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MANAGEMENT & REMEDIATION DIVISION

SITE INSPECTION REPORT

Minnie Moore Mine Site
Blaine County, Idaho

Prepared for

U.S. Environmental Protection Agency — Region 10
Contract No: 68-SO-10-03
TDD: 02-04-0004

Prepared by

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List of Acronyms

Acronym	**Definition**
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CLP	Contract Laboratory Program
CLPAS	Contract Laboratory Program Analytical Services
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
DQOs	data quality objectives
EPA	United States Environmental Protection Agency
GPS	Global Positioning System
Herrera	Herrera Environmental Consultants, Inc.
IDL	instrument detection limit
IDW	investigation-derived waste
ILM	inorganic laboratory method
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
MS/DUP	Matrix Spike/Duplicate
NPL	National Priorities List
NWI	National Wetlands Inventory
PA	Preliminary Assessment
PPE	probable point of entry
PRG	Preliminary Remediation Goals
QA	quality assurance
QC	quality control
RPD	relative percent difference
SI	Site Inspection
SQAP	Sampling and Quality Assurance Plan
SQL	Sample Quantitation Limit
START	Superfund Technical Assessment and Response Team
TAL	Target Analyte List
TDD	Technical Direction Document
TDL	Target Distance Limit

1.0 Introduction

The United States Environmental Protection Agency (EPA) has tasked Herrera Environmental Consultants, Inc. (Herrera) to provide technical support and conduct a Site Inspection (SI) at the Minnie Moore Mine site located near Bellevue, Idaho. Herrera conducted the SI activities under Technical Direction Document (TDD) No. 02-04-0004 issued under EPA, Region 10, Superfund Technical Assessment and Response Team (START) Contract No. 68-SO-10-03. The specific goals for this SI were intended to address SI objectives presented below:

- Collect and analyze samples to characterize potential contaminant sources
- Determine if offsite migration of contaminants has occurred
- Provide the EPA with appropriate information to determine whether the site is eligible for placement on the National Priorities List (NPL)
- Document any threat or potential threat to public health or the environment posed by the site.

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

2.0 Site Background

2.1 Site Description and Background

2.1.1 Project Location

Site Name:	Minnie Moore Mine
CERCLIS ID No.:	IDN001002295
Location:	Blaine County, Idaho
Latitude:	43°28'09" N
Longitude:	114°17'35" W
Legal Description:	Section 35, Township 2N, Range 18E of the Boise Meridian
Site Owners/Contacts:	Carl Johnston 3145 Sorrel St. Las Vegas, NV 89146 James Bilbray 3800 Howard Hughes Parkway, 7th Floor Las Vegas, NV 89109 Mick Halverson P.O. Box 3722 Hailey, ID 83333 William Evans 42 Fox Hollow Gulch Rd. Bellevue, ID 83313 Shannon and Arek Pace P.O. Box 357 Hailey, ID 83333

2.1.2 Site Description and Current Use

The Minnie Moore Mine is located about 1.5 miles west of Bellevue, Idaho in the Mineral Hill mining district of the Big Wood River Valley (Figure 2-1). The mine is at the mouth of Minnie Moore Gulch, formerly Galena Gulch, at an elevation of 5,300 feet above sea level. The site consists of the remains of a mill, the burned remains of a shop, a bunkhouse, a domestic well, a tailings pile, and two dry tailings overflow ponds (Figure 2-2).

