGATION-DERIVED WASTE

IDW generated during the SI sampling effort consisted of soil cuttings from monitoring well installations, well purge and development water, and disposable sampling and personal protective equipment (i.e. sampling gloves). The soil cuttings and well purge/development water were placed in 55-gallon drums which were emptied into the lower tailings pond at the conclusion of the field work. The disposable sampling and personal protective equipment was disposed of as nonhazardous solid waste in a dumpster at the FS Ketchum Ranger District warehouse. No containerized IDW remains at the site.

Table 3-1

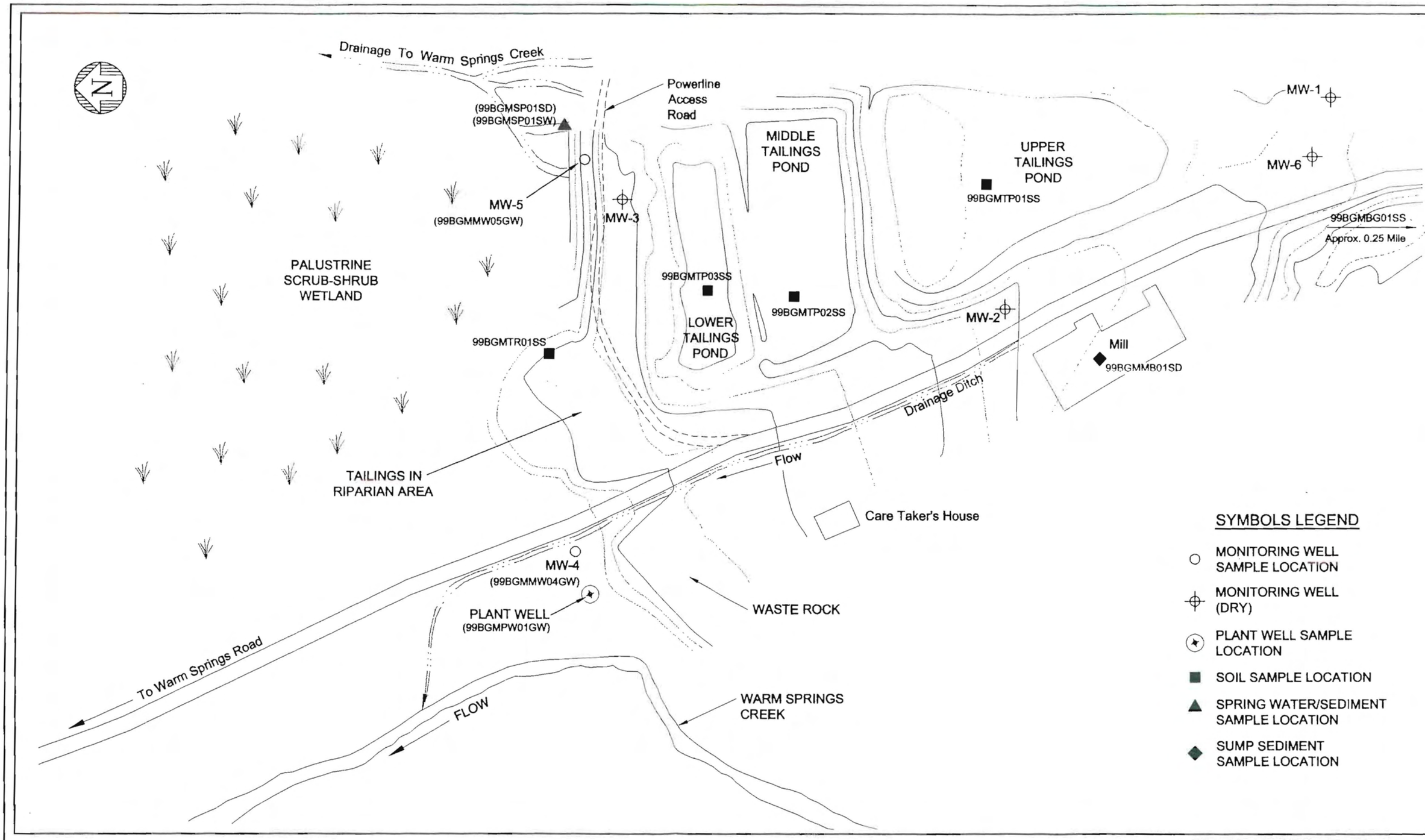
SAMPLE COLLECTION AND ANALYTICAL SUMMARY
BASSETT GULCH MILL SITE
KETCHUM, IDAHO

Sample Identification	Matrix	Depth (Inches bgs)	Date	Time	TAL Inorganic Elements	Cyanide	TCLP-Metals	BTEX	Location Description	Sample Description
Soil/Sediment Samples										
99BGMTP01SS	Soil	0-6	10/19/99	1643	X	X	X		Upper Tailings Pond	Beige, powdery/chalky
99BGMTP02SS	Soil	0-6	10/19/99	1710	X	X	X		Middle Tailings Pond	Beige, powdery/chalky
99BGMTP03SS	Soil	0-6	10/19/99	1725	X	X	X		Lower Tailings Pond	Fine, chalky soil material
99BGMTR01SS	Soil	0-6	10/19/99	1755	X	X			Tailings in Riparian Area	Fine, chalky soil material
99BGMMB01SD	Sediment	0-6	10/20/99	853	X	X		X	Mill Building Sump Under Flotation Tank	Dark beige, high moisture content sediment
99BGMBG01SS	Soil	0-6	10/20/99	950	X	X		X	Background Soil	Sandy soil with some organic matter
99BGMWC01SD	Sediment	0-2	10/19/99	1121	X	X			Warm Springs Creek: 275' Downstream of PPE	Sandy sediment
99BGMWC02SD	Sediment	0-2	10/19/99	1415	X	X			Warm Springs Creek: At PPE	Sandy sediment with some organic matter
99BGMWC03SD	Sediment	0-2	10/19/99	1600	X	X			Warm Springs Creek: Upstream of PPE	Sandy silty sediment
99BGMSP01SD	Sediment	0-2	10/20/99	1330	X	X			Spring Below Lower Tailings Pond	Sandy silty sediment
Water/Groundwater Samples										
99BGMWC01SW	Surface Water	NA	10/19/99	1121	X	X			Warm Springs Creek: 275' Downstream of PPE	Clear, no odor
99BGMWC02SW	Surface Water	NA	10/19/99	1415	X	X			Warm Springs Creek: At PPE	Clear, no odor
99BGMWC03SW	Surface Water	NA	10/19/99	1600	X	X			Warm Springs Creek: Upstream of PPE (MS/MSD requested)	Clear, no odor
99BGMSP01SW	Spring Water	NA	10/20/99	1330	X	X		X	Spring Below Lower Tailings Pond	Clear, no odor
99BGMPW01GW	Groundwater	NA	10/20/99	1745	X	X		X	On-site Production Well	Clear, no odor
99BGMMW04GW	Groundwater	NA	10/20/99	1105	X	X		X	On-site Monitoring Well MW-4	Turbid, no odor
99BGMMW05GW	Groundwater	NA	10/20/99	1254	X	X		X	On-site Monitoring Well MW-5	Turbid, no odor
99BGMDW01GW	Groundwater	NA	10/19/99	1145	X	X			Domestic Well at 574 Warm Springs Road	Clear, no odor
99BGMDW02GW	Groundwater	NA	10/19/99	1500	X	X			Domestic Well at 592 Warm Springs Road	Clear, no odor
99BGMDW03GW	Groundwater	NA	10/20/99	1515	X	X			Domestic Well at 590 Warm Springs Road	Clear, no odor
Field QC Samples										
99BGMTB01GW	Water	NA	10/20/99	1425				X	Trip Blank	Deionized water

Key:

bgs: Below Ground Surface
BTEX: Benzene, Toluene, Ethylbenzene, Xylenes
MS/MSD: Matrix Spike/Matrix Spike Duplicate
NA: Not Applicable
PPE: Probable Point of Entry
TAL: Environmental Protection Agency Target Analyte List
TCLP: Toxicity Characteristic Leaching Procedure

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SYMBOLS LEGEND

- MONITORING WELL SAMPLE LOCATION
- MONITORING WELL (DRY)
- PLANT WELL SAMPLE LOCATION
- SOIL SAMPLE LOCATION
- SPRING WATER/SEDIMENT SAMPLE LOCATION
- SUMP SEDIMENT SAMPLE LOCATION

SCALE IN FEET
0 100 200 300

SEA PLOTTED: 12-10-99 BEM

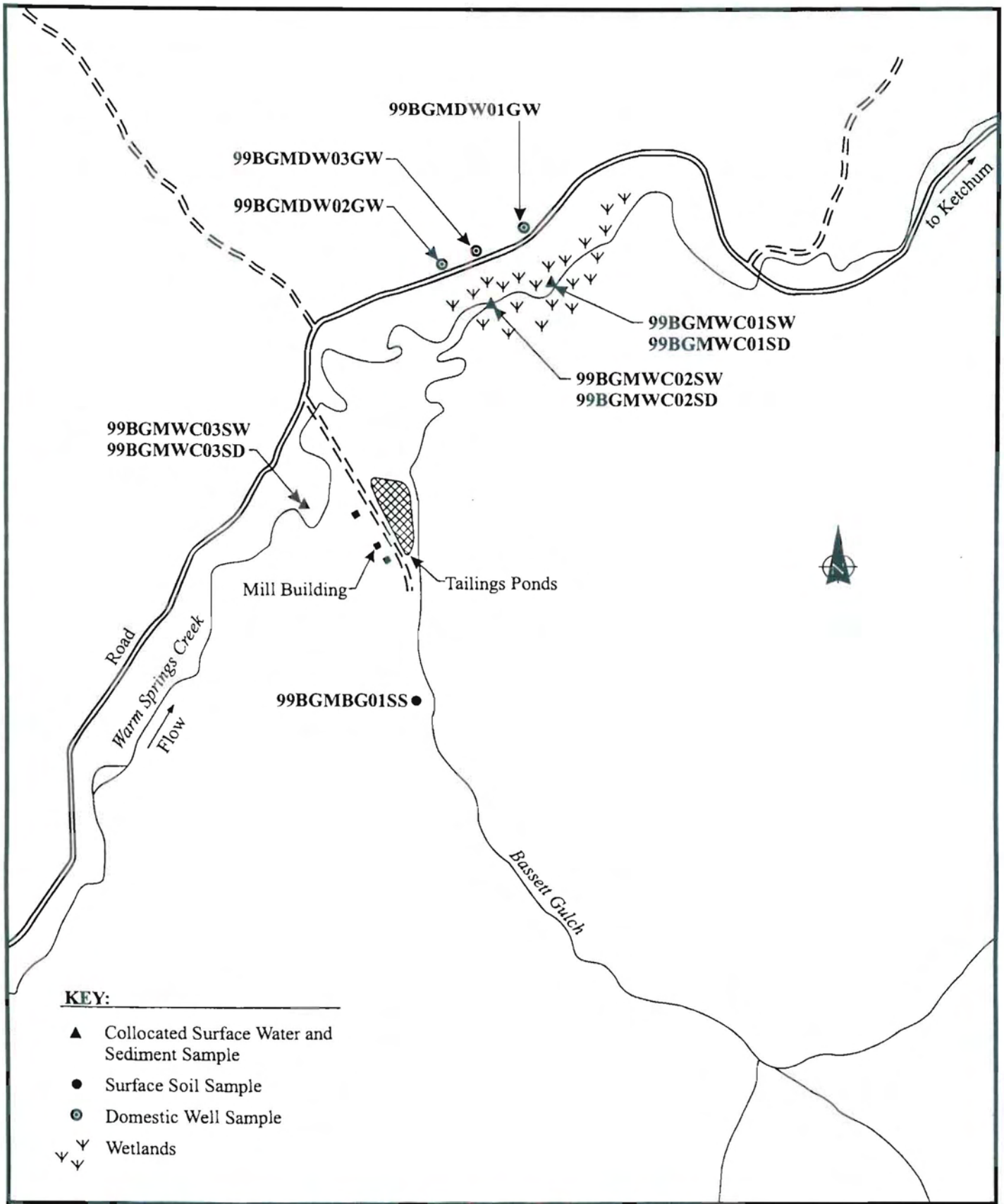
ecology and environment, inc.
International Specialists in the Environment
Seattle, Washington

U.S. DEPT. OF AGRICULTURE FOREST SERVICE

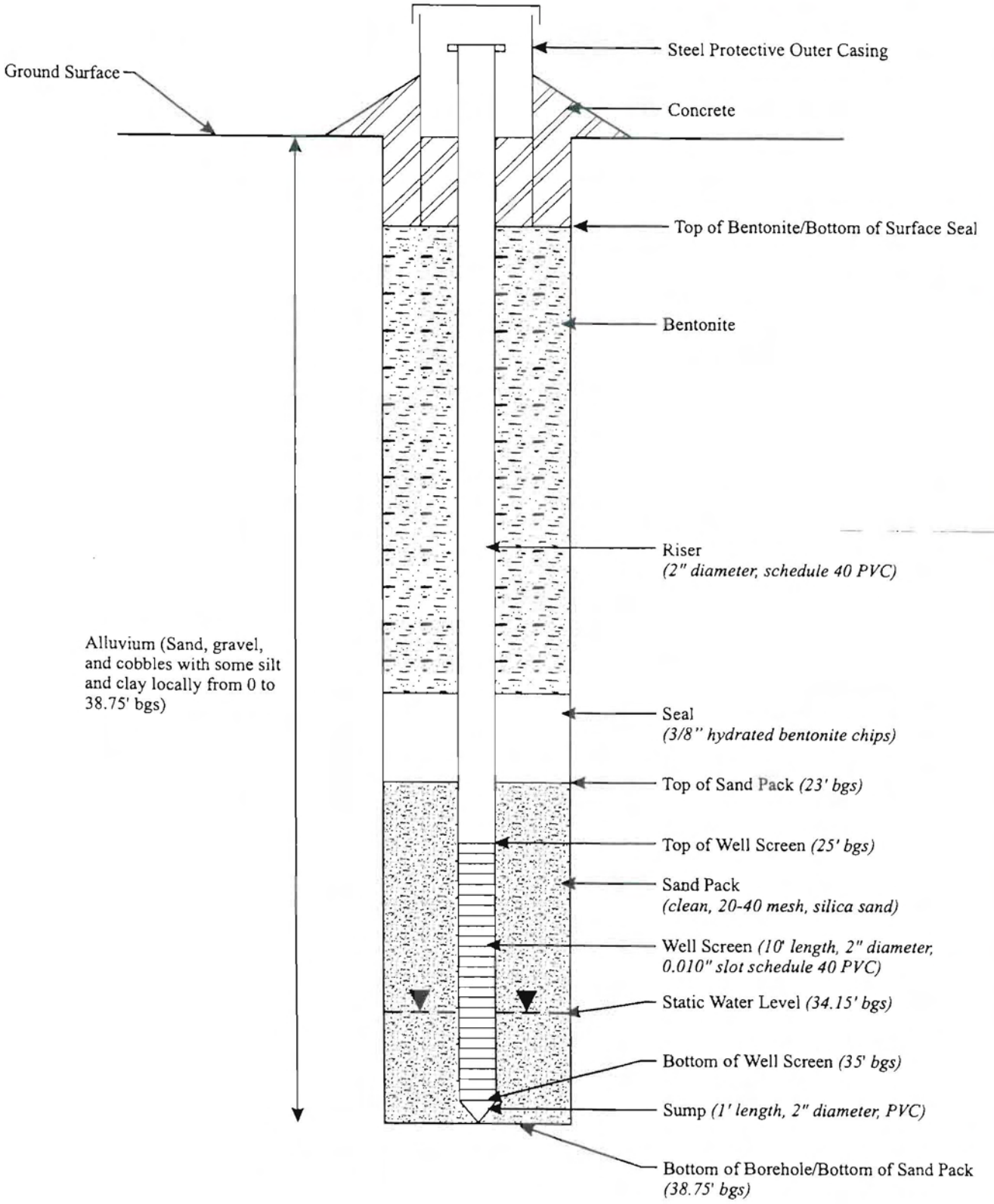
FIGURE 3-1
ON-SITE SAMPLE LOCATION MAP
BASSETT GULCH MILL SITE INSPECTION

SAWTOOTH NATIONAL FOREST KETCHUM, IDA

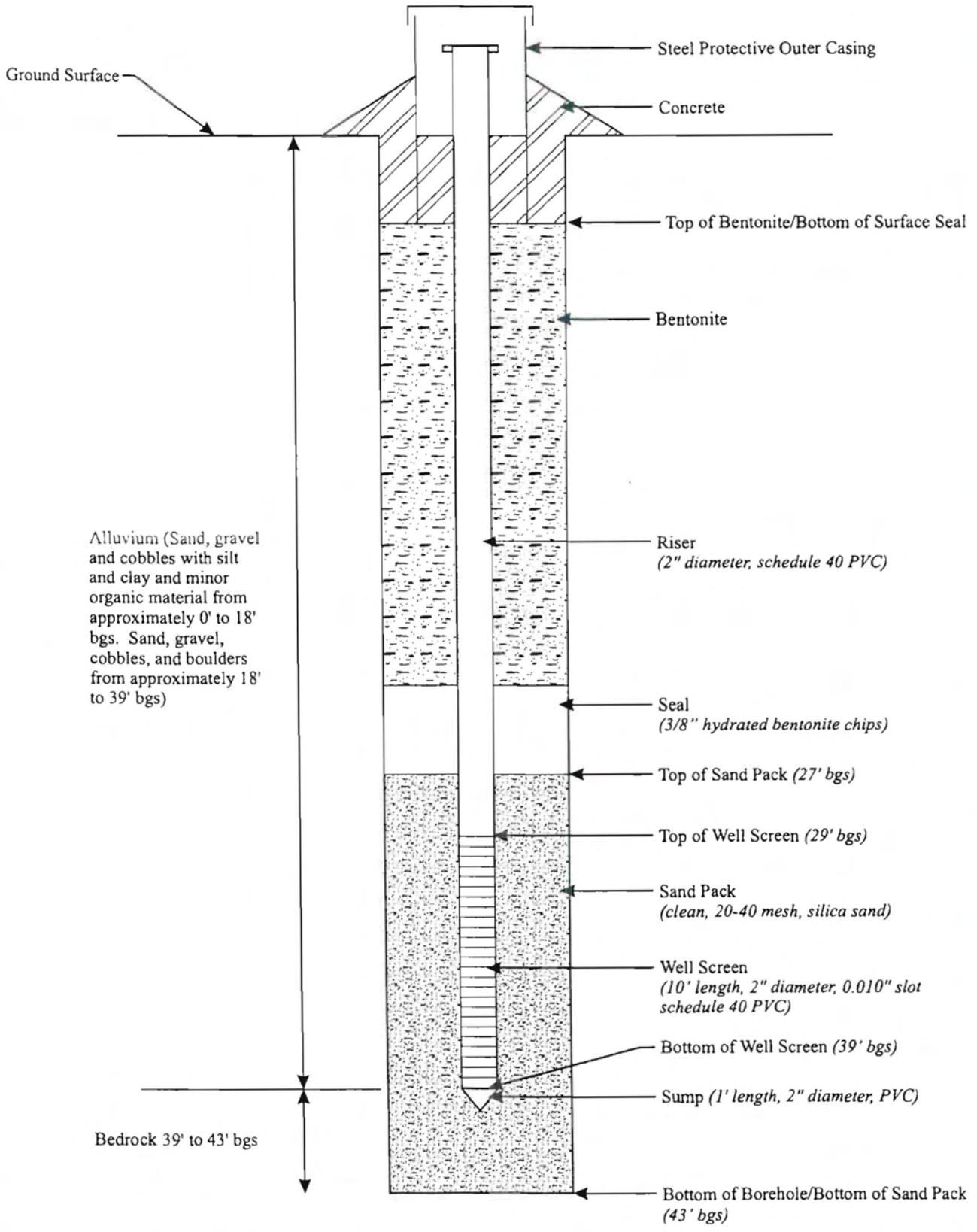
SCALE	DATE	C.A.D. FILE NO.	FIGURE NO.
1"=100'	12-10-99	VU07F03_1B.DWG	3-1



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	BASSETT GULCH MILL SITE INSPECTION Ketchum, Idaho	Figure 3-2 OFF-SITE SAMPLE LOCATION MAP			
	0 500 1000 Approximate Scale in Feet	Drawn: AES	DATE: 12/9/99	JOB NO. 000625VU07000100	Dwg.No. VU07 3-2



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	BASSETT GULCH MILL SITE INSPECTION Ketchum, Idaho	Figure 3-3 WELL LOG MONITORING WELL MW-5			
	NOTE: Vertical Scale - None	Drawn: AES	DATE: 12/14/99	JOB NO. 000625VU07000100	Dwg.No. VU07 3-3



ecology and environment, inc. International Specialists in the Environment Seattle, Washington	BASSETT GULCH MILL SITE INSPECTION Ketchum, Idaho	Figure 3-4 WELL LOG MONITORING WELL MW-6			
	NOTE: Vertical Scale - None	Drawn: AES	DATE: 11/4/99	JOB NO. 000625VU07000100	Dwg.No. VU07 3-4

4. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences with and/or contamination of sampling equipment, glassware, and reagents. Specific QC requirements for laboratory analyses are incorporated in the EPA *Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 1991a) and in EPA *Contract Laboratory Program Statement of Work for Organic Analyses* (EPA 1991b). These QC requirements or equivalent requirements were followed for analytical work in the Bassett Gulch Mill SI. This section describes the QA/QC measures and provides an evaluation of the usability of data presented in this report.