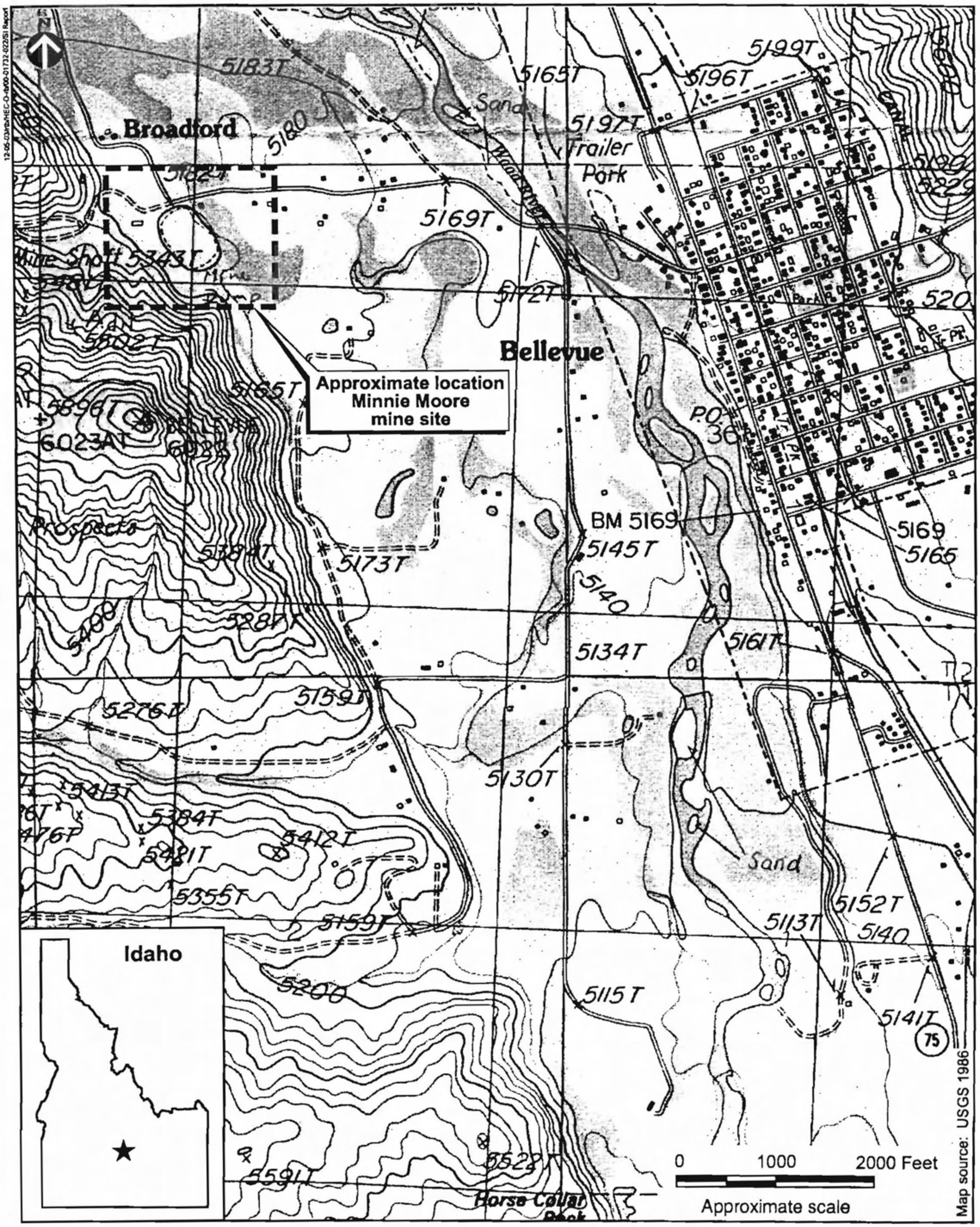

Figure 2-1. Vicinity map of the Minnie Moore mine site, Blaine County, Idaho.

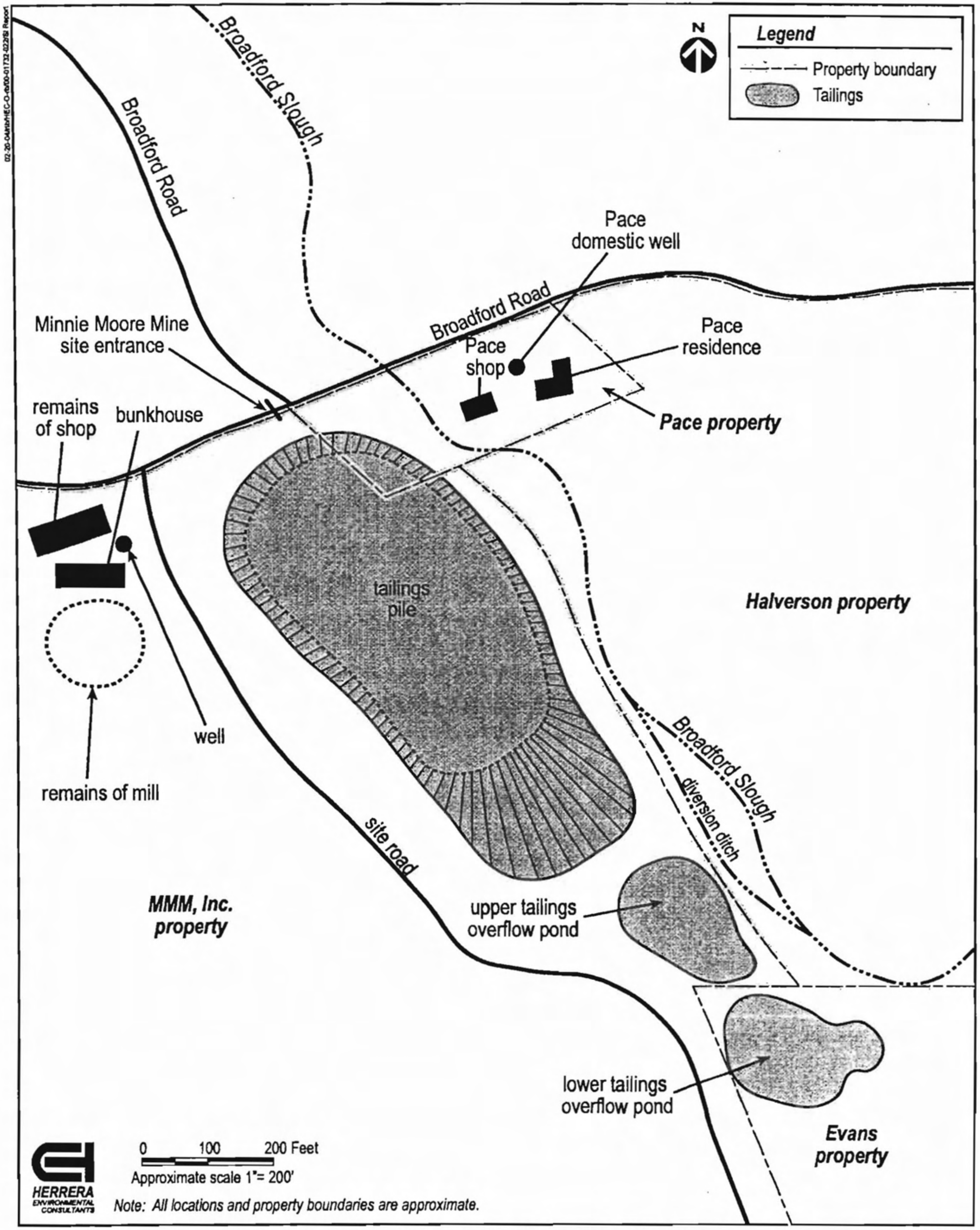

Figure 2-2. Site map of the Minnie Moore Mine site, Blaine County, Idaho.