All samples were collected following the guidance of the SQAP (E & E 1999b) for the field activities. All analyses were performed by Sound Analytical Services following EPA Methods contained in SW-846, Test Methods for Evaluating Solid Wastes (EPA 1996a).

All data from analyses performed at the laboratory were reviewed and validated by E & E chemists. Data qualifiers were applied as necessary according to the following guidance documents:

- *EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 1994a; when applicable);
- *EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (EPA 1994b; when applicable); and
- *EPA Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures* (EPA 1990).

In the absence of other QC guidance, laboratory- and/or method-specific QC limits also were utilized to apply qualifiers to the data. Copies of the data QA memoranda are included in Appendix D.

4.1 SATISFACTION OF DATA QUALITY OBJECTIVES

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

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

The data quality achieved during the fieldwork produced sufficient data that met the data objectives stated in the SQAP (E & E 1999b). A discussion of the objectives that were accomplished is presented in the following sections.

4.2 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

QA samples included a single trip blank. QC samples included matrix spike/matrix spike duplicate (MS/MSD) samples at a rate of one MS/MSD per 20 samples per matrix.

4.3 PROJECT-SPECIFIC DATA QUALITY OBJECTIVES

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

4.3.1 Precision

Precision measures the reproducibility of the sampling and analytical methodology. Laboratory and field precision 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 samples. None of the sample results were qualified based on duplicate RPD QC outliers. Overall, the project DQO of 90% for precision was met.

4.3.2 Accuracy

Accuracy measures the reproducibility of the sampling and analytical methodology. Laboratory accuracy is defined as the MS/MSD percent recovery (%R) for all analyses and surrogate recovery for organic analyses. The MS %R values were reviewed for all MS/MSD analyses. Approximately 3.7% of the data were qualified as estimated (J or UJ) based on MS/MSD recoveries. No data were qualified based on surrogate recoveries. Overall, the project DQO of 90% for accuracy was met.

4.3.3 Completeness

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

4.3.4 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices. None of the samples planned in the SQAP were eliminated from the sampling program. The DQO of 90% for representativeness was met.

4.3.5 Comparability

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

4.4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PARAMETERS

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

4.4.1 Holding Times

All sample analyses met EPA, Region 10, and method-specific holding time criteria.

4.4.2 Laboratory Blanks

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

Metals:	Antimony, barium, calcium, chromium, copper, lead, magnesium, nickel, potassium, silver, sodium, and thallium.

Associated sample results less than five times the value of positive blank results (10 times for common laboratory contaminants) were qualified as not detected (U). Associated sample results less than five times the negative blank results were qualified as estimated quantities (J or UJ). Sixty two sample results were qualified based on laboratory blank contamination.

4.4.3 Trip Blank

The trip blanks met the frequency criteria of one per cooler of samples containing sample fractions for BTEX analyses. No contaminants were detected in the trip blank.

5. ANALYTICAL RESULTS REPORTING AND BACKGROUND SAMPLES

This section describes reporting and methods applied to the 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 or elevated concentrations are those that are:

- Equal to or greater than the background sample's 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 compounds, but only those detected analytes at potential sources or in targets meeting the significant or elevated concentration criteria are discussed in the report text. All detected concentrations for background samples are discussed.

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 1996b) before it was determined 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.

5.1.1 Sample Results Reporting

When four or more analytes are detected or are significant or elevated for an analytical suite (e.g., TAL inorganic elements) in Sections 6 and 7, the number of such analytes and the concentration ranges are provided. When three or fewer analytes are detected or are significant or elevated for an analytical suite, the specific analyte and its concentration are provided. Analytical results summary tables in each section list the specific detected compounds and concentrations. Common earth crust elements (aluminum, calcium, iron, magnesium, potassium, and sodium) are not evaluated in analytical summary tables or discussed in the report text.

5.2 BACKGROUND SAMPLES

Background samples were collected for each of the naturally occurring media from which SI samples were collected. Those media include soil, sediment, surface water, and groundwater. Results for the appropriate background samples are shown in the first column in the analytical results summary tables in Sections 6 and 7 for comparison to source and target results.

5.2.1 Background Soil

5.2.1.1 Sample Location

One background soil sample (99BGMBG01SS) was collected for the SI. The sample was collected from a location approximately 0.25 mile south of the site, near the old road leading up Bassett Gulch. The sample was collected up-slope of the road in a location with no obvious signs of previous disturbance or impacts from mining operations (Figure 3-2).

5.2.1.2 Sample Results

Fourteen inorganic elements and cyanide were detected in the background soil sample. The detected concentrations ranged from 0.28 mg/kg AC (adjusted concentration) for silver, to 750 mg/kg for manganese.

5.2.2 Background Surface Water/Sediment

5.2.2.1 Sample Location

A collocated surface water and sediment sample set (99BGMWC03SW and 99BGMWC03SD) was collected from Warm Springs Creek to characterize background surface water and sediment concentrations. The collocated sample set location was situated approximately 0.25 miles upstream of

the access road to the site (Figure 3-2). The creek substrate and water flow conditions at the background sample station were similar to the downstream sample locations.

5.2.2.2 Sample Results

Cyanide was not detected in the background surface water sample. Five inorganic elements were detected in the sample. Concentrations ranged from 0.001 mg/L AC for lead to 0.02 mg/L for zinc.

Cyanide was not detected in the background sediment sample. Twelve inorganic elements were detected in the sample. Concentrations ranged from 0.40 mg/kg AC for silver to 225 mg/kg AC for zinc.

5.2.3 Background Groundwater

5.2.3.1 Sample Location

None of the monitoring wells (MW-1 and MW-6) installed upgradient (south) of the site contain groundwater. Therefore, the most appropriate location for determining background groundwater conditions is the on-site plant well, which is cross-gradient to the on-site contaminant sources (Figure 3-1).

5.2.3.2 Sample Results

Cyanide and BTEX were not detected in the background groundwater sample. Seven inorganic elements were detected in the background groundwater sample. Concentrations ranged from 0.0055 mg/L for arsenic to 0.61 mg/L for zinc.

6. POTENTIAL SOURCES

This section describes potential sources at the Bassett Gulch Mill site. The primary potential source of contamination at the site is tailings generated from ore concentration operations at the mill. In addition, the mill building contains potential sources of contamination from the storage and use of ore concentration reagents and petroleum-based materials for equipment operation and maintenance. The sample locations and analytical results are discussed in this section. Sample results of TCLP analyses performed on selected tailings samples are presented and discussed in Section 8. Laboratory analytical data forms are provided in Appendix D.

6.1 TAILINGS PONDS

The three tailings ponds cover an estimated area of 200,000 square feet (4.5 acres), and reportedly contain approximately 30,000 cubic yards of tailings (FS 1999). The tailings ponds did not contain any free liquids during the SI fieldwork, however, some ponding occurs within the ponds during the spring snowmelt period. No liner or engineered run-on/run-off controls exist at the tailings ponds (E & E 1999a).

6.1.1 Sample Locations

One sample was collected from each of the upper (BGMTP01SS), middle (BGMTP02SS), and lower (BGMTP03SS) tailings ponds (Figure 3-1). The samples were collected in the lowest areas inside of the tailings ponds structures.

6.1.2 Sample Results

Sample results are summarized in Table 6-1. Eleven inorganic elements and cyanide were detected at significant concentrations with respect to background in at least one of the tailings ponds samples. Significant concentrations of the following elements were detected in the tailings ponds samples: antimony, arsenic, barium, cadmium, copper, lead, mercury, selenium, silver, thallium, zinc, and cyanide. Significant concentrations in the samples ranged from 0.29 mg/kg for mercury to 11,000 mg/kg for barium.

6.2 TAILINGS IN RIPARIAN AREA

The tailings in the riparian area cover approximately 41,000 square feet (0.9 acre). The total depth of the tailings in unknown and no previous volume estimates are available for these tailings. No liner or engineered run-on/run-off controls exist at this tailings pile (E & E 1999a).

6.2.1 Sample Location

One sample (BGMTR01SS) was collected from the tailings deposited in the riparian area north of the lower tailings pond (Figure 3-1). The sample was collected on the east side of the tailings pile, immediately adjacent to the riparian area.

6.2.2 Sample Results

Sample results are summarized in Table 6-1. Eight inorganic elements were detected at significant concentrations with respect to background in the riparian area tailings sample. Cyanide was not detected in the sample. Significant concentrations of the following elements were detected in the riparian area tailings sample: antimony, arsenic, barium, cadmium, copper, lead, mercury, and silver. Significant concentrations in the samples ranged from 1.3 mg/kg for mercury to 13,000 mg/kg for barium.

6.3 MILL BUILDING

The mill building has numerous rooms and operational areas, including an assaying laboratory. Ore concentration equipment, including vats, shaker tables, and conveyers still remain inside the building. The building has concrete floors. Several sumps exist within the concrete floor, however, the field team could not identify if the sumps discharge outside of the building, or if they drain to the subsurface (i.e. dry wells). Many of the sumps are full of sediment, which presumably is fine ore material (E & E 1999a).

6.3.1 Sample Location

One sample (BGMMB01SD) was collected from sediment inside a floor sump under the main flotation tank in the mill building (Figure 3-1).

6.3.2 Sample Results

Sample results are summarized in Table 6-1. Ten inorganic elements were detected at significant concentrations with respect to background in the mill building sump sample. Cyanide was detected in the sample, but not at a significant concentration. Significant concentrations of the following elements were detected in the mill building sump sample: antimony, arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, and silver. Significant concentrations in the samples ranged from 1.2 mg/kg for mercury to 4,200 mg/kg for barium.

Table 6-1

SOURCE SAMPLES ANALYTICAL RESULTS SUMMARY
BASSETT GULCH MILL
KETCHUM, IDAHO

E & E Sample ID Depth (bgs) Description:	99BGMBG01SS 0-6" Background	99BGMTP01SS 0-6" Upper Tailings Pond	99BGMTP02SS 0-6" Middle Tailings Pond	99BGMTP03SS 0-6" Lower Tailings Pond	99BGMTR01SS 0-6" Tailings in Riparian Area	99BGMMB01SD 0-6" Mill Building Sump
TAL Inorganic Elements (mg/kg)						
Aluminum	15,000	9,200	15,000	15,000	6,300	23,000
Antimony	2.1 JB (2.9*)	9.3	9.2	35	35	33
Arsenic	5.5 JK (9.6*)	59 JK (34*)	220 JK (126*)	2,000 JK (1,150*)	140 JK (80.5*)	240 JK (138*)
Barium	450	600	11,000	2,300	13,000	4,200
Beryllium	0.47	0.75	1.2	0.89	0.5	0.98
Cadmium	2.1	1.4	5.6	51	8.1	9.1
Calcium	2,800 JH	6,700 JH	1,300 JH	10,000 JH	1,800 JH	24,000 JH
Chromium	20 JK (26*)	21 JK (16*)	79 JK (61*)	36 JK (28*)	45 JK (35*)	100 JK (78*)
Cobalt	4.2	2.1	2.5	8	2.3	18
Copper	8 JK (9.8*)	56 JK (46*)	84 JK (69*)	370 JK (303*)	61 JK (50*)	200 JK (164*)
Iron	12,000 JK	21,000 JK	28,000 JK	64,000 JK	15,000 JK	43,000 JK
Lead	37 JK (53*)	420 JK (292*)	410 JK (285*)	5,000 JK (3,470*)	290 JK (201*)	1,500 JK (1,040*)
Magnesium	5,200	430	1,400	5,900	860	14,000
Manganese	750	260	140	2,000	180	1,100
Mercury	0.037 U	0.29	3	0.97	1.3	1.2
Nickel	6.4 JB (39*)	41 U	18 JB	37 U	8.2 JB	50 U
Potassium	2,500	2,200	2,800	2,100	970	6,900
Selenium	2.9 U	1.6 JB	3.5	5.8	2.6 JB	3.8 U
Silver	0.16 JK (0.28*)	16 JB	6.4 JK (3.7*)	33 JK (19*)	4.1 JK (2.4*)	22 JK (13*)
Sodium	450 U	470 U	850 U	11,000	1,300	990 U
Thallium	0.97 U	1 U	1.1	0.73 JB	0.54 JB	1.3 U
Vanadium	20 JK (26.8*)	6.9 JK (5.1*)	74 JK (55*)	45 JK (34*)	43 JK (32*)	75 JK (56*)
Zinc	150 JK (225*)	230 JK (153*)	520 JK (347*)	4,700 JK (3,130*)	710 JK (473*)	910 JK (607*)
Cyanide (mg/kg)						
Cyanide	1.0	1.0 U	1.7	4.8	1.1 U	2.0
BTEX (mg/kg)						
Benzene	NA	NA	NA	NA	NA	0.047 U
Toluene	NA	NA	NA	NA	NA	0.047 U
Ethylbenzene	NA	NA	NA	NA	NA	0.047 U
m&p-Xylene	NA	NA	NA	NA	NA	0.095 U
o-Xylene	NA	NA	NA	NA	NA	0.047 U

Bold type indicates positively detected concentrations
Underline type indicates result is significant as defined in Section 5.

Key:

*	= Adjusted concentration per EPA document No. EPA 540-F-94-028.
B	= Analyte detected below the sample quantitation limit.
bgs	= Below ground surface.
BTEX	= Benzene, toluene, ethylbenzene, xylenes
H	= High bias
ID	= Identification.
J	= The analyte was positively identified. The associated numerical result is an estimate.
K	= Unknown bias.
L	= Low bias.
mg/kg	= Milligrams per kilogram.
NA	= Target Analyte List
TAL	= Analysis not performed.
U	= The analyte was not detected at or above the reported result.

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 in Appendix D. 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 and Hydrogeology

The site area is underlain by alluvial deposits of the Bassett Gulch drainage and, in the northern portion of the site, alluvial deposits of the Warm Springs Creek drainage. These deposits range in thickness to a minimum of 39 feet, and thin toward the valley margins. These deposits are composed predominantly of sand and gravel with varying amounts of silt and clay. Locally the alluvium also contains cobbles and boulders. The gravel, cobble, and boulder clasts consist of sandy limestone, calcareous sandstone, and altered igneous rocks. The alluvial deposits overlie bedrock, which is mapped as the Eagle Creek member of the Wood Creek Formation. The Wood Creek Formation comprises silty limestone, calcareous sandstone, quartz arenite, siltstone, and argillite (USGS 1991).

Groundwater exists locally under unconfined conditions within the alluvial deposits. In the northern portion of the site, at the location of monitoring well MW-5, groundwater was encountered at a depth of approximately 31 feet bgs. No groundwater was encountered during drilling of monitoring well MW-6, located in the southern portion of the site. Bedrock was encountered at a depth of 39 feet bgs in the MW-6 borehole, which was drilled to a total depth of 43 feet bgs. Per a discussion between the FS OSC and the E & E site geologist, it was decided to install monitoring well MW-6 with a screen set at the alluvium/bedrock contact. It is possible that groundwater could exist in the vicinity of MW-6 within the alluvium above the alluvium/bedrock contact during spring runoff or significant storm events. Based upon previous reports (SAIC 1998; USGS 1991; well drillers logs, various dates) groundwater also exists

locally within the bedrock. Insufficient information exists to determine whether groundwater occurring bedrock units is hydraulically connected to groundwater in the alluvial deposits. Water supply wells in the vicinity of the site are completed in bedrock at depths up to 400 feet.

Groundwater in the alluvial aquifer is assumed to flow parallel to the Warm Springs Creek valley. Groundwater flow directions in the bedrock aquifer are not known.

Several springs were observed at the base of the steep slope located immediately north of the lower tailings pond. These springs are believed to be hydraulically connected to the shallow unconfined groundwater zone contained within the alluvial deposits (E & E 1999a).

7.1.2 Groundwater Targets

As discussed in Section 7.1.1, two aquifers potentially exist within the site's groundwater TDL, a shallow alluvial aquifer and a bedrock aquifer. Since neither a hydraulic connection or a discontinuity between these water bearing zones has been documented, the groundwater targets are discussed separately for both water bearing zones.

In the alluvial aquifer, the nearest drinking water well is located approximately 1,000 feet north of the tailings ponds. Within 4 miles of the site, a total of 141 private drinking water wells exist in the alluvial aquifer (USGS 1967; IWRD 1999). No water wells are used for irrigation or for commercial livestock watering, food preparation, or aqualculture (IWRD 1999).

In the bedrock aquifer, the nearest drinking water well is located approximately 1 mile northeast of the tailings ponds. Within 4 miles of the site, a total of 50 private drinking water wells exist in the bedrock aquifer (USGS 1967; IWRD 1999). No water wells are used for irrigation or for commercial livestock watering, food preparation, or aquaculture (IWRD 1999).

Two public water supply wells exist within 4 miles of the site, and are assumed to be completed in the alluvial aquifer due their proximity to Warm Springs Creek. No well logs are available for these wells. The wells serve two restaurants which are located between 3 and 4 miles from the site (EPA 1999; IWRD 1999).

The total number of drinking wells in both the alluvial and bedrock aquifers, and the population served within a 4-mile radius of the site are provided in Table 7-1. The site is located within the Eastern Snake River Plain Sole Source Aquifer area (EPA 1999).

7.1.3 Sample Locations

Six groundwater samples were collected for the SI. These samples were collected from two on-site monitoring wells, MW-4 (99BGMMW04GW) and MW-5 (99BGMMW05GW), the on-site plant well (99BGMPW01GW), and from three nearby off-site domestic water wells (99BGMDW01GW, 99BGMDW02GW, and 99BGMDW03GW). The monitoring and plant wells are illustrated on Figure 3-1, the off-site domestic wells are illustrated on Figure 3-2.

7.1.4 Sample Results

Sample results are summarized in Table 7-2. Cyanide and BTEX were not detected in any of the groundwater samples. Only one of the wells sampled contained elevated concentrations of site-related contaminants with respect to background, MW-5 installed by E & E during the SI fieldwork at the north end of the lower tailings pond. Seven site related inorganic elements were detected at elevated concentrations in the sample, including barium, cadmium, chromium, cobalt, lead, mercury, and silver. Elevated concentrations ranged from 0.00066 mg/L mercury to 0.58 mg/L manganese. Two additional inorganic elements also were detected at elevated concentrations (manganese and zinc), however, these analytes cannot be attributed to sources at the site.