Broadford Slough borders the east side of the tailings pile, flowing 2.1 miles southeast to its confluence with the Big Wood River (USGS 1986a).

There are four mine shafts associated with the site: Minnie Moore, Relief, Overland, and Rockwell, with waste rock piles adjacent to all but the Rockwell shaft (the waste rock was removed). The Rockwell shaft is about 500 feet west and uphill from the tailings pile; the other three shafts are farther west. According to Mr. Johnston, all of the mineshafts are covered and fenced (EPA 2002a). Several roads composed of crushed waste rock provide access to portions of the site (EPA 2002a). At the direction of EPA, no sampling or investigation of the mine shafts or waste rock piles was conducted during the SI.

A roughly rectangular tailings pile is located just south of the site entrance from Broadford Road. It is about 20 feet tall and covers an area of approximately 6 acres. It is bordered to the east by Broadford Slough. The tailings are the waste product that resulted from operations at the former onsite mill. Ores from the mines were processed to extract silver and other minerals of value, leaving the fine-grained, gray tailings.

Two dry tailings overflow ponds are present southeast of the tailings pile. The two ponds are currently separated by a rock berm constructed by Mr. Evans to mark the boundary of his property, according to Mr. Johnston. In some areas, a white crystalline material that appears to have precipitated from the tailings was visible on the surface of the ponds.

Concrete foundations and walls, remaining from the former mill, are present approximately 150 feet west of the tailings pile and 150 feet south of the bunkhouse.

The former mine property is currently owned by four parties. Approximate property boundaries are shown on Figure 2. The boundaries are based in interpolation from several sources, and should not be considered definitive.

One of the current owners, Carl Johnston, operated a quarry providing crushed limestone for roads and riverbed linings until 1998, when his operation was shut down by the county. He, in partnership with James Bilbray (under the name of MMM, Inc.), owns the land containing the mine shafts, the former mill and shop, the bunkhouse and well, the upper tailings pond, and most of the tailings pile. Mr. Johnston currently rents the bunkhouse to a Spanish-speaking family of nine, including several children. The onsite well, originally installed for industrial purposes, is used by the bunkhouse residents for their domestic water supply. It also provides water for a vegetable garden, located just south of the bunkhouse. Both the well and bunkhouse are located approximately 150 feet west of the tailings pile.

The Paces own a piece of property that contains the northeast corner of the tailings pile, as well as land on the opposite (east) side of Broadford Slough, where they have a house and a metal-sculpting shop (Galena 1996). They both live (with their daughter) and work on this property. They purchased the property in 1997 and subsequently built the house and shop. The Pace's water supply is from a private well on their property. They have been living on the property for 2 years.

Mr. Halverson owns the property southeast of the Paces and northeast of the slough, including some of the wetlands adjacent to the slough (Butler 2001; Ivie 2003). No significant improvements have been made to the property. He bought the property from Jason Day in 1990, who bought it from Carl Johnston 20 to 25 years ago (Halverson 2003). He also owns other land in the area, including his residential property located about 500 feet north of the site.

Mr. Evans owns less than 1 acre at the southeastern end of the site, which includes the lower tailings pond. Mr. Evans' property extends southeast several hundred yards, where he owns a home and horse stables on Fox Hollow Gulch Road. He has made no improvements to the portion of his property on the mine site, other than to build up a rock berm to mark his property boundary.

2.1.3 Historical Site Operations and Waste Characteristics

The Minnie Moore Mine was the most famous of the Big Wood River silver mines, producing about $7 million worth of ore between 1881 and 1887. According to a state historical marker, the Minnie Moore grossed $8.4 million while active. Since the early 1900s, the site has had more than 15 owners. The property containing the four mine shafts has been owned by Mr. Johnston and Mr. Bilbray since 1978 (EPA 2002a; Mitchell 1994). Table 1-2 provides an ownership history and brief summaries of significant mining and processing activities that have occurred at the site (Mitchell 1994).

As of 1908, equipment at the mill included water pumps, a 750 horsepower hydroelectric power plant, and new ore concentration equipment to allow reprocessing of 140,000 tons of old mill tailings. These tailings were said to contain up to 2.2 percent lead, 11.5 percent zinc, 6 ounces per ton silver, and 0.03 ounces per ton gold. The mill was divided into two sides. One side had a wet process of crushing, close classification, and concentration on Wilfley tables; a slime separation unit; and triplex rolls for more efficient and uniform crushing of the ore. The other side used a dry concentration process that included a revolving dryer and dry concentrating tables and classifiers. The high-grade portion of the ore was shipped direct; the lower grade portion was concentrated 4 to 1 before shipping (Mitchell 1994).

Typical flotation processes can include amalgamation, leaching, and/or flocculation, all of which utilize inorganic compounds, including mercury. Contaminants of concern at the site consist of Target Analyte List (TAL) metals (including mercury).

2.2 Site Characterization

2.2.1 Previous Investigations

The EPA conducted a Preliminary Assessment (PA) of the site in 2000. At the conclusion of the PA, further action under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was recommended.

Table 1-2. Summary of historical information.