None of the groundwater samples collected for the SI contained contaminant concentrations exceeding federal maximum contaminant levels (MCLs) for drinking water. However, the lead concentrations detected in on-site monitoring wells MW-4 and MW-5 exceeded EPA's recommended drinking water action level of 0.015 mg/L (EPA 1996c).

7.2 SURFACE WATER MIGRATION PATHWAY

This section presents the pathway description and the targets for surface water migration pathway.

7.2.1 Pathway Description

The mean annual precipitation recorded at the FS Ketchum Ranger Station is 19.08 inches (WRCC 1999). The two-year, 24-hour precipitation event is 2.4 inches (NOAA 1973). The site is located within the 100-year floodplain of Warm Springs Creek (FS 1999). The total drainage area of the source areas at the site, including the tailings ponds and mill area, is approximately 11 acres (USGS 1967). Surface soils at the site consist of poorly sorted gravel, sand, and cobbles, with some clay occurring locally (E & E 1999a).

Runoff from the site has the potential to enter the surface water migration pathway via several means. Runoff from the tailings ponds and discharge from springs at the northern base of the tailings ponds enters the riparian area between the tailings ponds and Warm Springs Creek (Figure 3-2). This riparian area consists of Palustrine Scrub-Shrub wetlands. Runoff and spring discharge water flows through the wetlands via a complex system of small streamlets and drainage channels. These channels flow into the south side of Warm Springs Creek along an approximately 100-foot section of the creek. Runoff from the mill building area enters a ditch on the west side of the site access road. Water in this ditch flows northward and discharges to Warm Springs Creek (Figure 3-1).

Warm Springs Creek flows 5.5 miles east from the site to its confluence with the Big Wood River (Figure 7-1). The average annual flow rate of Warm Springs Creek is approximately 87 cubic feet per second (CFS) as measured by a USGS gauging station at Geyer Hot Springs, approximately 3.5 miles downstream of the site (USGS 1999).

The Big Wood River consists of the final segment of the surface water migration pathway. The Big Wood River flows south from Ketchum and through Hailey, Idaho. The average annual flow of the Big Wood River is 137 CFS as measured by a USGS gauging station at Hailey, Idaho (USGS 1999).

Figure 7-1 illustrates the extent of the 15-mile surface water migration pathway target distance limit.

7.2.2 Targets

Within the 15-mile TDL, surface water is not used for drinking water supplies (FS 1999; EPA 1999). Based on available information, Warm Springs Creek and the Boog Wood River are not used for other resources including irrigation, commercial food preparation, or as a designated recreation area (IWRD 1999).

Warm Springs Creek is a relatively popular sport fishery. The creek is stocked annually with rainbow trout (*Oncorhynchus mykiss*). Statistics for angling success and stocked fish tag returns were collected by the Idaho Department of Fish and Game in 1993 for a section of Warm Springs Creek adjacent to and downstream of the Bassett Gulch Mill site. These statistics indicate that a total of 454 hatchery stocked rainbow trout were caught during the months of July and August 1993. The size of the fish ranged from approximately 24 centimeters to 30 centimeters. No fish weight data were provided in the study (IDFG 1994). In 1994, IDFG reported that the average weight of stocked fish in Warm Springs Creek and the Big Wood River was 0.44 pounds per fish (IDFG 1995). Approximately 50% of the Warm

Springs Creek survey area is within the surface water TDL of the site. No fish harvest data for the Big Wood River within the site's TDL was available.

No portions of Warm Springs Creek or the Big Wood River within the 15-mile surface water pathway TDL provide habitat known to be used by federal- or state-listed threatened or endangered species (ICDC 1999). No other sensitive environments are located within the site's 15-mile TDL.

Warm Springs Creek is bordered by both Palustrine Scrub-Shrub and Palustrine Forested wetlands along its course between the site and the confluence with the Big Wood River. The estimated total wetland frontage along this portion of Warm Springs Creek is 28,000 linear feet (approximately 5.3 miles), which includes sporadic wetland frontage on both banks of the creek (NWI 1992). The Big Wood River is bordered by Palustrine Scrub Shrub, Palustrine Forested, and Palustrine Emergent wetlands. Both banks of the Big Wood River within the surface water migration pathway TDL continuously are bordered by these wetlands, resulting in a total wetland frontage of 19 miles along this river (NWI 1992).

7.2.3 Sample Locations

Three collocated surface water/sediment sample sets were collected from Warm Springs Creek (99BGMWC01SW/SD, 99BGMWC02SW/SD, and 99BGMWC03SW/SD), and one collocated spring water/sediment sample were collected for the SI (Figures 3-1 and 3-2). The Warm Springs Creek samples were collected upstream (background), adjacent to, and downstream of the site. The spring samples were collected from a spring emanating from the base of the lower tailings pond.

7.2.4 Surface Water Sample Results

Sample results are summarized in Table 7-3. Cyanide and BTEX were not detected in any of the samples. Three site related inorganic elements were detected at elevated concentrations with respect to background. The inorganic elements detected at elevated concentrations included barium (up to 0.011 mg/L), copper (up to 0.019 mg/L), and lead (0.0034 mg/L).

Two of the inorganic elements detected at elevated concentrations also were detected at levels exceeding federal ambient water quality criteria (AWQC) for freshwater. These included copper, which exceeded the AWQC of 0.012 mg/L in the Warm Springs Creek samples collected adjacent to and downstream of the site; and lead, which exceeded the AWQC of 0.0032 mg/L in the Warm Springs Creek sample collected adjacent to the site.

7.2.5 Sediment Sample Results

Sample results are summarized in Table 7-4. Cyanide was not detected in any of the samples. Ten site-related inorganic elements were detected at elevated concentrations with respect to background in the spring sample. The inorganic elements detected at elevated concentrations included: antimony, arsenic, barium, cadmium, copper, lead, mercury, selenium, silver, and zinc. Elevated concentrations ranged from 4.3 mg/kg mercury to 20,100 mg/kg (AC) lead. Only one analyte, barium at 310 mg/kg, was detected at an elevated concentration in the Warm Springs Creek samples.

7.3 SOIL EXPOSURE PATHWAY

The Bassett Gulch Mill property is not enclosed by a fence, although access to the site is controlled with a locked gate on the access road. The nearest household is located approximately 1,000 feet north of the tailings ponds. One caretaker resides on the site, but the actual amount of time spent on-site by this individual is not known (E & E 1999a). No schools or daycare facilities are located within 1 mile of the site (E & E 1999a). Table 7-5 provides the resident population within a 4-mile radius of the site (EPA 1999).

No terrestrial sensitive environments, commercial agriculture, or commercial livestock production areas are located in the vicinity of the Bassett Gulch Mill site (E & E 1999a).

7.4 AIR MIGRATION PATHWAY

One full time caretaker resides at the site (E & E 1999a). An estimated 678 people reside within a 4-mile radius of the site (EPA 1999). No habitat supporting federal- or state-listed threatened or endangered species exists within 4 miles of the site (ICDC 1999). No other sensitive environments are known to exist within 4 miles of the site. Approximately 303 acres of wetlands are known to exist within 4 miles of the site (EPA 1999). No commercial agriculture, silviculture, or major or designated recreational areas are known to exist withing ½ mile of the site. Table 7-3 provides population and wetlands acreage within the 4-mile radius.

Table 7-1

GROUNDWATER DRINKING WATER POPULATION WITHIN A 4-MILE RADIUS
BASSETT GULCH MILL SI
KETCHUM, IDAHO

DISTANCE (MILES)	WELL IDENTIFICATION	NUMBER OF WELLS		TOTAL POPULATION PER DISTANCE RING	
		Alluvial Aquifer	Bedrock Aquifer	Alluvial Aquifer	Bedrock Aquifer
0 to ¼	Domestic drinking wells	4	0	9.72	0
¼ to ½	Domestic drinking wells	0	0	0	0
½ to 1	Domestic drinking wells	0	0	0	0
1 to 2	Domestic drinking wells	39	5	94.77	12.15
2 to 3	Domestic drinking wells	27	20	65.61	48.60
3 to 4	Domestic drinking wells	69	25	167.67	60.75
	Public groundwater supply wells	2	0	31	0
Total		141	50	368.77	121.50

Source: EPA 1999; IWRD 1999; E & E 1999a

NOTE: Population estimates based on average number of persons per household for Blaine County, Idaho (2.43 persons/household), and on personal communication with restaurant owners.

Key:
SI = Site Inspection.

Table 7-2

GROUNDWATER SAMPLES ANALYTICAL RESULTS SUMMARY
BASSETT GULCH MILL
KETCHUM, IDAHO

E & E Sample ID Description:	99BGMPW01GW Plant Well-Background	99BGMMW04GW MW-4	99BGMMW05GW MW-5	99BGMDW01GW 574 Warm Springs Road	99BGMDW02GW 592 Warm Springs Road	99BGMDW03GW 590 Warm Springs Road
TAL Inorganic Elements (mg/L)						
Aluminum	0.23	2.7	21	0.2 U	0.2 U	0.2 U
Antimony	0.003 UJK	0.0038 UJK	0.003 UJK	0.003 UJK	0.003 UJK	0.003 UJK
Arsenic	0.0055	0.014	0.011	0.0027	0.002	0.0031
Barium	0.11	0.11	0.43	0.07	0.079	0.081
Beryllium	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cadmium	0.001 U	0.00052 JB	0.0011	0.001 U	0.001 U	0.001 U
Calcium	35 JK	33 JK	280 JK	49 JK	49 JK	48 JK
Chromium	0.01 U	0.0078	0.027	0.01 U	0.01 U	0.01 U
Cobalt	0.005 U	0.0034	0.0057	0.005 U	0.005 U	0.005 U
Copper	0.022	0.01 U	0.016	0.01 U	0.06	0.026
Iron	2.7	4.6	14	0.06	0.056	0.057
Lead	0.012	*0.023*	*0.064*	0.00024 JB	0.0064	0.0015
Magnesium	5.2 JK	5.1 JK	22 JK	8.6	9.9 JK	9.3 JK
Manganese	0.0497 JB (0.05*)	0.12	0.58	0.004 JK	0.0037 JB	0.0036 JB
Mercury	0.0002 U	0.0002 U	0.00066	0.0002 U	0.0002 U	0.0002 U
Nickel	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Potassium	1.2 U	1.7	5.8	1.3 U	1.3 U	1.4 U
Selenium	0.017	0.016	0.019	0.016	0.017	0.017
Silver	0.0005 U	0.0005 U	0.0012	0.0005 U	0.0005 U	0.0005 U
Sodium	5.9	5.1	10	2.4 U	2 U	2.6 U
Thallium	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Vanadium	0.002 U	0.011	0.026	0.005 U	0.005 U	0.005 U
Zinc	0.61	0.033	0.11	0.09	0.097	0.12
Cyanide (mg/L)						
Cyanide	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
BTEX (mg/L)						
Benzene	0.001 U	0.001 U	0.001 U	NA	NA	NA
Toluene	0.001 U	0.001 U	0.001 U	NA	NA	NA
Ethylbenzene	0.001 U	0.001 U	0.001 U	NA	NA	NA
m&p-Xylene	0.002 U	0.002 U	0.002 U	NA	NA	NA
o-Xylene	0.001 U	0.001 U	0.001 U	NA	NA	NA

Bold type indicates positively detected concentrations
Underline type indicates result is significant as defined in Section 5.
Italic type indicates result is above an EPA recommended action level for drinking water.

Key:

*	= Adjusted concentration per EPA document No. EPA 540-F-94-028.
B	= Analyte detected below the sample quantitation limit.
bgs	= Below ground surface.
BTEX	= Benzene, toluene, ethylbenzene, xylenes
EPA	= United States Environmental Protection Agency.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical result is an estimate.
K	= Unknown bias.
L	= Low bias.
mg/L	= Milligrams per liter.
NA	= Analysis not performed
TAL	= Target Analyte List
U	= The analyte was not detected at or above the reported result.

Table 7-3

SURFACE WATER SAMPLES ANALYTICAL RESULTS SUMMARY
BASSETT GULCH MILL
KETCHUM, IDAHO

E & E Sample ID Description:	99BGMWC03SW Warm Springs Creek Background	99BGMWC02SW Warm Springs Creek Adjacent to Site	99BGMWC01SW Warm Springs Creek Downstream of Site	99BGMSP01SW Spring Below Tailings Ponds
TAL Inorganic Elements (mg/L)				
Aluminum	0.2 U	**0.033 JB**	**0.21**	0.2 U
Antimony	0.003 UJK	0.003 UJK	0.003 UJK	0.003 UJK
Arsenic	**0.0037**	**0.011**	**0.003**	**0.0057**
Barium	**0.015**	**0.11**	**0.052**	**0.095**
Beryllium	0.002 U	0.002 U	0.002 U	0.002 U
Cadmium	0.001 U	0.001 U	0.001 U	0.001 U
Calcium	**29 JK**	**73 JK**	**30 JK**	**120 JK**
Chromium	0.01 U	0.01 U	0.01 U	0.01 U
Cobalt	0.005 U	0.005 U	0.005 U	0.005 U
Copper	0.01 U	***0.012***	***0.019***	0.01 U
Iron	**0.023 JB**	**0.12**	**0.085**	**0.073**
Lead	**0.00051 JB (0.001*)**	***0.0034***	**0.00042 JB**	**0.0029**
Magnesium	**5 JK**	**7.6 JK**	**5.2 JK**	**11 JK**
Manganese	0.05 U	**0.005 JB**	**0.0058 JB**	**0.0077 JB**
Mercury	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	0.04 U	0.04 U	0.04 U	0.04 U
Potassium	0.78 U	**2.2**	1.3 U	**2.3**
Selenium	**0.015**	**0.016**	**0.014**	**0.017**
Silver	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Sodium	**5.9**	**4.7**	**5.9**	**7.9**
Thallium	0.001 U	0.001 U	0.001 U	0.001 U
Vanadium	0.005 U	0.005 U	0.005 U	0.005 U
Zinc	**0.02**	**0.033**	**0.043**	**0.026**
Cyanide (mg/L)				
Cyanide	0.050 U	0.050 U	0.050 U	3.5 U
BTEX (mg/L)				
Benzene	NA	NA	NA	0.001 U
Toluene	NA	NA	NA	0.001 U
Ethylbenzene	NA	NA	NA	0.001 U
m&p-Xylene	NA	NA	NA	0.002 U
o-Xylene	NA	NA	NA	0.001 U

Bold type indicates positively detected concentrations

Underline type indicates result is significant as defined in Section 5.

Italic type indicates result is above a federal freshwater ambient water quality criterion.

Key:

*	= Adjusted concentration per EPA document No. EPA 540-F-94-028.
B	= Analyte was detected below the sample quantitation limit.
bgs	= Below ground surface.
BTEX	= Benzene, toluene, ethylbenzene, xylenes
EPA	= United States Environmental Protection Agency.
ID	= Identification
J	= The analyte was positively identified. The associated numerical result is an estimate.
K	= Unknown bias.
L	= Low bias.
mg/L	= Milligrams per liter.
NA	= Analysis not performed
TAL	= Target Analyte List
U	= The analyte was not detected at or above the reported result.

Table 7-4

SEDIMENT SAMPLES ANALYTICAL RESULTS SUMMARY
BASSETT GULCH MILL
KETCHUM, IDAHO

E & E Sample ID Depth (bgs) Description:	99BGMWC03SD 0-2" Warm Springs Creek Background	99BGMWC02SD 0-2" Warm Springs Creek Adjacent to Site	99BGMWC01SD 0-2" Warm Springs Creek Downstream of Site	99BGMSP01SD 0-2" Spring Below Tailings Ponds
TAL Inorganic Elements (mg/kg)				
Aluminum	6,700	8,600	5,300	18,000
Antimony	1.6 (3.9*) JB	1.8 JB	1.5 JB	400
Arsenic	30 JK (52*)	7.7 JK (4.4*)	12 JK (6.9*)	3,700 JK (2,100*)
Barium	100	310	72	1,400
Beryllium	0.52 U	0.37 JB	0.34 JB	1.4 U
Cadmium	0.74 JB (1.3*)	0.88 JB	0.44	16
Calcium	3,400 JH	4,900 JH	2,800 JH	33,000 JH
Chromium	26 JK (34*)	29 JK (22*)	21 JK (16*)	31 JK (24*)
Cobalt	5.7	5.5	5.1	3 JB
Copper	6 UJK (7.32*)	7.2 JK (5.9*)	6.2 JK (5.1*)	56 JK (46*)
Iron	15,000 JK	13,000 JK	13,000 JK	52,000 JK
Lead	76 JK (109*)	61 JK (42*)	56 JK (39*)	29,000 JK (20,100*)
Magnesium	4,200	4,700	4,100	4,000
Manganese	170	130	240	130
Mercury	0.04 U	0.044 JB	0.034 U	4.3
Nickel	52 U	5.3 JB	44 U	140 U
Potassium	1,100	1,400	730	5,200
Selenium	0.87 JB (3.9*)	1.1	3.3 U	20
Silver	0.23 (0.40*) JK	0.37 JK (0.21*)	0.18 JK (0.10*)	170 JK (98*)
Sodium	590 U	570 U	510 U	4,800
Thallium	1.3 U	1.2 U	1.1 U	1.1 JB
Vanadium	33 JK (44*)	30 JK (22*)	25 JK (19*)	38 JK (28*)
Zinc	150 JK (225*)	120 JK (80*)	120 JK (80*)	2,600 JK (1,700*)
Cyanide (mg/kg)				
Cyanide	1.3 U	1.4 U	0.97 U	3.5 U

Bold type indicates positively detected concentrations

Underline type indicates result is significant as defined in Section 5.

Key:

*	= Adjusted concentration per EPA document No. EPA 540-F-94-028.
B	= Analyte detected below the sample quantitation limit.
bgs	= Below ground surface.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical result is an estimate.
K	= Unknown bias.
L	= Low bias.
mg/kg	= Milligrams per kilogram.
U	= The analyte was not detected at or above the reported result.

Table 7-5

POPULATION AND WETLAND ACREAGE WITHIN A 4-MILE RADIUS
BASSETT GULCH MILL SI
KETCHUM, IDAHO

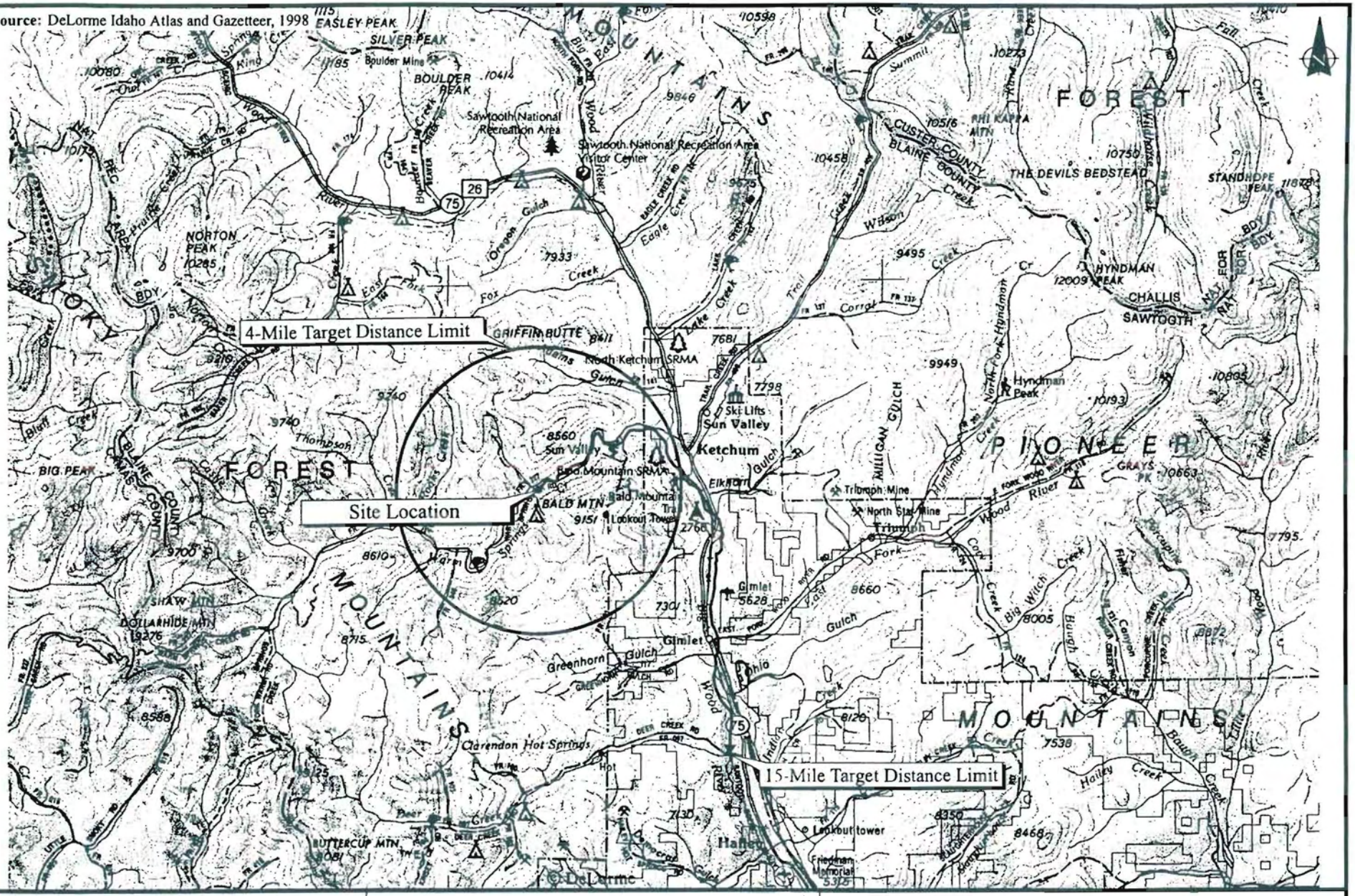
DISTANCE (MILES)	ESTIMATED NUMBER OF RESIDENTS [1]	WETLAND ACREAGE
0 to ⅛	27	18.68
¼ to ½	0	33.40
½ to 1	0	21.74
1 to 2	190	39.69
2 to 3	129	98.16
3 to 4	332	91.41
Total	678	303.08

Source: EPA 1999; NWI 1992.

(1) Number of residents for each distance ring based on a proportion of the total population reported by EPA within 4 miles of the site; Proportions used are based on the groundwater drinking water population.

Key:

SI = Site Inspection.



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BASSETT GULCH MILL SITE INSPECTION
Ketchum, Idaho

Figure 7-1
4-MILE AND 15-MILE TDL MAP

0 2 4
Approximate Scale in Miles

Drawn:	Date	Job No.	Dwg.No.
AES	12/14/99	000625VU07000100	VU07 7-1

8. REMOVAL CONSIDERATIONS

To address the project objective of determining potential hazardous substance removal options at the site, E & E collected samples of the tailings for TCLP analyses for 8 metals, and made specific on-site observations regarding the need for and feasibility of a removal action at the site. This information is provided below.

8.1 TCLP SAMPLE RESULTS

Table 8-1 summarizes the results of the TCLP analyses performed on three samples collected from the on-site tailings ponds. The TCLP data indicates that the tailings are not a Resource Conservation and Recovery Act (RCRA) hazardous waste via the toxicity characteristic. Therefore, excavation, transportation, and disposal of the tailings would not be regulated under RCRA's hazardous waste requirements.

8.2 REMOVAL OPTIONS AND CONSIDERATIONS

While the SI data indicates that inorganic contaminants are being released from the tailings ponds into nearby wetlands and surface water, the magnitude of the contaminant concentrations detected during the SI do not necessarily warrant an emergency removal effort. Furthermore, tailings samples collected on the surface suggest that the tailings do not have the potential for significant leaching of toxic heavy metals. Based on a preliminary, cursory assessment of site conditions, the most feasible and effective measure for reducing impacts to the nearby wetlands and Warm Springs Creek is in-place stabilization of the tailings. Stabilization measures could include one or a combination of the following:

- Capping the tailings to prevent precipitation and runoff from eroding the tailings into nearby surface waters, and to decrease the infiltration of water and subsequent leaching of heavy metals to groundwater;
- Construction of a french drain uphill of the tailings ponds to reduce the quantity of groundwater flowing under and through the tailings ponds. This measure would decrease contaminant loading to shallow groundwater which discharges at the springs immediately north of the lower tailings pond; and

- Construction of run-on and run-off diversions to decrease the quantity of water entering the tailings ponds during the spring snowmelt season or during significant storm events.

Table 8-1

TCLP TAILINGS SAMPLES
ANALYTICAL RESULTS SUMMARY
BASSETT GULCH MILL
KETCHUM, IDAHO

E & E Sample ID	99BGMTP01SS	99BGMTP02SS	99BGMTP03SS	RCRA Hazardous Waste Threshold Concentration
Depth (bgs)	0-6"	0-6"	0-6"	
Description:	Upper Tailings Pond	Middle Tailings Pond	Lower Tailings Pond	
TCLP Metals (mg/L)				
Arsenic	0.2 U	0.2 U	**0.16**	5.0
Barium	**0.16**	**0.62**	**1.3**	100.0
Cadmium	0.02 U	**0.046**	**0.45**	1.0
Chromium	0.01 UJL	0.01 UJL	0.01 UJL	5.0
Lead	**0.28**	0.05 U	**0.54**	5.0
Mercury	0.002 U	0.002 U	0.002 U	0.2
Selenium	0.4 U	0.4 U	0.4 U	1.0
Silver	0.01 UJK	0.6 UJK	0.6 UJK	5.0

Bold type indicates positively detected concentrations.

Key:

bgs	= Below ground surface.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical result is an estimate.
K	= Unknown bias.
L	= Low bias.
mg/L	= Milligrams per liter.
RCRA	= Resource Conservation and Recovery Act
TCLP	= Toxicity Characteristic Leaching Procedure
U	= The analyte was not detected at or above the reported result.

9. SUMMARY AND CONCLUSIONS

In May 1999, E & E conducted a SI at the Bassett Gulch Mill site located approximately 4 miles west of Ketchum, Idaho. The Bassett Gulch Mill is owned privately but is situated on public lands within the Sawtooth National Forest.

The site is a former barite and precious metals mill. Major features include the mill building, a caretaker's house, and three tailings ponds used for disposal of tailings during the mill's operational years. The mill operated between the early 1950s and 1987. Occasional ore assaying is still conducted at the mill.

The site is not fenced, however a locked gate across the entrance road controls access to the mill area. The site is located in a rural area with scattered residences north and northeast of the property. The nearest residence is located approximately 1,000 feet from the site.

The SI involved collection of samples from potential source areas and migration routes. Twenty one samples, including background samples but excluding QA samples were collected. Samples were collected from the tailings ponds, tailings deposited in a riparian area, a sump in the mill building, an on-site spring, on-site monitoring wells, the on-site plant well, Warm Springs Creek, and from residential wells located near the site. The sampled media included soil, sediment, surface water, and groundwater. Samples were analyzed by Sound Analytical Services of Tacoma, Washington. Section 9.1 summarizes the potential source analytical sample results and provides a brief overview of analytes that were detected in the source samples. Section 9.2 summarizes the potential target analytical sample results and provides a brief overview of analytes that were detected in the target samples.

9.1 SOURCES

Three samples were collected from the tailings ponds, one sample was collected from the tailings in the riparian area, and one sample was collected from a sump inside the mill building.

Several inorganic elements were consistently detected at significant levels with respect to background in the tailings samples. These elements include antimony, arsenic, barium, copper, lead, mercury and silver. Two of the tailings ponds (lower and middle) also contained detectable

concentrations of cyanide, although the cyanide concentrations detected were only significantly elevated above background in the lower tailings pond.

The mill building sump sample contained the most contaminants at significant concentrations. These included a total of ten inorganic elements which include the same elements that were consistently detected in the tailings samples. Cyanide was detected in the mill building sump sample, but not at a significant level.

9.2 TARGETS

A summary of the groundwater and surface water migration pathways, the two pathways which were characterized with SI sampling data, is provided below.

9.2.1 Groundwater Migration Pathway

Only one of the groundwater samples (99BGMMW05GW), collected from a monitoring well installed during the SI (MW-5) contained contaminant concentrations at elevated levels with respect to background. MW-5 contained elevated concentrations of nine inorganic elements. The lead concentration in the MW-5 sample also exceeded EPA's recommended drinking water action level.

None of the private domestic drinking water wells sampled for the SI contained concentrations of site-related contaminants at elevated levels with respect to background.

9.2.2 Surface Water Migration Pathway

Barium, copper, and lead were detected at elevated concentrations in Warm Springs Creek surface water samples collected downstream of the site (99BGMWC01SW and 99BGMWC02SW). Barium also was detected at an elevated concentration in a Warm Springs Creek sediment sample collected downstream of the site (99BGMWC02SD). The surface water sample collected from the spring located north of the lower tailings pond and adjacent to wetlands, contained elevated concnetrations of brium and lead. The collocated sediment sample contained elevated concentrations of ten contaminants, including barium, copper, and lead.

Two contaminants detected in Warm Springs Creek surface water samples exceeded AWQC. These included copper at a concentrations of 0.012 mg/L and 0.019 mg/L (99BGMWC02SW and 99BGMWC01SW, respectively), and lead at a concentration of 0.0034 mg/L (99BGMWC02SW).

9.3 CONCLUSIONS

Results of the SI conducted at the Bassett Gulch Mill indicate that the site is a source of heavy metals contamination. Contaminants have impacted shallow groundwater locally, but they have not migrated to nearby domestic drinking water wells. Site-related contaminants also have been released to a wetland area and Warm Springs Creek. Warm Springs Creek is stocked fishery, and is bordered by wetlands. For these reasons, further assessment of the Bassett Gulch Mill site under CERCLA may be warranted.

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APPENDIX A

PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

Site Name: Bassett Gulch Mill
Contract #: 625.VU07
Camera # 1, Kodak Max Outdoor Camera (disposable)

Photo No.	Dir.	Date	Time	By	Description
1	N	10/19/99	9005	ML	Drillers installing monitoring well MW-6. Sunny in background.
2	W	10/19/99	1010	ML	Dark exposure not printed.
3	N	10/20/99	1330	ML	View of new monitoring well MW-5 from top of northern embankment of lower tailings pond. Wetlands in background.
4	NE	10/20/99	1335	ML	Photo of Brown and Miller at location of spring collecting sample 99BGMSP01SW and 99BGMSP01SD. Photo taken from top of embankment overlooking wetlands at location approximately 40 feet east of MW-5.
5	S	10/20/99	1340	ML	Photo of spring surface water and sediment sample location 99BGMSP01. Katy Miller at location of sample. Embankment above wetlands in background.
6	Down	10/20/99	1343	ML	Photo of surface water sample 99BGMSP01SW and sediment sample 99BGMSP01SD.
7	S	10/20/99	1505	ML	Photo of Bassett Gulch Mill Site from mountainside south of warm springs road. Warm Springs Creek and bridge in foreground. Riparian area to left of site access road. Tailings pile in riparian area and tailings ponds to left. Mill building to right.
8-15	All	10/22/99	1520	ML	Panorama of Bassett Gulch Mill site from location of Well MW-4. Note plant well in exposure #8. Note tailings in riparian area in photos 10, 11, and 12. (west to south to east to north)
16	W	10/22/99	1535	ML	View of erosional gully on tailings pile in riparian area on NW side of pile. Vehicles in background near MW-4 location.
17	NE	10/20/99	1540	ML	View of tailings pile in riparian area (foreground) and riparian area (background). Note toe of tailings locally extends into vegetated area.
18	NE	10/20/99	1550	ML	View of wetlands from near MW-5 location. Location of spring sample 99BGMSP01SW in foreground. Sampled spring channel joins channel of a second spring (right) in grassy area (center).
19-21	NE N NW	10/22/99	1555	ML	Panorama of wetlands from location approximately 150 feet east of MW-5 location, on top of embankment. Note grassy area in photo #19 (same as shown in photo #18).
22-24	SW S SE	10/22/99	1655	ML	Panorama of bank at Warm Springs Creek from plant well location. Bank is manmade, consisting of unknown material, possibly wasterock or tailings.

PHOTOGRAPH IDENTIFICATION SHEET

Site Name: Bassett Gulch Mill
Contract #: 625.VU07
Camera # 3, Kodak Funsaver 35 with flash (disposable)

Photo No.	Dir.	Date	Time	By	Description
1	N	10/20/99	1425	ML	View of inside of mill and processing building, ground floor. No flash, photo not printed.
2	N	10/20/99	1425	ML	Same as #1
3	N	10/20/99	1426	ML	View of inside of mill and processing building, ground floor.
4	E	10/21/99	1242	ML	View of new monitoring well MW-6 (foreground, yellow casing and bollards) with MW-1 in background (unpainted metal).
5	E	10/21/99	1320	ML	View of existing well MW-3 (right, next to 55-gallon drum) and new well MW-5, left of road (yellow casing and bollards). Dave Brown for scale.
6	SE	10/21/99	1332	ML	View of inside of mill building interior from NW corner of main processing area near location of sump where sediment (sludge) sample 99BGMMB01SD was collected. No flash, photo not printed.
7	SE	10/21/99	1335	ML	View of inside of mill building interior from NW corner of main processing area near location of sump where sediment (sludge) sample 99BGMMB01SD was collected.
8	E	10/21/99	1338	ML	View of rusty cylindrical tank overlying sump. Tank is approximately 2/3 full of liquid. Dave Brown to right.
9	Down and east	10/21/99	1340	ML	Photo of sump where sample 99BGMMB01SD was collected.
10	S	10/21/99	1355	ML	View of the processing vats left and right in mill building. Miller and Brown in center. No flash.
11	S	10/21/99	1355	ML	View of the processing vats left and right in mill building. Miller and Brown in center.
12	N	10/21/99	1400	ML	View of processing vats photographed photos # 10 & 11. No flash, photo not printed.
13	E and upward	10/21/99	1404	ML	View of drum processing chemical and fed lines (feeding into processing vat photographed in photo #12).
14	N	10/21/99	1408	ML	View of chemical drum photographed in photo #13 (left) and two rectangular metal vats. No liquid in drum or in vats. Vats corroded and contain solid material (several inches deep) of unknown composition.
15	W and downward	10/21/99	1412	ML	View of liquid waste on floor (same level as the chemical drum and vats noted in photos # 13 and 14). Note dead mice.
16	W	10/21/99	1415	ML	View of 50-pound bags of "Percol 726, Allied Colloids." Material is white and crystaline.

PHOTOGRAPH IDENTIFICATION SHEET

Site Name: Bassett Gulch Mill
Contract #: 625.VU07
Camera # 3, Kodak Funsaver 35 with flash (disposable)

Photo No.	Dir.	Date	Time	By	Description
17	W	10/21/99	1422	ML	View of mill building from western bank of upper tailings pond.
18	W	10/21/99	1422	ML	View of northern portion of mill building from bank of upper tailings pond.