Owner/Operator	Dates	Major Activities
Moore, Scriber, Grayson, Miller	1880-1884	Surface mining, main inclined shaft to 160' below ground surface; 2 levels east to 205', 3 levels west to 80'.
Dent, Palmer & Co.	1884-1900	High production during this time; then in 1889 the mine closed and was allowed to flood.
Minnie Moore Mining Co./Schwab (owned by Rockwell Carpenter and Associates)	1900-1906	Water was pumped out and further exploration took place. Workings included a 1,000' inclined shaft, a 250'shaft, and drifts. 100 tons per day mill with jigs and Wilfrey tables was used onsite.
Idaho Consolidated Mines Co.	1906-1915	A new mill was completed in 1908 and was operated for 3 months on old tailings. A new hydroelectric plant was completed. Continued to dewater the Minnie Moore and Relief shafts. In 1909, both sections of the mill were operated and lead and zinc concentrates and lead-silver concentrates were produced from old tailings.
Minnie Moore Mines Co.	1912-1927?	In 1913, the Minnie Moore shaft caved in and was abandoned. The mill was remodeled to process the tailings from the Queen of the Hills mine (until 1921).
Federal Mining & Smelting Co.	1923-1924	More renovations took place in 1923, and the Allen shaft was advanced significantly in 1924 to locate the Minnie Moore vein.
Harold Boericke	1924-1925	Development work continued.
Unnamed lessee	1926	Development work continued.
Minnie Moore Syndicate	1926	Development work continued.
unknown	1927-1931	In 1927, the mine was abandoned, buildings were dismantled, and equipment was removed from the property.
Federal Mining & Smelting Co.	1931-1935	In 1932 (date questionable), Federal began sinking the Rockwell shaft. They were unsuccessful in locating the Minnie Moore vein and the property was surrendered in 1935.

Owner/Operator	Dates	Major Activities
Stratton & Stratton/Minnie Moore Mine Development Co.	1935-1943	S&S looked for the MM vein via the Hershey crosscut. They found the Bergman vein in 1939, but it did not contain much ore. In 1941, the mine was allowed to flood. Old tailings were shipped from the property between 1941 and 1944.
Walker & Walker/W.J. Walter	Unknown (pre-1950 to post-1964)	In 1949, the Silver Star-Queens Mines Company began rehabilitation the Rockwell shaft in order to gain access to the lower levels of the Queen of the Hills Mine.
Silver Star-Queens Mines, Inc.	1949-1970?	
Samson Oil and Mineral Company	1959-1961	Operations ceased in 1959 when a "breccia blowout" occurred in the Rockwell shaft. Some prospecting was done in 1960.
Federal Resources Corporation	1961-1971	In 1964, FRC completed construction of a 250 tons per day flotation mill. Tailings were reprocessed during 1964 and 1965.
Carl Johnston	1974-present	Quarrying.
Unknown operator	1980	A company based in Hailey reprocessed material from the tailings pile.
	1983	In mid-1983, high-grade silver ore was discovered accidentally by a contractor who was breaking up rock for riprap.
Exxon Minerals Company	1983-1986	1984 to 1985, Exxon reopened mines and did exploration.

A wetlands delineation of the Pace property was conducted by Galena Engineering Inc. in 1996, indicating wetlands crossing the property along Broadford Slough (Galena 1996). The Paces also had samples of the tailings on their property analyzed in 1995. Samples contained arsenic (up to 4,600 mg/kg), lead (up to 127 mg/kg), and cadmium (up to 4.3 mg/kg) (Agri-test 1995).

2.2.2 START Site Visit

The START did not conduct a presampling site visit, relying instead on information gathered by EPA during the PA.

2.2.3 Summary of SI Investigation Locations

Based on a review of existing information, areas and features within the site were identified for sample collection during the SI as potential CERCLA hazardous substance sources migration routes.

Potential Sources:

- **Tailings pile and tailings overflow ponds.** It is assumed that tailings at the site have been physically and chemically processed. Contaminants of concern include TAL metals (including mercury).
- **Mill site soils.** Historical mill processes may include concentration, flotation, and mercury amalgamation. Contaminants of concern include TAL metals (including mercury).

Migration Routes:

- **Surface water drainage.** Overland flow from tailings piles and mill soils may enter the Broadford Slough. Contaminants of concern in include TAL metals (including mercury).
- **Subsurface percolation.** Drainage from tailings piles and mill soils may migrate to ground water beneath the site. Contaminants of concern include TAL metals (including mercury).
- **Air pathway.** Contaminated soil particles may become airborne during dry periods.
- **Soil exposure pathway.** No barriers to direct contact with contaminated soils or tailings are present.

Potential Targets:

- **Broadford Slough surface water.** Contamination from potential sources at the site may migrate via overland runoff, flooding, and ground water to Broadford Slough. Broadford Slough flows into the Big Wood River, which supports sport fishing. Contaminants of concern include TAL metals (including mercury).
- **Broadford Slough sediment.** River sediment tends to accumulate persistent contaminants, providing a long-term exposure mechanism to aquatic organisms. Contaminants of concern include TAL metals (including mercury).

- **Wetlands.** Contamination from potential sources at the site may be migrating via overland runoff and the Broadford Slough to wetlands located adjacent to and downstream of the site. Contaminants of concern include TAL metals (including mercury).

- **Ground water.** Contamination from potential sources at the site may be migrating to the on-site domestic well. Contaminants of concern include TAL metals (including mercury).

- **Soils and tailings.** Contamination from potential sources may be migrating via wind blown particles. Onsite and nearby residents may come into direct contact with contaminated soils and tailings.