1-1


1-3


1-4


1-5

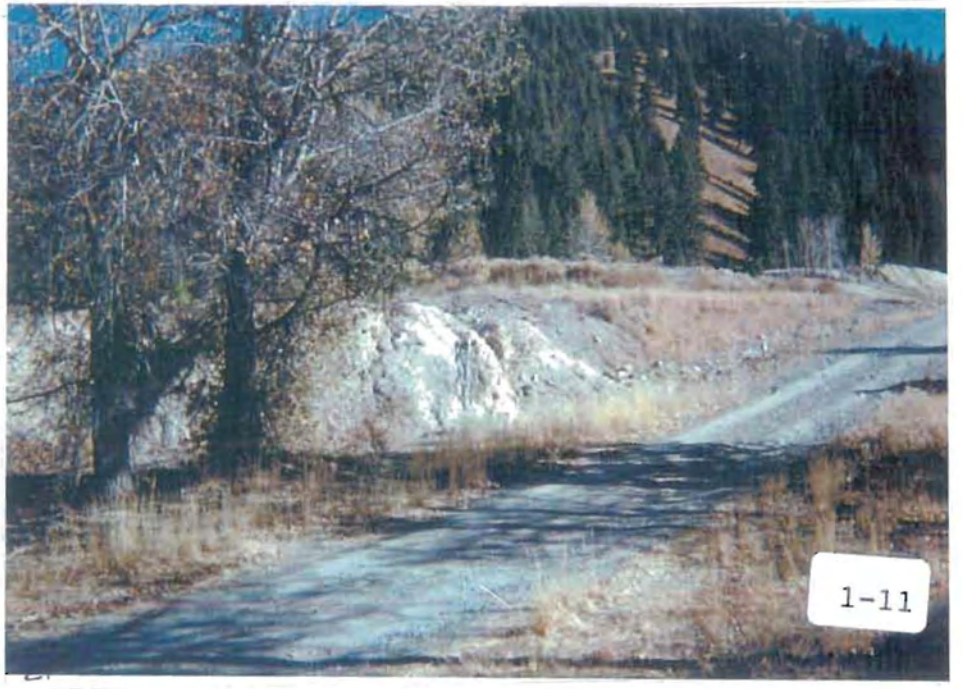

1-6

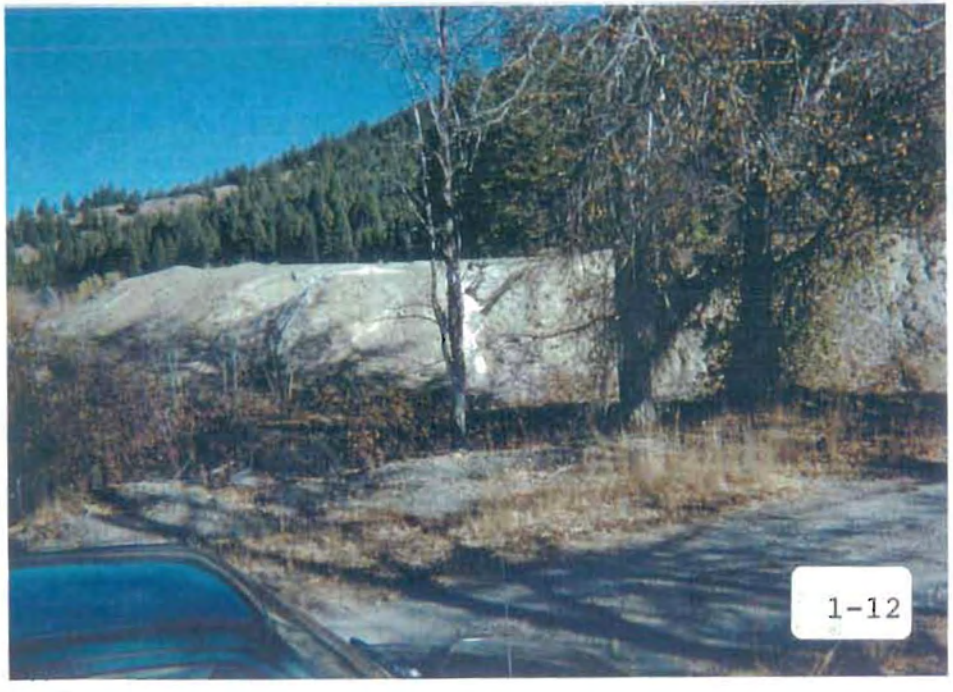

1-7

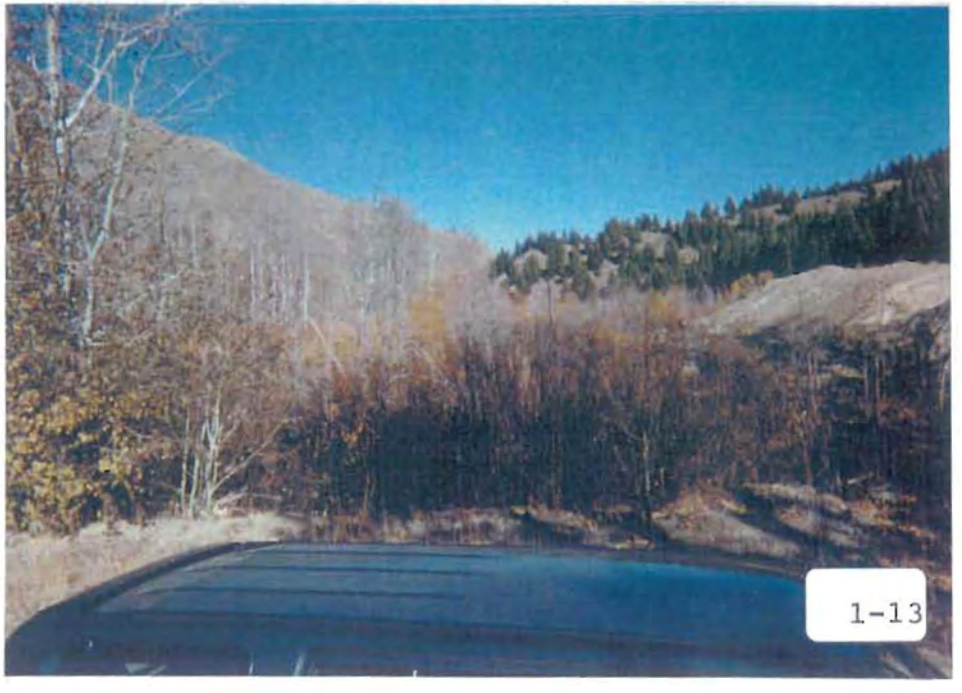

1-8

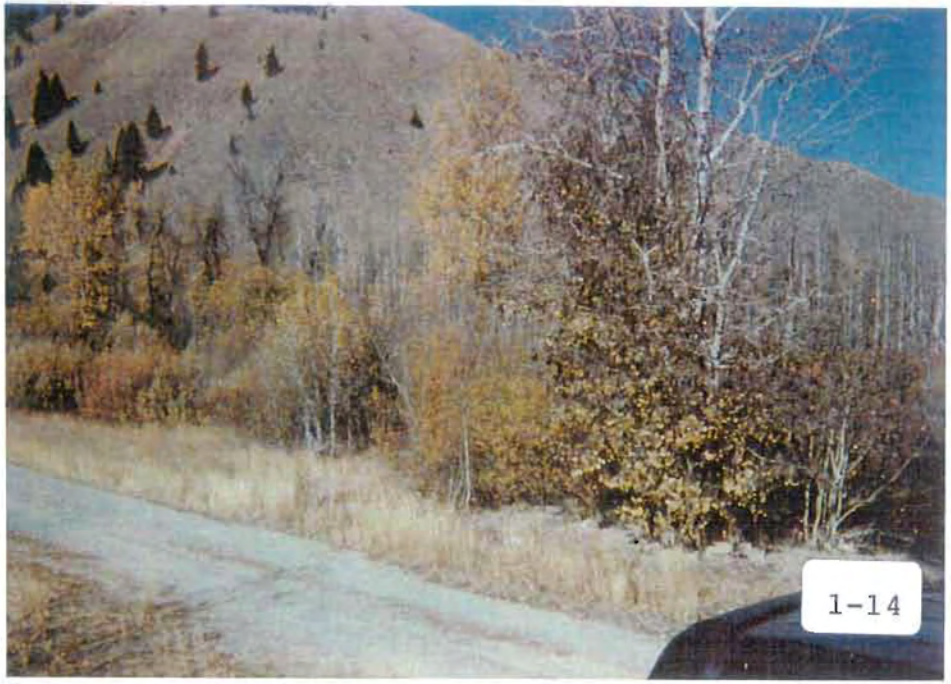

1-9

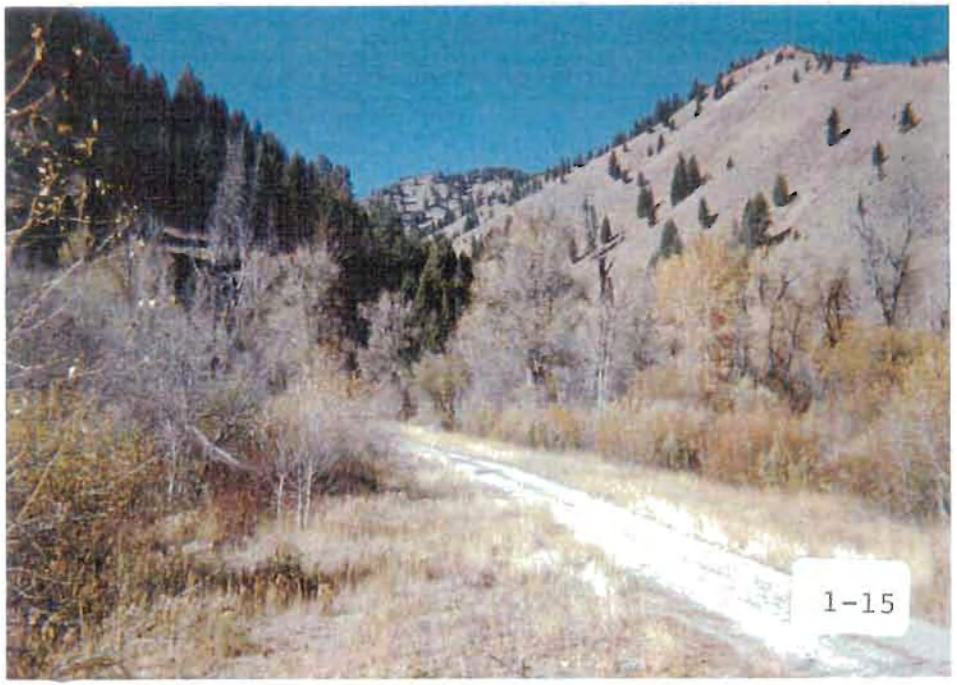

1-10


1-11


1-12


1-13


1-14


1-15


1-16


1-17


1-17


1-18

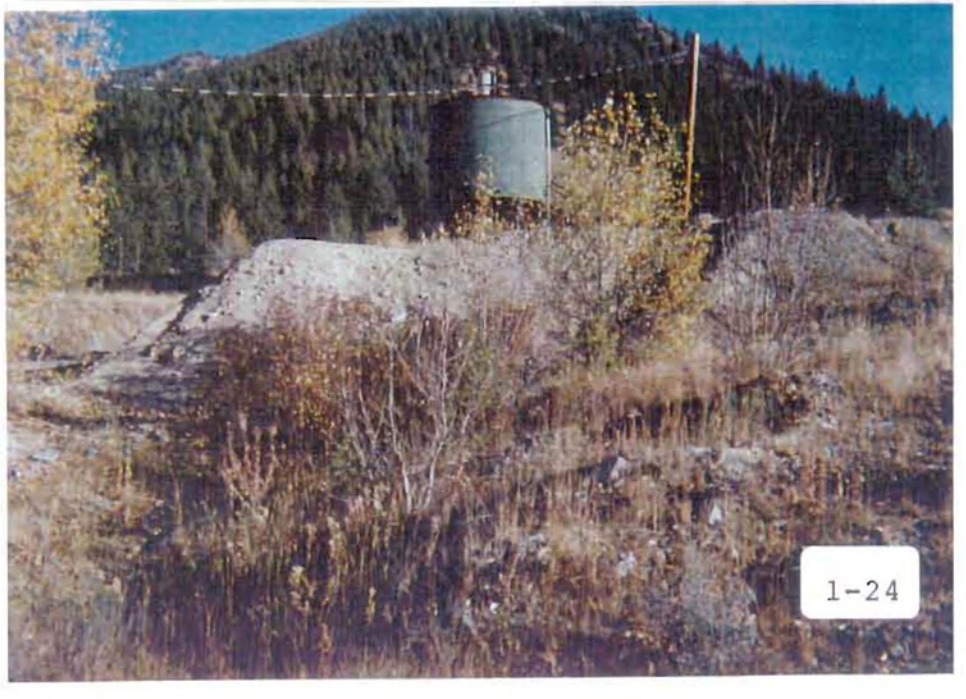

1-19


1-20

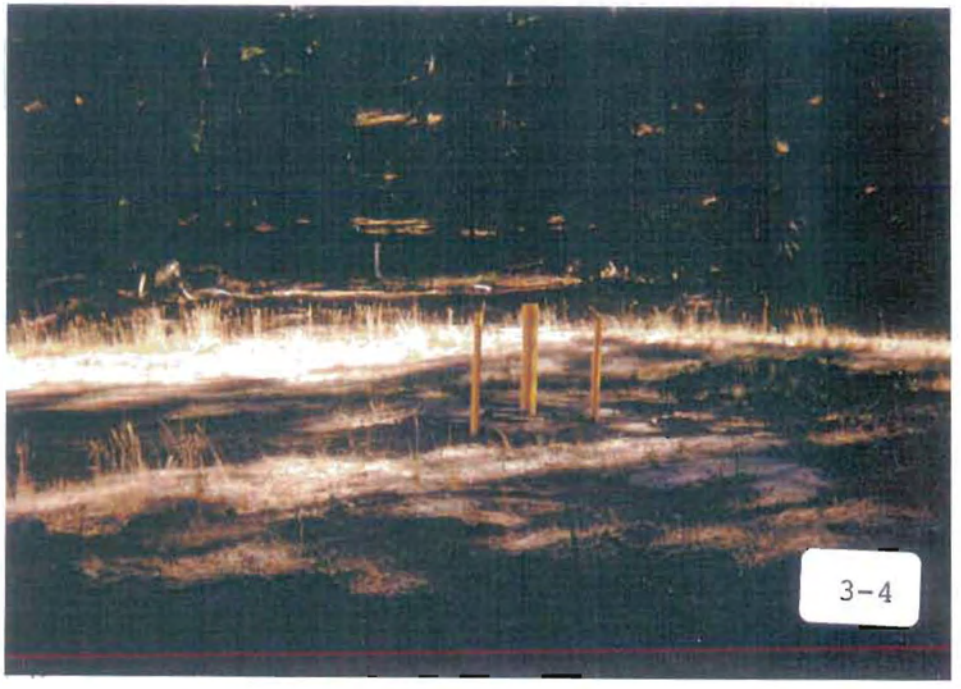

1-21


1-22


1-23


1-24


3-3


3-4

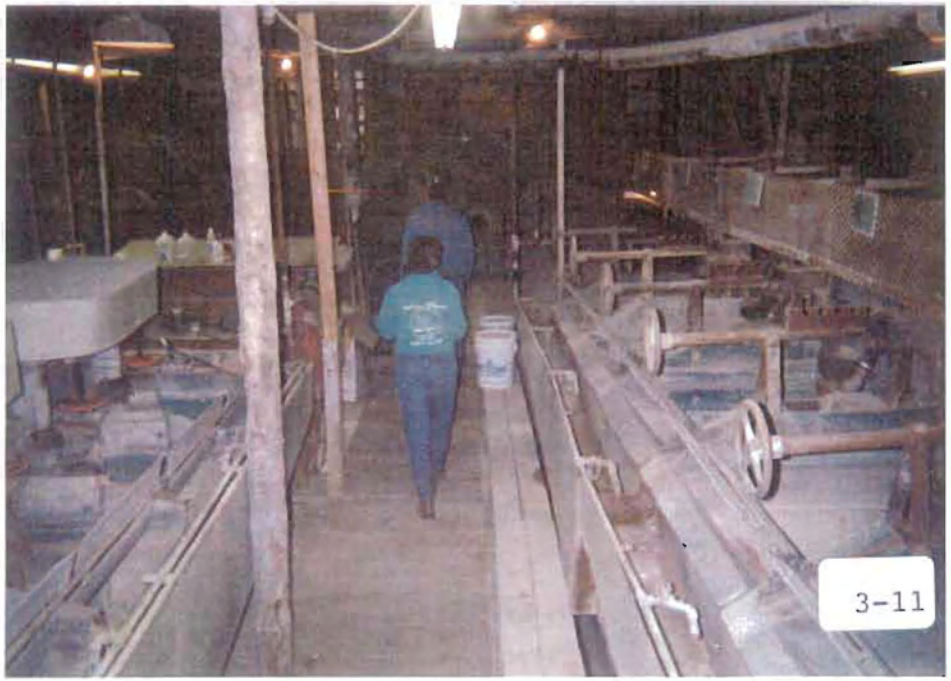

3-5


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3-15


3-16



3-17



3-18

3-13

3-14

APPENDIX B

GROUNDWATER SAMPLE COLLECTION FORMS

GROUNDWATER SAMPLE COLLECTION FORM

SITE NAME: BASSETT GULCH MILL
PROJECT NUMBER: 00625 VU07 TDD: —

Well ID #: MW-4 Date: 10/20/99
Recorder: MARK LONGTINE K Miller

GENERAL WELL INFORMATION

Well owner name, phone #, and address: USFS

Address (if different) and description of well location (roads, T., R., S., location on property, etc.; sketch on reverse):
BASSETT GULCH MILL SITE, OFF WARM SPRINGS CREEK ROAD T. 4 N., R. 17 E., S. 20, KETCHUM, IDAHO

GPS: Station #: Lat: ° ' "; Long: ° ' "
Well type (circle one): domestic, municipal, community, (monitoring), commercial, industrial, irrigation, livestock
Well log available (Y/N): Y; Total Depth: 16.5 BGS; Screened/Open Interval: 8-16 BGS; Diameter: 2"
Year well installed: 1997; Well pumping? NA; Pump rate: NA; # people drinking from well: NA

WATER LEVEL MEASUREMENT

Measuring Point Description (sketch on reverse if appropriate): TOP 2" PVC INNER CASING, BLACK MARK, SOUTH SIDE
Static Water Level (to nearest 0.01 ft. below measuring point): 10.76

PURGING INFORMATION

A) Domestic, municipal, commercial, industrial, irrigation wells (on-line and active):
Description of draw point: Holding tank (Y/N): Treatment system (Y/N):
Time purging began: Time purging completed:
Water quality parameters and description at time of sampling: (record in table below)

B) Monitoring Wells not sampled by low-flow technique:
Well total depth (ft): 18.80 - Static water level (ft): 10.76 = Water column (ft): 8.04
Calculated well volume (gal): 1.3 x 3 = Calculated purge volume (gal): 3.9
Purging device: DEDICATED TEFLON BAILER Sampling device: DEDICATED TEFLON BAILER
Water quality parameters and description at time of sampling: (record in table below)

0.163
8
1.304

C) Monitoring Wells sampled by low-flow technique:
Description of pump: NA

Time	Rate (gpm)	Vol. (gal)	T (°C)	pH	Cond. (uS/cm)	D.O. (mg/L)	Turb. (NTU)	Description of water (clarity, color, odor, sheen, particulates), other remarks
1125		0						BEGIN BAILING WELL
1129		1	11.1	6.39	.311	4.46	429	
1134		2	11.2	6.91	.268	5.56	405	sandy-yellow in color
1138		3	11.2	7.03	.263	6.07	293	"
1140		3.5	11.0	7.15	.264	6.14	348	
1144		5	11.2	7.14	.265	5.75	342	

SAMPLING INFORMATION

Sample Time: 1145 Sampler(s): KMiller

EPA Sample #: 99BGMMW01GW CLP Sample #:
Analytical parameters / type and number of sample containers:
TAL Inorganics / 1-1L poly HNO3
Cyanide / 1-1L poly NaOH
BTEX / 2-40mL VOA HCl
/

GROUNDWATER SAMPLE COLLECTION FORM

SITE NAME: BASSETT GULCH mill
PROJECT NUMBER: 000625 UU07 TDD: —

Well ID #: MW-5 Date: 10/20/99
Recorder: k.miller

GENERAL WELL INFORMATION
Well owner name, phone #, and address: USFS

Address (if different) and description of well location (roads, T., R., S., location on property, etc.; sketch on reverse):
BASSETT GULCH MILL SITE, OFF WARMS SPRINGS CREEK ROAD. T.4N, R.17E., S. 20, KETCHUM IDAHO
GPS: Station #: _____ Lat: ____° ____' ____"; Long: ____° ____' ____"
Well type (circle one): domestic, municipal, community, monitoring, commercial, industrial, irrigation, livestock
Well log available (Y/N): Y; Total Depth: ____; Screened/Open Interval: _____; Diameter: ____
Year well installed: 1999; Well pumping? NA; Pump rate: NA; # people drinking from well: NA

WATER LEVEL MEASUREMENT
Measuring Point Description (sketch on reverse if appropriate): Top 2" PVC INNER CASING
Static Water Level (to nearest 0.01 ft. below measuring point): 34.2

PURGING INFORMATION
A) Domestic, municipal, commercial, industrial, irrigation wells (on-line and active):
Description of draw point: _____ Holding tank (Y/N): ___ Treatment system (Y/N): ____
Time purging began: _____ Time purging completed: _____
Water quality parameters and description at time of sampling: (record in table below)

B) Monitoring Wells not sampled by low-flow technique:
Well total depth (ft): 38.75 - Static water level (ft): 34.15 = Water column (ft): 4.60
Calculated well volume (gal): .75 x 3 = Calculated purge volume (gal): 1.95
Purging device: Dedicated Teflon Bailer Sampling device: Dedicated Teflon Bailer
Water quality parameters and description at time of sampling: (record in table below)

4.60
1.63
380
60
0
74980

.75
3
1.95

C) Monitoring Wells sampled by low-flow technique:
Description of pump: _____

Time	Rate (gpm)	Vol. (gal)	T (°C)	pH	Cond. (uS/cm)	D.O. (mg/L)	Turb. (NTU)	Description of water (clarity, color, odor, sheen, particulates), other remarks
1225		INITIAL						Begin purging well
1235	~~.5~~	.5	8.7	7.26	1.15	8.42	423	sediment + yellow
1239		1	8.0	7.27	1.14	7.45	820	" "
1245		2	7.9	7.17	1.14	7.20	939	" "
1248		2.5	7.8	7.06	1.13	6.98	903	" "
1252		3.5	7.9	7.08	1.13	8.10	901	" "

SAMPLING INFORMATION
Sample Time: 1254 Sampler(s): K.Miller
EPA Sample #: 99BGMMW05GW CLP Sample #: _____
Analytical parameters / type and number of sample containers:
THL metals / 1-1 Lt poly HNO3
Cyanide / 1-1 Lt poly NaOH
BTEX / 6-40ml MS/MSD
_____ / _____

GROUNDWATER SAMPLE COLLECTION FORM

SITE NAME: BASSETT GREEN MILL
PROJECT NUMBER: 625.0007 TDD: ✓

Well ID #: 99BGMDW01GW Date: 10-19-99
Recorder:

GENERAL WELL INFORMATION

Well owner name, phone #, and address: ROSEMARIE BOGNER, 726-8088
574 W. WARM SPRINGS ROAD

Address (if different) and description of well location (roads, T., R., S., location on property, etc.; sketch on reverse):

GPS: Station #: Lat: ° ' "; Long: ° ' "

Well type (circle one): (domestic), municipal, community, monitoring, commercial, industrial, irrigation, livestock

Well log available (Y/N): N; Total Depth: 40'; Screened/Open Interval: ; Diameter: 6"

Year well installed: ~~1974~~ 1975; Well pumping? ; Pump rate: ; # people drinking from well: 1

MUNICIPAL WATER SYSTEMS

WATER LEVEL MEASUREMENT

Measuring Point Description (sketch on reverse if appropriate):

Static Water Level (to nearest 0.01 ft. below measuring point):