3.0 Field Activities and Analytical Protocol

The Minnie Moore Mine Sampling and Quality Assurance Plan (SQAP) approved by EPA prior to field sampling was based on review of background information, interviews with site representatives, and a PA site visit by EPA in November 2001 (Herrera 2003). The SQAP describes the sampling strategy and methodology, in addition to the analytical program used to investigate potential hazardous substance sources and potential targets. With few exceptions, SI field activities were conducted in accordance with the approved SQAP; deviations were approved by the EPA and are described, when applicable, in the sampling location discussions in Section 6 and Section 7.

The SI field-sampling event was conducted from June 29 through July 2, 2003. A total of 24 samples, including background samples, were collected from onsite and offsite locations. Sample types and methods of collection are described below. A list of all samples collected for laboratory analysis for the SI is presented in Table 3-1 and photographic documentation of field activities is presented in Appendix A.

Alphanumeric identification numbers applied by the START to each sample location (e.g., MM01SS) are used in the report as the sample location identifiers. Sample locations are provided in Figure 3-1.

3.1 Sampling Methodology

Surface soil, sediment, and ground water samples were collected at the Minnie Moore Mine site in accordance with the sampling methodologies provided in the SQAP. Materials unsuitable for analysis were removed from samples before being placed into sample containers. Soil and sediment sample material was homogenized in dedicated stainless steel bowls prior to containerization. Dedicated stainless steel spoons/scoops and bowls were used to collect, homogenize, and place sampled material into sample containers. All bowls and spoons were decontaminated before use and disposed of after each sample was containerized. No non-dedicated sampling tools were used in this sampling event. Samples were stored on ice in coolers maintained under the custody of START personnel.

3.1.1 Surface Soil Samples

A total of 13 surface soil samples, including two at background locations, were collected from the Minnie Moore Mine site and its vicinity. All were discrete grab samples collected across the site in areas of potential contamination and at background locations determined to be outside the potential influence of the site. Samples were collected from 0 to 6 inches below ground surface (bgs).

Table 3-1. Sample collection and analytical summary, Minnie Moore Mine Site, Blaine County Idaho.

EPA Sample ID	Station	Lab Sample ID	Matrix	Depth (inches bgs)	Analysis TAL Metals	Description
202103	MM02SS	MJ4002	SS	0-6	X	Soil sample collected from west side of mill foundation; gray brown fine to course sand, some fine gravel (Photos 1-3, 1-6).
202104	MM03SS	MJ4003	SS	0-6	X	Soil sample collected approximately 45 feet from southwest corner of bunkhouse; brown fine sand with some gravel (Photos 1-4, 1-5).
202105	MM04SS	MJ4004	SS	0-6	X	Soil sample collected from center of lower tailings pond (dry); top inch was cracked rust and white sand/silt, below was dark gray fine sand/silt.
202106	MM05SS	MJ4005	SS	0-6	X	Soil sample collected from center of upper tailings pond (dry); top inch was cracked rust and white sand/silt, below was dark gray fine sand/silt (Photos 1-8, 1-10).
202107	MM06SS	MJ4006	SS	0-6	X	Soil sample collected from main tailings pile; fine brownish-gray tailings (Photo 1-13).
202108	MM07SS	MJ4007	SS	0-6	X	Soil sample collected from main tailings pile; brownish gray fine tailings (Photo 1-14).
202109	MM08SS	MJ4008	SS	0-6	X	Soil sample collected from the north corner of the main tailings pile; top ½ inch hard gray crust, below were separate layers of red and brown fine-grained material (Photos 1-16, 1-17).
202110	MM09SS	MJ4009	SS	0-6	X	Soil sample collected from the berm present to the northeast of the main tailings pile; fine to coarse sand, with some fine gravel (Photo 1-18).
202111	MM10SS	MJ4010	SS	0-6	X	Soil sample collected from a small drainage canal on the northeast side of the tailings pile; fine gray tailings (Photos 1-22, 1-23).
202124	MM11SS	MJ4023	SS	0-6	X	Sample collected from a pile of grayish-white crusty material at the lower end of the main tailings pile. Dense hard granular material (Photos 2-21, 2-22).
202125	MM12SS	MJ4024	SS	0-6	X	Sample collected from the west side of the tailings pile where the pile is closest (~100 feet) to the bunkhouse; fine grayish-brown tailings with some gravel (Photo 2-23, 2-24).
202116	BG04SS	MJ4015	SS	0-6	X	Background soil sample collected approximately 1/4 mile northwest of tailings pile; gray fine to medium sand (Photos 1-47, 1-48).
202117	BG05SS	MJ4016	SS	0-6	X	Background soil sample collected northwest of tailings pile; light brown sand with some organic matter (Photos 1-49, 1-50).

Table 3-1. Sample collection and analytical summary, Minnie Moore Mine Site, Blaine County Idaho (continued).

EPA Sample ID	Station	Lab Sample ID	Matrix	Depth (inches bgs)	Analysis TAL Metals	Description
202114	BG02SD	MJ4013	SD	0-6	X	Background sediment sample collected from Broadford Slough 15 feet upstream of the north end of the culvert that crosses below Broadford Road; fine to coarse gravel (Photos 1-43, 1-44).
202115	BG03SD	MJ4014	SD	0-6	X	Background sediment sample collected from Broadford Slough (emergent scrub/shrub wetland), several hundred feet upstream of BG02SD; dark fine-grained sand/silt (Photos 1-45, 1-46).
202118	BS01SD	MJ4017	SD	0-6	X	Sample collected from a wetland area in Broadford Slough, adjacent to the upper tailings pond; fine to medium dark brown sand with some silt (Photos 1-30, 1-31).
202119	BS02SD	MJ4018	SD	0-6	X	Sample collected from a wetland area, approximately 350 feet upstream of BS01SD and just downstream of the diversion dam;. dark brown, fine sand silt with organic content (Photo 1-33).
202120	BS03SD	MJ4019	SD	0-6	X	Sample collected from Broadford Slough adjacent to the lower end of the tailings pile; dark brown sand/silt with some organic matter (Photos 1-36, 1-37).
202121	BS04SD	MJ4020	SD	0-6	X	Sample collected from Broadford Slough about 120 feet above BS03SD; dark brown sand/silt with some organic matter (Photos 1-39, 1-40).
202122	BS05SD	MJ4021	SD	0-6	X	Sample collected from Broadford Slough adjacent to the north end of the tailings pile; dark brown sand/silt (Photos 1-41, 1-42).
202123	DD01SD	MJ4022	SD	0-6	X	Sediment sample collected from the diversion ditch, just downstream of the diversion dam; dark brown/black fine-grained sediment (Photo 1-34).
202101	MM01GW	MJ4000	GW	NA	X	Ground water sample collected from the well that supplies the onsite bunkhouse from an outdoor spigot (Photo 1-2).
202102	BG01GW	MJ4001	GW	NA	X	Sample was collected about 1,000 feet northwest of the site at the Halverson residence from the outdoor spigot (Photo 1-7).
202112	PC01GW	MJ4011	GW	NA	X	Ground water sample collected from the Pace residence from the kitchen tap (Photo 1-1).

Key:

bgs	= below ground surface
EPA	= United States Environmental Protection Agency.
GW	= ground water.
ID	= identification
SD	= sediment.
SS	= Surface soil.

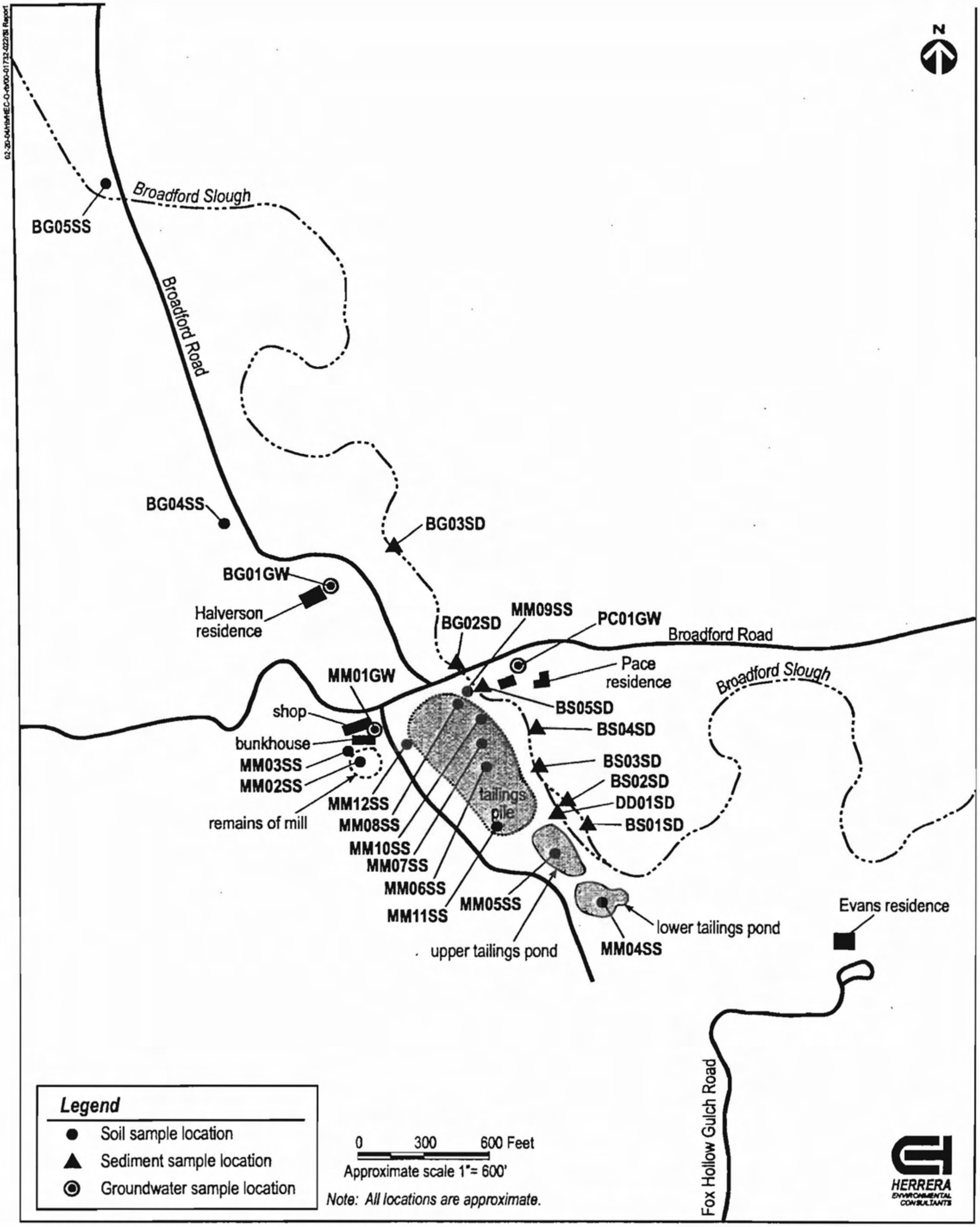

Figure 3-1. Sampling locations for the Minnie Moore Mine site, Blaine County, Idaho.