PURGING INFORMATION

A) (Domestic) municipal, commercial, industrial, irrigation wells (on-line and active):

Description of draw point: Holding tank (Y/N): Treatment system (Y/N):

Time purging began: Time purging completed:

Water quality parameters and description at time of sampling: (record in table below)

B) Monitoring Wells not sampled by low-flow technique:

Well total depth (ft): - Static water level (ft): = Water column (ft):

Calculated well volume (gal): x 3 = Calculated purge volume (gal):

Purging device: Sampling device:

Water quality parameters and description at time of sampling: (record in table below)

C) Monitoring Wells sampled by low-flow technique:

Description of pump:

Time	Rate (gpm)	Vol. (gal)	T (°C)	pH	Cond. (uS/cm)	D.O. (mg/L)	Turb. (NTU)	Description of water (clarity, color, odor, sheen, particulates), other remarks
1106 START			3.9	7.74	0.268	13.10	0	
1121			9.5	6.52 8.60	0.360	6.52		

15 seconds FOR 1 LITER PURGE RATE

SAMPLING INFORMATION

Sample Time: 1121 Sampler(s): K. Miller D. Brown

EPA Sample #: CLP Sample #:

Analytical parameters / type and number of sample containers:

INORGANICS /
CYANIDE /
/
/

GROUNDWATER SAMPLE COLLECTION FORM

SITE NAME: Bassett Green Mill
PROJECT NUMBER: 6255007 TDD: ✓

Well ID #: 99BGMDW02GW Date: 10-19-99
Recorder:

GENERAL WELL INFORMATION

Well owner name, phone #, and address: 592 WEST WARM SPRINGS ROAD
JIM CHAPMAN 726-3780 83340
Address (if different) and description of well location (roads, T., R., S., location on property, etc.; sketch on reverse):

GPS: Station #: Lat: ° ' "; Long: ° ' "
Well type (circle one): domestic, municipal, community, monitoring, commercial, industrial, irrigation, livestock
Well log available (Y/N): Y; Total Depth: ; Screened/Open Interval: ; Diameter: 6"
Year well installed: ; Well pumping? ; Pump rate: ; # people drinking from well: 2-4

WATER LEVEL MEASUREMENT

Measuring Point Description (sketch on reverse if appropriate):
Static Water Level (to nearest 0.01 ft. below measuring point):

PURGING INFORMATION

A) (Domestic) municipal, commercial, industrial, irrigation wells (on-line and active):
Description of draw point: Hose Holding tank (Y/N): ___ Treatment system (Y/N): ___
Time purging began: Time purging completed:
Water quality parameters and description at time of sampling: (record in table below)

B) Monitoring Wells not sampled by low-flow technique:
Well total depth (ft): - Static water level (ft): = Water column (ft):
Calculated well volume (gal): x 3 = Calculated purge volume (gal):
Purging device: Sampling device:
Water quality parameters and description at time of sampling: (record in table below)

C) Monitoring Wells sampled by low-flow technique:
Description of pump:

Time	Rate (gpm)	Vol. (gal)	T (°C)	pH	Cond. (uS/cm)	D.O. (mg/L)	Turb. (NTU)	Description of water (clarity, color, odor, sheen, particulates), other remarks

SAMPLING INFORMATION

Sample Time: 1504 Sampler(s):

EPA Sample #: CLP Sample #:
Analytical parameters / type and number of sample containers:
Inorganics /
Cyanide /
/
/

GROUNDWATER SAMPLE COLLECTION FORM

SITE NAME: BASSETT GULCH MILL
PROJECT NUMBER: 625UU07 TDD: /

Well ID #: GW03 Date: ~~10-7~~ 10-20-99
Recorder: D. BROWN

GENERAL WELL INFORMATION
Well owner name, phone #, and address: CHRIS CORD, 590 WARM SPRINGS RD. KETCHUM 83340 208-726-8991
Address (if different) and description of well location (roads, T., R., S., location on property, etc.; sketch on reverse):

GPS: Station #: GW03 Lat: ° ' "; Long: ° ' "
Well type (circle one): domestic, municipal, community, monitoring, commercial, industrial, irrigation, livestock
Well log available (Y/N): Y; Total Depth: 43; Screened/Open Interval: ; Diameter: 8"
Year well installed: 1992; Well pumping? ; Pump rate: ; # people drinking from well: 2

WATER LEVEL MEASUREMENT
Measuring Point Description (sketch on reverse if appropriate): —
Static Water Level (to nearest 0.01 ft. below measuring point): 4 FEET FROM WELL LOG

PURGING INFORMATION
A) Domestic, municipal, commercial, industrial, irrigation wells (on-line and active):
Description of draw point: HOSE BIB AT HOUSE Holding tank (Y(N): Treatment system (Y(N):
Time purging began: 1445 Time purging completed: 1515
Water quality parameters and description at time of sampling: (record in table below)

~~X~~ B) Monitoring Wells not sampled by low-flow technique:
Well total depth (ft): - Static water level (ft): = Water column (ft):
Calculated well volume (gal): x 3 = Calculated purge volume (gal):
Purging device: Sampling device:
Water quality parameters and description at time of sampling: (record in table below)

40 X C) Monitoring Wells sampled by low-flow technique:
Description of pump:

Time	Rate (gpm)	Vol. (gal)	T (°C)	pH	Cond. (uS/cm)	D.O. (mg/L)	Turb. (NTU)	Description of water (clarity, color, odor, sheen, particulates), other remarks
			11.3	7.79	0.379	10.27	0	CLEAR,

SAMPLING INFORMATION
Sample Time: Sampler(s):
EPA Sample #: CLP Sample #:
Analytical parameters / type and number of sample containers:
/
/
/
/

APPENDIX C

GPS DATA

Bassett Gulch
GPS Locations

Sample	Decimal Degrees		Longitude			Latitude		
Locations	Longitude	Latitude	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
WC01	-114.4463	43.6668	-114	26	46.6516	43	40	0.3212
WC02	-114.4473	43.6669	-114	26	50.1471	43	40	0.9185
DW02	-114.4502	43.6671	-114	27	0.5770	43	40	1.3894
WC03	-114.4550	43.6612	-114	27	18.1296	43	39	40.2295
TP01	-114.4498	43.6625	-114	26	59.2128	43	39	44.8983
TP02	-114.4505	43.6630	-114	27	1.7964	43	39	46.8885
TP03	-114.4507	43.6633	-114	27	2.4098	43	39	47.9482
TR01	-114.4507	43.6641	-114	27	2.5603	43	39	50.7340
MW04	-114.4516	43.6637	-114	27	5.8688	43	39	49.4390
MW05	-114.4502	43.6636	-114	27	0.7709	43	39	48.8322
SP01	-114.4500	43.6638	-114	27	0.0756	43	39	49.8416
MW03	-114.4505	43.6636	-114	27	1.9509	43	39	48.8167
MW02	-114.4502	43.6622	-114	27	0.6331	43	39	44.0043
MW06	-114.4496	43.6606	-114	26	58.4592	43	39	38.2079
MW01	-114.4493	43.6607	-114	26	57.6506	43	39	38.3890
BG01	-114.4491	43.6591	-114	26	56.7348	43	39	32.6318
DW03	-114.4497	43.6669	-114	26	58.8543	43	40	0.8091
DW01	-114.4469	43.6675	-114	26	48.6863	43	40	2.9073
PW01	-114.4517	43.6636	-114	27	6.2580	43	39	48.8474

APPENDIX D

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 6, 1999

TO: William Richards, Project Manager, E & E, Seattle, WA

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

THRU: Rod Peroff, Chemist, E & E, Seattle, WA RP

SUBJ: **Organic Data Quality Assurance Review, Bassett Gulch Site, Ketchum, Idaho**

REF: 000625VU0700400

The data quality assurance review of one soil and five liquid samples collected from the Bassett Gulch site located in Ketchum, Idaho, has been completed. Analysis for Volatile Aromatic Hydrocarbons (EPA Method 8021) was performed by Sound Analytical Services, Inc., Tacoma, Washington.

The samples were numbered:

Soil	99BGMMB01SD		
Water	99BGMSPO1SW	99BGMTBO1GW	99BGMMWO4GW
	99BGMMWO5GW	99BGMPWO1GW	

Data Qualifications:

1. **Sample Holding Times: Acceptable.**

All samples were maintained at 4°C (± 2°C), except two coolers which were received at 7°C and 8°C. This was not judged to be significant, therefore no action was taken based on these discrepancies. The samples were collected on October 20, 1999, and were analyzed on October 27, 1999, therefore meeting QC criteria of less than 14 days between collection and analysis for soil and preserved water samples.

2. **Initial Calibration: Acceptable.**

Calculations were verified as correct for all analytes. All individual relative response factors (RRFs) and average RRFs for the initial calibration were greater than 0.050. All percent relative standard deviations (%RSDs) were less than 25.0 %.

3. **Continuing Calibration: Acceptable.**

Calculations were verified as correct for all analytes. All individual RRFs for the continuing calibration were greater than 0.050. All percent differences (% Ds) were less than 25.0 % except the surrogates in some calibrations; no action was taken based on the surrogate outliers.

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4. **Internal Standards: Acceptable.**

Areas of the internal standards were within the control limits of 50 % to 200 % of the associated 12-hour calibration standard. Retention times were within 30 seconds of the 12-hour standard retention times.

5. **Blanks: Acceptable.**

A method blank was analyzed at the required frequency of every 12 hours beginning with the continuing calibration for each matrix, preparation technique, and analysis system. No target analytes were detected in any associated blanks.

6. **System Monitoring Compounds (SMC): Acceptable.**

All recoveries of the system monitoring compounds (surrogates) were greater than 10 % and within QC criteria.

7. **Matrix Spikes: Acceptable.**

Recoveries of all spiked analytes were within the required control limits for both the matrix spike and matrix spike duplicate analyses.

8. **Duplicates: Acceptable.**

Relative percent differences (RPDs) of all spiked analytes were within the required control limits.

9. **Target Compound Identification: Acceptable.**

All target compounds reported by the laboratory met identification criteria of relative retention times (RRT) within 0.06 RRT units of the 12 hour standard.

10. **Target Compound Quantitation: Acceptable.**

Concentrations of all reported analytes and all quantitation limits were correctly calculated.

11. **Laboratory Contact: Not Required.**

No laboratory contact was required.

12. **Overall Assessment of Data for Use**

The overall usefulness of the data is based on the criteria outlined in the OSWER Directive "Quality Assurance/Quality Control Guidance for Removal Activities, Data Validation Procedures" (EPA/540/G-90/004), the analytical method, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (EPA 540/R-94/012). Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The material was analyzed for but was not detected. The associated numerical value is the estimated sample quantitation limit.

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMSP01SW
Lab ID:	85032-06
Date Received:	10/22/99
Date Prepared:	10/26/99
Date Analyzed:	10/27/99
% Solids	-
Dilution Factor	1

Volatile Aromatic Hydrocarbons by USEPA Method 8021B/5030B Modified

Surrogate	% Recovery	Flags	Recovery Limits Low	Recovery Limits High
Trifluorotoluene	99		67	120
Bromofluorobenzene	103		74	148

Analyte		Result (mg/L)	PQL	MDL	Flags
Benzene	ND		0.001	0.00064	
Toluene	ND		0.001	0.00051	
Ethylbenzene	ND		0.001	0.00037	
m&p-Xylene	ND		0.002	0.00063	
o-Xylene	ND		0.001	0.00063	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTB01GW
Lab ID:	85032-08
Date Received:	10/22/99
Date Prepared:	10/26/99
Date Analyzed:	10/27/99
% Solids	-
Dilution Factor	1

Volatile Aromatic Hydrocarbons by USEPA Method 8021B/5030B Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Trifluorotoluene	101		67	120
Bromofluorobenzene	105		74	148

Analyte	**Result (mg/L)**	**PQL**	**MDL**	**Flags**
Benzene	ND	0.001	0.00064	
Toluene	ND	0.001	0.00051	
Ethylbenzene	ND	0.001	0.00037	
m&p-Xylene	ND	0.002	0.00063	
o-Xylene	ND	0.001	0.00063	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMW04GW
Lab ID:	85032-09
Date Received:	10/22/99
Date Prepared:	10/26/99
Date Analyzed:	10/27/99
% Solids	-
Dilution Factor	1

Volatile Aromatic Hydrocarbons by USEPA Method 8021B/5030B Modified

Surrogate	% Recovery	Flags	Recovery Limits Low	High
Trifluorotoluene	99.7		67	120
Bromofluorobenzene	105		74	148

Analyte	Result (mg/L)	PQL	MDL	Flags
Benzene	ND	0.001	0.00064	
Toluene	ND	0.001	0.00051	
Ethylbenzene	ND	0.001	0.00037	
m&p-Xylene	ND	0.002	0.00063	
o-Xylene	ND	0.001	0.00063	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMW05GW
Lab ID:	85032-10
Date Received:	10/22/99
Date Prepared:	10/26/99
Date Analyzed:	10/27/99
% Solids	-
Dilution Factor	1

Volatile Aromatic Hydrocarbons by USEPA Method 8021B/5030B Modified

Surrogate	% Recovery	Flags	Recovery Limits Low	High
Trifluorotoluene	103		67	120
Bromofluorobenzene	112		74	148

Analyte	Result (mg/L)	PQL	MDL	Flags
Benzene	ND	0.001	0.00064	
Toluene	ND	0.001	0.00051	
Ethylbenzene	ND	0.001	0.00037	
m&p-Xylene	ND	0.002	0.00063	
o-Xylene	ND	0.001	0.00063	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMPW01GW
Lab ID:	85032-11
Date Received:	10/22/99
Date Prepared:	10/26/99
Date Analyzed:	10/27/99
% Solids	-
Dilution Factor	1

Volatile Aromatic Hydrocarbons by USEPA Method 8021B/5030B Modified

Surrogate	% Recovery	Flags	Recovery Limits Low	High
Trifluorotoluene	102		67	120
Bromofluorobenzene	110		74	148

Analyte	Result (mg/L)	PQL	MDL	Flags
Benzene	ND	0.001	0.00064	
Toluene	ND	0.001	0.00051	
Ethylbenzene	ND	0.001	0.00037	
m&p-Xylene	ND	0.002	0.00063	
o-Xylene	ND	0.001	0.00063	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMB01SD
Lab ID:	85032-14
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
% Solids	69.93
Dilution Factor	1

Volatile Aromatic Hydrocarbons by USEPA Method 8021B/5030B Modified

			Recovery Limits	
Surrogate	**% Recovery**	**Flags**	**Low**	**High**
Trifluorotoluene	76.4		67	108
Bromofluorobenzene	74.5		58	156

Sample results are on a dry weight basis.

Analyte	**Result (mg/kg)**	**PQL**	**MDL**	**Flags**
Benzene	ND	0.047	0.0038	
Toluene	ND	0.047	0.015	
Ethylbenzene	ND	0.047	0.0014	
m&p-Xylene	ND	0.095	0.0024	
o-Xylene	ND	0.047	0.00095	

MW

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Tel: (206) 624-9537 , Fax: (206) 621-9832

MEMORANDUM

DATE: December 6, 1999

TO: William Richards, Project Manager, E & E, Seattle, WA

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

THRU: Rod Peroff, Chemist, E & E, Seattle, WA RP

SUBJ: **Inorganic Data Quality Assurance Review, Bassett Gulch Site, Ketchum, Idaho**

REF: 000625VU0700400

The data quality assurance review of three soil samples collected from the Bassett Gulch site located in Ketchum, Idaho, has been completed. Analysis for Toxicity Characteristic Leaching Procedure (TCLP) Target Analyte List Metals (EPA SW-846 6000 and 7000 Series Methods) was performed by Sound Analytical Services, Inc., Tacoma, Washington.

The samples were numbered: 99BGMTP03SS 99BGMTP02SS 99BGMTP01SS

Data Qualifications:

1. **Sample Holding Times: Acceptable.**

The samples were maintained at 4°C (± 2°C), except for two coolers which were received at 7°C and 8°C; no action was taken based on these outliers as the metals are stable at these temperatures. The water samples were preserved with nitric acid to a pH ≤ 2. The samples were collected on October 19 or 20, 1999, and were analyzed by November 3, 1999, therefore meeting QC holding time criteria. Water holding time criteria were applied to the soil samples in the absence of soil holding time criteria.

2. **Initial and Continuing Calibration: Acceptable.**

A minimum of one calibration standard and a blank were analyzed at the beginning of the analysis sequence. A minimum of five calibration standards and a blank were analyzed at the beginning of the mercury analysis sequence and after every 10 samples. No sample results were greater than 110 % of the highest calibration standard. The mercury correlation coefficient was ≥ the QC limit of 0.995. All mercury recoveries were within the QC limits of 80 % to 120 %. All ICP recoveries were within the QC limits of 90 % to 110 %.

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3. **Blanks: Satisfactory.**

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in the soil blanks except the following:

Blank	Element	Concentration
ICB	Barium	6.5 ug/L
CCB2	Silver	378 ug/L
CCB3	Chromium	-3.5 ug/L
PB	Silver	-281.4 ug/L

ICB - Initial Calibration Blank
CCB - Continuing Calibration Blank
PB - Preparation Blank

Associated sample results were qualified as not detected (U) if the sample result was less than five times the blank concentration. Associated sample results were qualified as estimated quantities (J) if the sample result was less than five times the absolute value of the negative blank concentration.

4. **ICP Interference Check Sample: Acceptable.**

An Interference Check Sample (ICS) was analyzed at the beginning and end of each sequence or at least twice every 8 hours, whichever was more frequent. All ICS (solution AB) results were within QC limits of 80% - 120 % recovery except the ICSABF silver result of 130 %; no action was taken based on this outlier as silver was not detected in any sample.

5. **ICP Serial Dilution: Acceptable.**

A serial dilution analysis was performed per matrix per concentration or per sample delivery group, whichever was more frequent. All serial dilution results were within QC limits.

6. **Matrix Spike Analysis: Acceptable.**

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike recoveries were within the QC limits of 75 % to 125 %.

7. **Duplicate Analysis: Acceptable.**

A duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

8. **Laboratory Control Sample Analysis: Acceptable.**

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within QC limits.

9. Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (EPA 540/R-94/013). Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

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 not detected. The reported detection limit is estimated because Quality Control criteria were not met.

The following additional qualifiers were applied when necessary to indicate potential bias of estimated quantities :

L - Low Bias

K - Unknown Bias

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP03SS
Lab ID:	85032-13
Date Received:	10/22/99
Date Prepared:	10/29/99
Date Analyzed:	11/1/99
Dilution Factor	1

TCLP Metals by ICP - USEPA Method 6010

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.16	0.2	0.085	J
Barium	1.3	0.005	0.0012	
Cadmium	0.45	0.02	0.019	
Chromium	ND	0.01 UJL	0.0021	
Lead	0.54	0.05	0.041	
Selenium	ND	0.4 U	0.21	
Silver	ND	0.6 UJK	0.0078	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP03SS
Lab ID:	85032-13
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

TCLP Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.002	0.0017	

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SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP02SS
Lab ID:	85032-16
Date Received:	10/22/99
Date Prepared:	10/29/99
Date Analyzed:	11/1/99
Dilution Factor	1

TCLP Metals by ICP - USEPA Method 6010

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	ND	0.2 U	0.085	
Barium	0.62	0.005	0.0012	
Cadmium	0.046	0.02	0.019	
Chromium	ND	0.01 U J L	0.0021	
Lead	ND	0.05	0.041	
Selenium	ND	0.4	0.21	
Silver	ND	0.6 J K	0.0078	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP02SS
Lab ID:	85032-16
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

TCLP Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.002	0.0017	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP01SS
Lab ID:	85032-17
Date Received:	10/22/99
Date Prepared:	10/29/99
Date Analyzed:	11/1/99
Dilution Factor	1

TCLP Metals by ICP - USEPA Method 6010

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	ND	0.2 U	0.085	
Barium	0.16	0.005	0.0012	
Cadmium	ND	0.02 U	0.019	
Chromium	ND	0.01 UJL	0.0021	
Lead	0.28	0.05	0.041	
Selenium	ND	0.4 U	0.21	
Silver	ND	0.01 UJK	0.0078	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP01SS
Lab ID:	85032-17
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

TCLP Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.002 U	0.0017	

MW
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International Specialists in the Environment

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Seattle , Washington 98104
Tel: (206) 624-9537 , Fax: (206) 621-9832

MEMORANDUM

DATE: December 6, 1999

TO: William Richards, Project Manager, E & E, Seattle, WA

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

THRU: Rod Peroff, Chemist, E & E, Seattle, WA RP

SUBJ: **Inorganic Data Quality Assurance Review, Bassett Gulch Site, Ketchum, Idaho**

REF: 000625VU0700400

The data quality assurance review of ten soil and ten liquid samples collected from the Bassett Gulch site located in Ketchum, Idaho, has been completed. Analysis for Target Analyte List Metals (EPA SW-846 6000 and 7000 Series Methods) and Cyanide (EPA SW-846 Method 9012) was performed by Sound Analytical Services, Inc., Tacoma, Washington.

The samples were numbered:

Soil	99BGMTR01SS	99BGMTP03SS	99BGMMB01SD	99BGMBG01SS
	99BGMTP02SS	99BGMTP01SS	99BGMWC01SD	99BGMWC02SD
	99BGMWC03SD	99BGMSP01SD		
Water	99BGMWC01SW	99BGMWC02SW	99BGMWC03SW	99BGMDWO2GW
	99BGMDWO3GW	99BGMSPO1SW	99BGMDWO1GW	99BGMMW04GW
	99BGMMWO5GW	99BGMDWO1GW		

Data Qualifications:

1. **Sample Holding Times: Acceptable.**

The samples were maintained at 4°C (± 2°C), except for two coolers which were received at 7°C and 8°C; no action was taken based on these outliers as the metals are stable at these temperatures. The water TAL metal samples were preserved with nitric acid to a pH ≤ 2. The water cyanide samples were preserved with sodium hydroxide to a pH ≥ 12. The samples were collected on October 19 or 20, 1999, and were analyzed by November 3, 1999, therefore meeting QC criteria of less than 14 days between collection and cyanide analysis, 28 days between collection and mercury analysis, and less than 6 months between collection and analysis for all other metals. Water holding time criteria were applied to the soil samples in the absence of soil holding time criteria.

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2. **Initial and Continuing Calibration: Acceptable.**

A minimum of one calibration standard and a blank were analyzed at the beginning of the analysis sequence and after every 10 samples. A minimum of five calibration standards and a blank were analyzed at the beginning of the mercury analysis sequence. No sample results were greater than 110 % of the highest calibration standard. The mercury correlation coefficient was ≥ the QC limit of 0.995. All mercury recoveries were within the QC limits of 80 % to 120 %. All ICP recoveries were within the QC limits of 90 % to 110 %.

3. **Blanks: Satisfactory.**

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in the soil blanks except the following:

Blank	Element	Concentration
CCB1	Chromium	-0.2 ug/L
	Silver	0.1 ug/L
CCB2	Barium	30.3 ug/L
	Copper	2.1 ug/L
CCB3	Calcium	10.6 ug/L
	Lead	6.2 ug/L
CCB4	Antimony	0.8 ug/L
	Chromium	0.2 ug/L
	Nickel	5.1 ug/L
	Potassium	264 ug/L
	Thallium	0.3 ug/L
	Magnesium	3.5 ug/L
	Sodium	1,118.2 ug/L
PB	Antimony	0.027 mg/kg
	Calcium	3.72 mg/kg
	Chromium	0.022 mg/kg
	Copper	1.189 mg/kg
	Magnesium	0.194 mg/kg
	Potassium	36.22 mg/kg

PB	Sodium	146.2 mg/kg
	Thallium	0.002 mg/kg

CCB - Continuing Calibration Blank
PB - Preparation Blank

There were no detections in the water blanks except the following:

Blank	Element	Concentration
ICB	Chromium	0.1 ug/L
CCB1	Antimony	0.8 ug/L
	Cadmium	0.1 ug/L
	Copper	2.0 ug/L
	Magnesium	7.3 ug/L
	Nickel	4.1 ug/L
	Potassium	296.6 ug/L
	Silver	0.1 ug/L
	Sodium	592.5 ug/L
CCB2	Calcium	21.0 ug/L
	Thallium	0.4 ug/L
CCB3	Antimony	0.6 ug/L
	Arsenic	0.2 ug/L
	Selenium	0.9 ug/L
PB	Chromium	-0.157 ug/L
	Thallium	-0.009 ug/L

CCB - Continuing Calibration Blank
ICB - Initial Calibration Blank
PB - Preparation Blank

Associated sample results were qualified as not detected (U) if the sample result was less than five times the blank concentration. Associated sample results were qualified as estimated quantities (J) if the sample result was less than five times the absolute value of the negative blank concentration.

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning and end of each sequence or at least twice every 8 hours, whichever was more frequent. All ICS (solution AB) results were within QC limits of 80% - 120 % recovery.

5. **ICP Serial Dilution: Satisfactory.**

A serial dilution analysis was performed per matrix per concentration or per sample delivery group, whichever was more frequent. All serial dilution results were within QC limits except the water antimony, calcium, and magnesium results and the soil arsenic, chromium, copper, iron, lead, silver, vanadium, and zinc sample results. All results for these elements were qualified as estimated quantities (J or UJ) in the associated samples.

6. **Matrix Spike Analysis: Satisfactory.**

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike recoveries were within the QC limits of 75 % to 125 %, except the following:

Sample	Element	% Recovery	Qualifier
99BGMTR01SS	Calcium	127	J/na
	Iron	3	J/R

Qualifiers were applied for all outliers in each associated matrix.

7. **Duplicate Analysis: Acceptable.**

A duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

8. **Laboratory Control Sample Analysis: Acceptable.**

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within QC limits of $\pm$ 20 % difference for water samples or within the established control limits for soil samples.

9. **Overall Assessment of Data for Use**

The overall usefulness of the data is based on the criteria outlined in the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (EPA 540/R-94/013). Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or because quality control criteria limits were not met.

UJ - The material was analyzed for, but not detected. The reported detection limit is estimated because Quality Control criteria were not met.

R - The sample results are rejected (analyte may or may not be present) due to gross deficiencies in quality control criteria. Any reported value is unusable. Resampling and/or reanalysis is necessary for verification.

The following additional qualifiers were applied when necessary to indicate potential bias of estimated quantities :

L - Low Bias

H - High Bias

K - Unknown Bias

B - The result is estimated because the concentration is below the Practical Quantitation Limits

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC01SW
Lab ID:	85032-01
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte	Result (mg/L)	PQL	MDL	Flags
Aluminum	0.21	0.2	0.024	
Barium	0.052	0.005	0.0016	
Beryllium	ND	0.002 U	0.0014	
Calcium	30 J K	0.5	0.01	~~B2~~ MW
Chromium	ND	0.01 U	0.0025	
Cobalt	ND	0.005 U	0.002	
Copper	0.019	0.01	0.0018	
Iron	0.085	0.05	0.017	
Magnesium	5.2 J	0.1	0.026	
Manganese	0.0058	0.05	0.003	J B
Nickel	~~0.0053~~ MW J	0.04 U	0.0032	~~J B~~ MW
Potassium	1.3 U	0.5	0.021	~~B2~~ MW
Sodium	5.9	0.5	0.18	~~B2~~ MW
Vanadium	ND	0.005 U	0.0018	
Zinc	0.043	0.01	0.0044	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC01SW
Lab ID:	85032-01
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.003	0.001	0.0001	
Antimony	~~0.0019~~	0.003 UJK	0.00048	~~J B~~
Cadmium	ND	0.001 U	0.0001	
Lead	0.00042	0.001	0.00011	J B
Selenium	~~0.014~~	0.003	0.00066	
Silver	~~0.000051~~	0.0005 U	0.000031	~~J B~~
Thallium	~~0.00018~~	0.001 U	0.000022	~~J B~~

12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC01SW
Lab ID:	85032-01
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL		MDL	Flags
Mercury	ND	0.0002	U	0.00017	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC02SW
Lab ID:	85032-02
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte		Result (mg/L)	PQL	MDL	Flags
Aluminum		0.033	0.2	0.024	J B
Barium		0.11	0.005	0.0016	
Beryllium	ND		0.002 V	0.0014	
Calcium		73 JK	0.5	0.01	~~B2 MW~~
Chromium	ND		0.01 V	0.0025	
Cobalt	ND		0.005 V	0.002	
Copper		0.012	0.01	0.0018	
Iron		0.12	0.05	0.017	
Magnesium		7.6 JK	0.1	0.026	
Manganese		0.005	0.05	0.003	JB
Nickel		~~0.0052 MW~~	0.04 V	0.0032	~~J B MW~~
Potassium		2.2	0.5	0.021	~~B2 MW~~
Sodium		4.7	0.5	0.18	~~B2 MW~~
Vanadium	ND		0.005 V	0.0018	
Zinc		0.033	0.01	0.0044	

MW

11-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC02SW
Lab ID:	85032-02
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.011	0.001	0.0001	
Antimony	~~0.00019~~	0.003 UJK	0.00048	~~J B~~
Cadmium	ND	0.001 U	0.0001	
Lead	0.0034	0.001	0.00011	
Selenium	0.016	0.003	0.00066	
Silver	~~0.000038~~	0.0005 U	0.000031	~~J B~~
Thallium	~~0.00013~~	0.001 U	0.000022	~~J B~~

MW

12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC02SW
Lab ID:	85032-02
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.0002	0.00017	

MRV
12/6/99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC03SW
Lab ID:	85032-03
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte	Result (mg/L)	PQL	MDL	Flags
Aluminum	ND	0.2 U	0.024	
Barium	0.015	0.005	0.0016	
Beryllium	ND	0.002 U	0.0014	
Calcium	29 JK	0.5	0.01	~~B2~~ ML
Chromium	ND	0.01 U	0.0025	
Cobalt	ND	0.005	0.002	
Copper	ND	0.01	0.0018	
Iron	0.023	0.05	0.017	JB
Magnesium	5.1 JK	0.1	0.026	
Manganese	ND	0.05 U	0.003	
Nickel	ND	0.04 U	0.0032	
Potassium	0.78 U	0.5	0.021	~~B1~~ MU
Sodium	5.9	0.5	0.18	B2 MU
Vanadium	ND	0.005 U	0.0018	
Zinc	0.02	0.01	0.0044	

MW
11-9-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC03SW
Lab ID:	85032-03
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.0037	0.001	0.0001	
Antimony	~~0.0024~~	0.003 UJK	0.00048	~~JB~~
Cadmium	ND	0.001 U	0.0001	
Lead	0.00051	0.001	0.00011	JB
Selenium	0.015	0.003	0.00066	
Silver	~~0.00009~~	0.0005 U	0.000031	~~UJ~~
Thallium	~~0.0007~~	0.001 U	0.000022	~~UJ~~

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC03SW
Lab ID:	85032-03
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.0002	0.00017	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW02GW
Lab ID:	85032-04
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte		Result (mg/L)	PQL	MDL	Flags
Aluminum	ND		0.2U	0.024	
Barium		0.079	0.005	0.0016	
Beryllium	ND		0.002U	0.0014	
Calcium		49 JK	0.5	0.01	~~B2~~ MW
Chromium	ND		0.01U	0.0025	
Cobalt	ND		0.005U	0.002	
Copper		0.06	0.01	0.0018	
Iron		0.056	0.05	0.017	
Magnesium		9.9 J	0.1	0.026	
Manganese		0.0037	0.05	0.003	J B
Nickel		~~0.0058~~ MW	0.04U	0.0032	~~J B~~ MW
Potassium		1.3U	0.5	0.021	~~B2~~ MW
Sodium		2U	0.5	0.18	~~B1~~ MW
Vanadium	ND		0.005U	0.0018	
Zinc		0.097	0.01	0.0044	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW02GW
Lab ID:	85032-04
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.002	0.001	0.0001	
Antimony	~~0.00066~~ MW	0.003 V J K	0.00048	~~J B~~ MW
Cadmium	ND	0.001 V	0.0001	
Lead	0.0064	0.001	0.00011	
Selenium	0.017	0.003	0.00066	
Silver	~~0.000034~~ MW	0.0005 V	0.000031	~~J B~~ MW
Thallium	~~0.000083~~ MW	0.001 V	0.000022	~~J B~~ MW

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW02GW
Lab ID:	85032-04
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.0002	0.00017	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW03GW
Lab ID:	85032-05
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte	Result (mg/L)	PQL	MDL	Flags
Aluminum	ND	0.2 U	0.024	
Barium	0.081	0.005	0.0016	
Beryllium	ND	0.002 U	0.0014	
Calcium	48 J K	0.5	0.01	~~B2 MW~~
Chromium	ND	0.01 U	0.0025	
Cobalt	ND	0.005 U	0.002	
Copper	0.026	0.01	0.0018	
Iron	0.057	0.05	0.017	
Magnesium	9.3 J K	0.1	0.026	
Manganese	0.0036	0.05	0.003	J B
Nickel	~~0.0048 MW~~	0.04 U	0.0032	~~J B MW~~
Potassium	1.4 U	0.5	0.021	~~B2 MW~~
Sodium	2.6 U	0.5	0.18	~~B2 MW~~
Vanadium	ND	0.005 U	0.0018	
Zinc	0.12	0.01	0.0044	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW03GW
Lab ID:	85032-05
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.0031	0.001	0.0001	
Antimony	~~0.00067~~ MW	0.003 UJK	0.00048	~~J~~ B MW
Cadmium	ND	0.001 U	0.0001	
Lead	0.0015	0.001	0.00011	
Selenium	0.017	0.003	0.00066	
Silver	ND	0.0005 U	0.000031	
Thallium	~~0.000075~~ MW	0.001 U	0.000022	~~J~~ B MW

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW03GW
Lab ID:	85032-05
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.0002	0.00017	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMSP01SW
Lab ID:	85032-06
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte		Result (mg/L)	PQL	MDL	Flags
Aluminum	ND		0.2 U	0.024	
Barium		0.095	0.005	0.0016	
Beryllium	ND		0.002 U	0.0014	
Calcium		120 JK	0.5	0.01	~~B2 mw~~
Chromium	ND		0.01 U	0.0025	
Cobalt	ND		0.005 U	0.002	
Copper		~~0.0052 mw~~	0.01 U	0.0018	~~JB mw~~
Iron		0.073	0.05	0.017	
Magnesium		11 JK	0.1	0.026	
Manganese		0.0077	0.05	0.003	JB
Nickel		~~0.0048 mw~~	0.04 U	0.0032	~~JB mw~~
Potassium		2.3	0.5	0.021	~~B2 mw~~
Sodium		7.9	0.5	0.18	~~B2 mw~~
Vanadium	ND		0.005 U	0.0018	
Zinc		0.026	0.01	0.0044	

mw
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMSP01SW
Lab ID:	85032-06
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.0057	0.001	0.0001	
Antimony	~~0.00054~~ MW	0.003 U JK	0.00048	~~JB~~ MW
Cadmium	~~0.00017~~ MW	0.001 U	0.0001	~~JB~~ MW
Lead	0.0029	0.001	0.00011	
Selenium	0.017	0.003	0.00066	
Silver	ND	0.0005 U	0.000031	
Thallium	~~0.000054~~ MW	0.001 U	0.000022	~~JB~~ MW

MW
11-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMSP01SW
Lab ID:	85032-06
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.0002	0.00017	

12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW01GW
Lab ID:	85032-07
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte		Result (mg/L)	PQL	MDL	Flags
Aluminum	ND		0.2U	0.024	
Barium		0.07	0.005	0.0016	
Beryllium	ND		0.002U	0.0014	
Calcium		49 JK	0.5	0.01	~~B2mw~~
Chromium	ND		0.01U	0.0025	
Cobalt	ND		0.005U	0.002	
Copper		~~0.0065 mw~~	0.01U	0.0018	~~JB mw~~
Iron		0.06	0.05	0.017	
Magnesium		8.6	0.1	0.026	
Manganese		0.004 JK	0.05	0.003	JB
Nickel		~~0.0043 mw~~	0.04U	0.0032	~~JB mw~~
Potassium		1.3U	0.5	0.021	~~B2mw~~
Sodium		2.4U	0.5	0.18	~~B2mw~~
Vanadium	ND		0.005U	0.0018	
Zinc		0.09	0.01	0.0044	

mw
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW01GW
Lab ID:	85032-07
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.0027	0.001	0.0001	
Antimony	ND	0.003 J/JK	0.00048	
Cadmium	~~0.00016~~ MW	0.001 U	0.0001	~~JB~~ MW
Lead	0.00024	0.001	0.00011	JB
Selenium	0.016	0.003	0.00066	
Silver	ND	0.0005 U	0.000031	
Thallium	~~0.000026~~ MW	0.001 U	0.000022	~~JB~~ MW

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMDW01GW
Lab ID:	85032-07
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.0002	0.00017	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMW04GW
Lab ID:	85032-09
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte	Result (mg/L)	PQL	MDL	Flags
Aluminum	2.7	0.2	0.024	
Barium	0.11	0.005	0.0016	
Beryllium	ND	0.002 V	0.0014	
Calcium	33 JK	0.5	0.01	~~B2~~ MW
Chromium	0.0078	0.01	0.0025	JB
Cobalt	0.0034	0.005	0.002	JB
Copper	~~0.0062~~ MW	0.01 V	0.0018	~~JB~~ MW
Iron	4.6	0.05	0.017	
Magnesium	5.1 JK	0.1	0.026	
Manganese	0.12	0.05	0.003	
Nickel	~~0.0079~~ MW	0.04 V	0.0032	~~JB~~ MW
Potassium	1.7	0.5	0.021	~~B2~~ MW
Sodium	5.1	0.5	0.18	~~B2~~ MW
Vanadium	0.011	0.005	0.0018	
Zinc	0.033	0.01	0.0044	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMW04GW
Lab ID:	85032-09
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.014	0.001	0.0001	
Antimony	0.0038U ~~0.0038~~ MW	0.003	0.00048	
Cadmium	0.00052	0.001	0.0001	JB
Lead	0.023	0.001	0.00011	
Selenium	0.016	0.003	0.00066	
Silver	~~0.00037~~ MW	0.0005U	0.000031	~~JB~~ MW
Thallium	~~0.00012~~ MW	0.001U	0.000022	~~JB~~ MW

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMW04GW
Lab ID:	85032-09
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.0002	0.00017	

MN
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMW05GW
Lab ID:	85032-10
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte	Result (mg/L)	PQL	MDL	Flags
Aluminum	21	0.2	0.024	
Barium	0.43	0.005	0.0016	
Beryllium	ND	0.002 U	0.0014	
Calcium	280 JK	0.5	0.01	~~B2~~ MW
Chromium	0.027	0.01	0.0025	
Cobalt	0.0057	0.005	0.002	
Copper	0.016	0.01	0.0018	
Iron	14	0.05	0.017	
Magnesium	22 JK	0.1	0.026	
Manganese	0.58	0.05	0.003	
Nickel	~~0.012~~ MW	0.04 U	0.0032	~~J~~ B MW
Potassium	5.8	0.5	0.021	~~B2~~ MW
Sodium	10	0.5	0.18	~~B2~~ MW
Vanadium	0.026	0.005	0.0018	
Zinc	0.11	0.01	0.0044	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMW05GW
Lab ID:	85032-10
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.011	0.001	0.0001	
Antimony	~~0.0019~~	0.003 UJ	0.00048	~~J~~
Cadmium	0.0011	0.001	0.0001	
Lead	0.064	0.001	0.00011	
Selenium	0.019	0.003	0.00066	
Silver	0.0012 ~~0.0012~~	0.0005	0.000031	
Thallium	~~0.00063~~	0.001 U	0.000022	~~J~~