3.1.2 Sediment Samples

A total of eight sediment samples (including two upstream background samples) were collected from Broadford Slough and the diversion ditch that is a spur of the Broadford Slough. Samples were collected from 0 to 6 inches below the sediment surface. Samples were collected from downstream to upstream locations to avoid potential cross-contamination of downstream samples.

3.1.3 Domestic Ground Water Well Samples

Ground water samples were collected from the onsite domestic well used by the bunkhouse residents and from the domestic well on the Pace property. In addition, a background ground water sample was collected from a domestic well about 700 feet upgradient of the bunkhouse well, owned by Mr. Halverson. Samples from the bunkhouse well and the Halverson well were collected from outdoor faucets; the Pace well was sampled at the kitchen faucet. Prior to sample collection, water lines were purged for a minimum of 10 minutes. All samples were collected directly into sample containers and preserved with nitric acid to a $pH \leq 2$.

3.2 Analytical Protocols

All SI samples were analyzed by Contract Laboratory Program Analytical Services (CLPAS) for TAL metals according to EPA methods provided in ILM05.2 (EPA 1991)). Analyses of ground water samples for TAL metals were performed by American Analytical and Technical Services, located in Baton Rouge, Lousiana; analyses of soil and sediment samples for TAL metals were performed by Cemic Corp., located in Narragansett, Rhode Island. Both laboratories were contracted by the EPA under the Contract Laboratory Program (CLP).

3.3 Global Positioning System

A Trimble GeoExplorer 3 Global Positioning System (GPS) survey unit and data logger were used by START personnel to record coordinates of all sample locations. Recorded GPS coordinates by sample point are listed in Appendix B.

3.4 Investigation-Derived Waste

Investigation-derived waste (IDW) generated during the SI sampling effort consisted of sampling equipment, disposed of as non-hazardous solid waste. No IDW generated during the sampling event remains at the site.

4.0 Quality Assurance/Quality Control

A total of 21 soil/sediment samples and 3 water samples were analyzed for TAL total metals. Total metal analyses were performed in accordance with the *EPA Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 1991). Specific quality assurance/quality control (QA/QC) requirements for analyses of the Minnie Moore Mine Site samples are presented in the CLP statement of work and the project SQAP (Herrera 2003).

All data from analyses performed by the CLP laboratories were reviewed and validated by an EPA chemist. Data qualifiers were applied by the EPA chemist as necessary according to statements of work and the following guidance:

- *U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 2002b)

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

4.1 Satisfaction of Data Quality Objectives

Data quality objectives (DQOs) for this SI were developed based on *Data Quality Objectives Process for Superfund, Interim Final Guidance* (EPA 1993). Data quality achieved during field sample collection and sample analyses conducted at the laboratories produced sufficient data to meet all DQOs established in the SQAP (Herrera 2003).

4.2 Quality Assurance/Quality Control Samples

Samples were collected or processed in the field to assist analysis of QA/QC measures. Temperature blank samples were included in each cooler. QC samples included a matrix spike/duplicate (MS/DUP) at a rate of one per at most 20 samples for each matrix.

4.3 Project-Specific Data Quality Objectives

The following describes the laboratory's ability to meet project DQOs for precision, accuracy, and completeness, and the overall success of the field team and the laboratory at meeting project DQOs for representativeness and comparability. The laboratories and the field team were able to meet DQOs for the project with the exceptions noted below. Table 4-1 presents a summary of data qualification by the EPA chemist.

Table 4-1. **Data qualification summary for the Minnie Moore Mine Site, Blaine County, Idaho.**

Analysis	No. of Samples	Total No. of Data Values [a]	Qualification	Number (%) of Data Qualified	Qualification Categories [b]
Total Metals	21 Soil/Sediment	534	Estimated (J or UJ)	95 (18%)	< CRDL, serial dilution, matrix spike recovery, sample non-homogeneity, blank contamination, duplicate analysis, interferences.
			Unusable (R)	41 (8%)	Low matrix spike recovery.
			Not detected (U)	17 (3%)	Blank contamination.

Key:
< CRDL = Value reported at less than the contract required detection limit.

Notes:

[a] The total number of data values is defined as the total of number of analytes for each sample analyzed times the total number of samples.

[b] See the following pages for detailed reasons for sample data qualification.

4.3.1 Precision

Precision represents the reproducibility of the sampling and analytical methodology. Laboratory and field precision is measured as the relative percent difference (RPD) between laboratory duplicate samples or MS/DUP samples.

The RPD values were reviewed for all laboratory duplicate samples. According to data validation reports provided by EPA, the precision DQOs for the Minnie Moore Mine Site Investigation were met for all analyses, with the exception of copper analyses of the three ground water samples, and antimony analyses of 20 of the soil/sediment samples. These results were qualified as estimated, bias unknown.

4.3.2. Accuracy

Accuracy represents the measure of bias from a set of measurements relative to a known or true value. Data accuracy was measured using various quality control samples and procedures that include:

- Maximum sample holding times
- Instrument calibration and performance checks
- Preparation, calibration, and temperature blank analyses

- Interference check sample, serial dilution, and laboratory control sample analyses
- Matrix spike analyses.