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMW05GW
Lab ID:	85032-10
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	0.00066	0.0002	0.00017	

MR
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMPW01GW
Lab ID:	85032-11
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/3/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Analyte		Result (mg/L)	PQL	MDL	Flags
Aluminum		0.23	0.2	0.024	
Barium		0.11	0.005	0.0016	
Beryllium	ND		0.002 U	0.0014	
Calcium		35 JK	0.5	0.01	~~B2~~ MW
Chromium	ND		0.01 U	0.0025	
Cobalt	ND		0.005 U	0.002	
Copper		0.022	0.01	0.0018	
Iron		2.7	0.05	0.017	
Magnesium		5.2 JK	0.1	0.026	
Manganese		0.05	0.05 U	0.003	JB
Nickel	ND		0.04 U	0.0032	
Potassium		1.2 U	0.5	0.021	~~B2~~
Sodium		5.9	0.5	0.18	~~B2~~ MW
Vanadium		0.002	0.005	0.0018	JB
Zinc		0.61	0.01	0.0044	

MW
11-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMPW01GW
Lab ID:	85032-11
Date Received:	10/22/99
Date Prepared:	11/1/99
Date Analyzed:	11/1/99
Dilution Factor	1

Metals by ICP-MS - USEPA Method 6020

Analyte	Result (mg/L)	PQL	MDL	Flags
Arsenic	0.0055	0.001	0.0001	
Antimony	~~0.000961~~	0.003 U	0.00048	~~J~~
Cadmium	~~0.00016~~	0.001 U	0.0001	~~JB~~
Lead	0.012	0.001	0.00011	
Selenium	0.017	0.003	0.00066	
Silver	~~0.00011~~	0.0005 U	0.000031	~~J~~
Thallium	~~0.00003~~	0.001 U	0.000022	~~J~~

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMPW01GW
Lab ID:	85032-11
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	1

Mercury by CVAA - USEPA Method 7470

Analyte	Result (mg/L)	PQL	MDL	Flags
Mercury	ND	0.0002 U	0.00017	

MM 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTR01SS
Lab ID:	85032-12
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	89.1

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Aluminum	6300	40	4.8	
Barium	13000	8	0.32	
Beryllium	0.5	0.4	0.28	
Calcium	1800 JH	100	2.1	B2MW
Chromium	45 JK	2	0.5	
Cobalt	2.3	1	0.4	
Copper	61 JK	2	0.36	B2MW
Iron	15000 JK	10	3.4	
Magnesium	860	20	5.2	
Manganese	180	10	0.6	
Nickel	8.2	40	0.64	JB
Potassium	970	100	4.3	B2MW
Sodium	1300 BMW	460	36	B1MW
Vanadium	43 JK	1	0.36	
Zinc	710 JK	2	0.88	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTR01SS
Lab ID:	85032-12
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	89.1

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	140 JK	1	0.1	
Antimony	35	3	0.48	
Cadmium	8.1	1	0.1	
Lead	290 JK	1	0.11	
Selenium	2.6	3	0.66	JB
Silver	4.1 JK	0.5	0.031	
Thallium	0.54	1	0.022	JB

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTR01SS
Lab ID:	85032-12
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	89.1

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	1.3	0.034	0.029	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP03SS
Lab ID:	85032-13
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	98.81

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	2000 JK	1.8	1.5	
Aluminum	15000	37	4.4	
Barium	2300	7.4	0.29	
Beryllium	0.89	0.37	0.26	
Calcium	10000 JH	92	1.9	~~B2~~ MW
Chromium	36 JK	1.8	0.46	
Cobalt	8	0.92	0.37	
Copper	370 JK	1.8	0.33	~~B2~~ MW
Iron	64000 JK	9.2	3.2	
Lead	5000 JK	1.3	0.39	
Magnesium	5900	18	4.8	
Manganese	2000	9.2	0.55	
Nickel	ND	37 U	0.59	
Potassium	2100	92	3.9	~~B2~~ MW
Sodium	11000	420	33	~~B2~~ MW
Vanadium	45 JK	0.92	0.33	
Zinc	4700 JK	1.8	0.81	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP03SS
Lab ID:	85032-13
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	98.81

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Antimony	35	2.8	0.44	
Cadmium	51	0.92	0.093	
Selenium	5.8	2.8	0.6	
Silver	33 J K	0.46	0.028	
Thallium	0.73	0.92	0.02	J B

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP03SS
Lab ID:	85032-13
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	98.81

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	0.97	0.031	0.027	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMB01SD
Lab ID:	85032-14
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	69.93

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Aluminum	23000	50	6	
Barium	4200	10	0.4	
Beryllium	0.98	0.5	0.35	
Calcium	24000 J+	130	2.6	~~B2~~ MW
Chromium	100 JK	2.5	0.63	
Cobalt	18	1.3	0.5	
Copper	200 JK	2.5	0.45	B2 MW
Iron	43000 JK	13	4.3	
Lead	1500 JK	1.8	0.53	
Magnesium	14000	25	6.6	
Manganese	1100	13	0.75	
Nickel	~~5~~ MW	50 U	0.8	~~J B~~ MW
Potassium	6900	130	5.4	~~B2~~ MW
Sodium	990 U	580	45	~~B1~~ MW
Vanadium	75 JK	1.3	0.45	
Zinc	910 JK	2.5	1.1	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMB01SD
Lab ID:	85032-14
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	69.93

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	240 JK	1.3	0.13	
Antimony	33	3.8	0.6	
Cadmium	9.1	1.3	0.13	
Selenium	ND	3.8 V	0.82	
Silver	22 JK	0.63	0.039	
Thallium	~~0.25~~	1.3 U	0.028	~~MW~~

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMMB01SD
Lab ID:	85032-14
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	69.93

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	1.2	0.05	0.043	

MM
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMBG01SS
Lab ID:	85032-15
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	97.58

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Aluminum	15000	39	4.7	
Barium	450	7.8	0.31	
Beryllium	0.47	0.39	0.27	
Calcium	2800 JH	97	2	~~B2~~ MW
Chromium	20 JK	1.9	0.49	
Cobalt	4.2	0.97	0.39	
Copper	8 JK	1.9	0.35	~~B1~~ MW
Iron	12000 JK	9.7	3.4	
Magnesium	5200	19	5.1	
Manganese	750	9.7	0.58	
Nickel	6.4	39	0.62	JB
Potassium	2500	97	4.2	~~B2~~ MW
Sodium	ND	450 V	35	
Vanadium	20 JK	0.97	0.35	
Zinc	150 JK	1.9	0.86	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMBG01SS
Lab ID:	85032-15
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	97.58

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	5.5 JK	0.97	0.098	
Antimony	2.1	2.9	0.47	JB
Cadmium	2.1	0.97	0.099	
Lead	37 JK	0.97	0.1	
Selenium	ND	2.9 U	0.64	
Silver	0.16 JK	0.49	0.03	JB
Thallium	~~0.27~~ MW	0.97 U	0.021 ~~JB~~ MW	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMBG01SS
Lab ID:	85032-15
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	97.58

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	ND	0.037	0.032	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP02SS
Lab ID:	85032-16
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	96.18

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Aluminum	15000	37	4.5	
Barium	11000	7.5	0.3	
Beryllium	1.2	0.37	0.26	
Calcium	1300 J+	93	1.9	~~B2~~
Chromium	79 J	1.9	0.47	
Cobalt	2.5	0.93	0.37	
Copper	84 J	1.9	0.34	~~B2~~
Iron	28000 J	9.3	3.2	
Magnesium	1400	19	4.9	
Manganese	140	9.3	0.56	
Nickel	18	37	0.6	JB
Potassium	2800	93	4	~~B2~~
Sodium	850 U	430	34	~~B1~~
Vanadium	74 J	0.93	0.34	
Zinc	520 J	1.9	0.82	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP02SS
Lab ID:	85032-16
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	96.18

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	220 JK	0.93	0.094	
Antimony	9.2	2.8	0.45	
Cadmium	5.6	0.93	0.095	
Lead	410 JK	0.93	0.099	
Selenium	3.5	2.8	0.61	
Silver	6.4 JK	0.47	0.029	
Thallium	1.1	0.93	0.021	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP02SS
Lab ID:	85032-16
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	96.18

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	3	0.034	0.03	

MW
11-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP01SS
Lab ID:	85032-17
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	93.08

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Aluminum	9200	41	4.9	
Barium	600	8.2	0.33	
Beryllium	0.75	0.41	0.29	
Calcium	6700 J	100	2.1	~~B2~~
Chromium	21 J	2	0.51	
Cobalt	2.1	1	0.41	
Copper	56 J	2	0.37	~~B2~~
Iron	21000 J	10	3.5	
Magnesium	430	20	5.4	
Manganese	260	10	0.61	
Nickel	ND	41 U	0.66	
Potassium	2200	100	4.4	~~B2~~
Sodium	~~350~~	470 U	37	~~J B~~
Vanadium	6.9 J	1	0.37	
Zinc	230 J	2	0.9	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP01SS
Lab ID:	85032-17
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	93.08

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	59 JK	1	0.1	
Antimony	9.3	3.1	0.49	
Cadmium	1.4	1	0.1	
Lead	420 JK	1	0.11	
Selenium	1.6	3.1	0.67	J B
Silver	16 JK	0.51	0.032	
Thallium	~~0.21~~ mw	1 U	0.023	~~J B~~ mw

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMTP01SS
Lab ID:	85032-17
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	93.08

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	0.29	0.034	0.029	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC01SD
Lab ID:	85032-18
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	87.74

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Aluminum	5300	44	5.3	
Barium	72	8.8	0.35	
Beryllium	0.34	0.44	0.31	JB
Calcium	2800 JH	110	2.3	~~B2mw~~
Chromium	21 JK	2.2	0.55	
Cobalt	5.1	1.1	0.44	
Copper	6.2 JK	2.2	0.4	~~B1mw~~
Iron	13000 JK	11	3.8	
Magnesium	4100	22	5.8	
Manganese	240	11	0.66	
Nickel	~~4.1mw~~	44 U	0.71	~~Jfmw~~
Potassium	730	110	4.7	~~B2mw~~
Sodium	ND	510 U	40	
Vanadium	25 JK	1.1	0.4	
Zinc	120 JK	2.2	0.97	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC01SD
Lab ID:	85032-18
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	87.74

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	12 JK	1.1	0.11	
Antimony	1.5	3.3	0.53	JB
Cadmium	0.44	1.1	0.11	JB
Lead	56 JK	1.1	0.12	
Selenium	ND	3.3 U	0.72	
Silver	0.18 JK	0.55	0.034	JB
Thallium	~~0.001~~	1.1 U	0.024	~~JB~~

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC01SD
Lab ID:	85032-18
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	87.74

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	ND	0.034	0.029	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC02SD
Lab ID:	85032-19
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	73.81

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Aluminum	8600	50	6	
Barium	310	9.9	0.4	
Beryllium	0.37	0.5	0.35	JB
Calcium	4900 JH	120	2.6	~~B2~~
Chromium	29 JK	2.5	0.62	
Cobalt	5.5	1.2	0.5	
Copper	7.2 JK	2.5	0.45	~~B1~~
Iron	13000 JK	12	4.3	
Magnesium	4700	25	6.5	
Manganese	130	12	0.74	
Nickel	5.3	50	0.79	JB
Potassium	1400	120	5.3	~~B2~~
Sodium	ND	570 V	45	
Vanadium	30 JK	1.2	0.45	
Zinc	120 JK	2.5	1.1	

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC02SD
Lab ID:	85032-19
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	73.81

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	7.7 JK	1.2	0.13	
Antimony	1.8	3.7	0.6	JB
Cadmium	0.88	1.2	0.13	JB
Lead	61 JK	1.2	0.13	
Selenium	1.1	3.7	0.81	JB
Silver	0.37 JK	0.62	0.038	JB
Thallium	~~0.16~~	1.2U	0.027	~~JB~~

MW
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC02SD
Lab ID:	85032-19
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	73.81

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	0.044	0.046	0.04	JB

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC03SD
Lab ID:	85032-20
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	77.25

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Aluminum	6700	52	6.2	
Barium	100	10	0.41	
Beryllium	ND	0.52 U	0.36	
Calcium	3400 J	130	2.7	~~B2~~ MW
Chromium	26 JK	2.6	0.65	
Cobalt	5.7	1.3	0.52	
Copper	6 UJK	2.6	0.47	~~B1~~ MW
Iron	15000 JK	13	4.4	
Magnesium	4200	26	6.8	
Manganese	170	13	0.78	
Nickel	~~4.8~~ MW	52 U	0.83	~~JB~~ MW
Potassium	1100	130	5.5	~~B2~~ MW
Sodium	ND	590 U	47	
Vanadium	33 JK	1.3	0.47	
Zinc	150 JK	2.6	1.1	

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC03SD
Lab ID:	85032-20
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	77.25

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	30 JK	1.3	0.13	
Antimony	1.6	3.9	0.62	JB
Cadmium	0.74	1.3	0.13	JB
Lead	76 JK	1.3	0.14	
Selenium	0.87	3.9	0.85	JB
Silver	0.23 JK	0.65	0.04	JB
Thallium	~~<0.081 mw~~	1.3U	0.028	~~JB mw~~

MW
11-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMWC03SD
Lab ID:	85032-20
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	77.25

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	ND	0.04	0.034	

Mm
12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMSP01SD
Lab ID:	85032-21
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	11/3/99
Dilution Factor	1
% Solids	28.37

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Arsenic	3700 JK	6.9	5.6	
Aluminum	18000	140	17	
Barium	1400	28	1.1	
Beryllium	ND	1.4 U	0.97	
Calcium	33000 JH	350	7.2	~~B2~~ MW
Chromium	31 JK	6.9	1.7	
Cobalt	3	3.5	1.4	JB
Copper	56 JK	6.9	1.2	~~B2~~ MW
Iron	52000 JK	35	12	
Lead	29000 JK	4.9	1.5	
Magnesium	4000	69	18	
Manganese	130	35	2.1	
Nickel	ND	140 U	2.2	
Potassium	5200	350	15	~~B2~~ MW
Sodium	4800	1600	130	~~B1~~ MW
Vanadium	38 JK	3.5	1.2	
Zinc	2600 JK	6.9	3.1	

MW 12690

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMSP01SD
Lab ID:	85032-21
Date Received:	10/22/99
Date Prepared:	10/28/99
Date Analyzed:	10/28/99
Dilution Factor	5
% Solids	28.37

Metals by ICP-MS - USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Antimony	400	10	1.7	
Cadmium	16	3.5	0.35	
Selenium	20	10	2.3	
Silver	170 JK	1.7	0.11	
Thallium	1.1	3.5	0.076	J B

12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Client ID:	99BGMSP01SD
Lab ID:	85032-21
Date Received:	10/22/99
Date Prepared:	10/27/99
Date Analyzed:	10/27/99
Dilution Factor	1
% Solids	28.37

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MDL	Flags
Mercury	4.3	0.1	0.087	

MR
12-6-99

ecology and environment, inc.
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MEMORANDUM

DATE: December 6, 1999

TO: William Richards, Project Manager, E & E, Seattle, WA

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

THRU: Rod Peroff, Chemist, E & E, Seattle, WA RP

SUBJ: **Inorganic Data Quality Assurance Review, Bassett Gulch Site, Ketchum, Idaho**

REF: 000625VU0700400

The data quality assurance review of ten soil and ten liquid samples collected from the Bassett Gulch site located in Ketchum, Idaho, has been completed. Analysis for Cyanide (EPA SW-846 Method 9012) was performed by Sound Analytical Services, Inc., Tacoma, Washington.

The samples were numbered:

Soil	99BGMTR01SS	99BGMTP03SS	99BGMMB01SD	99BGMBG01SS
	99BGMTP02SS	99BGMTP01SS	99BGMWC01SD	99BGMWC02SD
	99BGMWC03SD	99BGMSP01SD		
Water	99BGMWC01SW	99BGMWC02SW	99BGMWC03SW	99BGMDWO2GW
	99BGMDWO3GW	99BGMSPO1SW	99BGMDWO1GW	99BGMMW04GW
	99BGMMWO5GW	99BGMPWO1GW		

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were maintained at 4°C (± 2°C), except for two coolers which were received at 7°C and 8°C; no action was taken based on these outliers as cyanide is stable at these temperatures. The water cyanide samples were preserved with sodium hydroxide to a pH ≥ 12. The samples were collected on October 19 or 20, 1999, and were analyzed by November 3, 1999, therefore meeting QC criteria of less than 14 days between collection and cyanide analysis. Water holding time criteria were applied to the soil samples in the absence of soil holding time criteria.

recycled paper

2. **Initial and Continuing Calibration: Acceptable.**

A minimum of five calibration standards and a blank were analyzed at the beginning of the cyanide analysis sequence. No sample results were greater than 110 % of the highest calibration standard. The cyanide correlation coefficient was ≥ the QC limit of 0.995. All cyanide recoveries were within the QC limits of 85 % to 115 %.

3. **Blanks: Acceptable.**

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks.

4. **Matrix Spike Analysis: Acceptable.**

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike recoveries were within the QC limits.

5. **Duplicate Analysis: Acceptable.**

A duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

6. **QC Check Sample: Acceptable.**

A QC check sample was analyzed per SDG per matrix. All QC check sample results were within QC limits.

7. **Overall Assessment of Data for Use**

The overall usefulness of the data is based on the criteria outlined in the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical method, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (EPA 540/R-94/013). Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SOUND ANALYTICAL SERVICES, INC.

Client Name	Ecology & Environment
Project Name	VU07 Bassett Gulch
Date Received	10-22-99

General Chemistry Parameters

Client Sample ID			99BGMWC01SW		
Lab ID			85032-01		
Parameter	**Method**	**Date Analyzed**	**Units**	**Result**	**PQL**
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID			99BGMWC02SW		
Lab ID			85032-02		
Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID			99BGMWC03SW		
Lab ID			85032-03		
Parameter	**Method**	**Date Analyzed**	**Units**	**Result**	**PQL**
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID			99BGMDW02GW		
Lab ID			85032-04		
Parameter	**Method**	**Date Analyzed**	**Units**	**Result**	**PQL**
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID			99BGMDW03GW		
Lab ID			85032-05		
Parameter	**Method**	**Date Analyzed**	**Units**	**Result**	**PQL**
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Sample ID 99BGMSP01SW
Lab ID 85032-06

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID 99BGMDW01GW
Lab ID 85032-07

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID 99BGMMW04GW
Lab ID 85032-09

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID 99BGMMW05GW
Lab ID 85032-10

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID 99BGMPW01GW
Lab ID 85032-11

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/L	ND	0.050 U

Client Sample ID 99BGMTR01SS
Lab ID 85032-12

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	ND	1.1 U

Client Sample ID 99BGMTP03SS
Lab ID 85032-13

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	4.8	1.0

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

Client Sample ID 99BGMMB01SD
Lab ID 85032-14

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	2.0	1.4

Client Sample ID 99BGMBG01SS
Lab ID 85032-15

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	1.0	1.0

Client Sample ID 99BGMTP02SS
Lab ID 85032-16

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	1.7	0.99

Client Sample ID 99BGMTP01SS
Lab ID 85032-17

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	ND	1.0 U

Client Sample ID 99BGMWC01SD
Lab ID 85032-18

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	ND	0.97 U

Client Sample ID 99BGMWC02SD
Lab ID 85032-19

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	ND	1.4 U

Client Sample ID 99BGMWC03SD
Lab ID 85032-20

Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	ND	1.3 U

MW 12-6-99

SOUND ANALYTICAL SERVICES, INC.

	Client Sample ID	99BGMSP01SD			
	Lab ID	85032-21			
Parameter	Method	Date Analyzed	Units	Result	PQL
Cyanide	EPA 9012	11-02-99	mg/kg	ND	3.5 V

MW
12-6-99