According to data validation reports provided by the EPA, accuracy DQOs for the Minnie Moore Mine Site were met with the exceptions noted below.

Data were qualified by the EPA chemist for the following reasons:

- Interfering levels of iron in samples resulted in quantifying antimony data as estimated, or estimated detection limit, for 13 soil/sediment samples; cobalt and vanadium were qualified as estimated in one soil/sediment sample. Selenium was also qualified as estimated in two soil/sediment samples based on suspected iron interference; however, these results were rejected because of extremely low matrix spike recovery.
- Based on blank contamination, sodium results for 15 soil/sediment samples were qualified as undetected. Based on serial dilution results, the remaining samples were qualified as estimated.
- Duplicate results for ground water were outside acceptable criteria, resulting in copper results for all three ground water samples being qualified as estimated.
- Contamination in procedural blanks associated with the three ground water samples resulted in the following data qualifications:
    - ☐ Sample MJ4000: The result for aluminum was qualified as estimated; the results for beryllium, cobalt, lead, manganese, silver, thallium, and vanadium were qualified as undetected.
    - ☐ Sample MJ4001: The result for aluminum was qualified as estimated; the results for antimony, manganese, and vanadium were qualified as undetected.
    - ☐ Sample MJ4011: The results for antimony, beryllium, lead, silver, and thallium were qualified as undetected.
- For all three ground water samples, copper results were qualified as estimated based on unacceptable serial dilution results.
- Manganese was qualified as estimated for one soil/sediment sample due to poor serial dilution results.

- Low matrix spike recoveries resulted in 20 soil/sediment samples being qualified as estimated for antimony results, and unusable for selenium and thallium results.
- Lead and zinc results for one soil sample were qualified as estimated based on suspected sample non-homogeneity. This was based on large differences between native and spike results.

In addition, the EPA chemist qualified detected values as estimated if they were reported at levels above the instrument detection limit but below the CRDL.

4.3.3 Completeness

Data completeness is measured as the percentage of usable data (usable data divided by the total possible data where estimated values are considered usable). All laboratory data were reviewed for data validation and usability. The project DQOs for completeness of 90 percent for soil/sediment samples and 95 percent for water samples were met.

4.3.4 Representativeness

Data representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental condition. The number and selection of samples were determined for the SQAP and verified in the field to accurately account for site variations and sample matrices. Therefore, the DQOs for representativeness have been met.

4.3.5 Comparability

Comparability represents the ability to evaluate one set of data with another. Data produced for this site resulted from applicable field and consistent sampling techniques, consistent analytical methods, standard units of measurement, and required data reporting formats. Therefore, the DQOs for comparability have been met.

5.0 Analytical Results Reporting and Background Samples

All analytical results are reported in Sections 5, 6, and 7; this section describes the criteria for data presentation and provides a description of background sample conditions.

5.1 Analytical Results Evaluation Criteria

Analytical results presented in the summary tables in Sections 6 and 7 show all compounds detected above laboratory detection limits 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 also shown underlined and in **bold** type. For the purposes of this investigation, significant/elevated concentrations are those concentrations:

- Equal to or greater than the sample's Contract Required Detection/Quantitation Limit (CRDL/CRQL) or the sample quantitation limit (SQL)
- Equal to or greater than the background sample's CRDL/CRQL or SQL when the background concentration is below the detection limit
- At least three times greater than the background concentration when the background concentration equals or exceeds the detection limit.

Based on EPA Region 10 policy, evaluation of aluminum, calcium, iron, magnesium, potassium, and sodium (common earth crust elements) is beyond the scope of this report; these elements are not reported in the data tables or discussed in the text. The analytical summary tables in Sections 6 and 7 present all other detected analytes. Only those detected analytes at potential sources or in targets meeting the significant and/or elevated concentration criteria are discussed in the report text. All detected concentrations are also discussed for background samples, including those concentrations that were qualified as estimated (i.e., J) because they were detected below the CRDL.

5.1.1 Analytical Sample Results Reporting

When four or more analytes are detected or are significant/elevated in Sections 6 and 7, the number of such analytes and the concentration ranges are given. When three or fewer analytes are detected or are significant/elevated, the specific analyte and its concentration are provided.

5.2 Background Samples

Background samples were collected for each medium from which SI samples were collected. Those media are surface soil (including tailings), Broadford Slough wetland sediment, and ground water. The domestic ground water samples will be compared to EPA Drinking Water Regulations and Health Advisories. Results for the appropriate background samples are shown in the first columns of the analytical results summary tables in Sections 6 and 7 for comparison against source or target results. Background sample locations are shown on Figure 3-1.

5.2.1 Background Surface Soil

5.2.1.1 Sample Locations

Two offsite background surface soil samples (BG04SS and BG05SS) were collected from areas determined to be outside the influence of the site. For sample BG04SS, native soil was collected approximately 0.25 mile north of the site near Broadford Road (Figure 3-1). Sample BG05SS was collected another 2.5 mile north of sample BG04SS. Background soil types were similar to those of samples collected from potential source areas onsite. The analyte concentrations found in source and target soil samples were compared to the highest concentration of each analyte found in the two background soil samples.

5.2.1.2 Sample Results

Sixteen inorganics were detected in background sample BG04SS, ranging in concentration from 0.18 milligrams per kilogram (mg/kg) mercury to 796 mg/kg zinc. Fourteen inorganics were detected in background sample BG05SS, ranging in concentration from 0.08 mg/kg (estimated) mercury to 283 mg/kg zinc. Concentrations of arsenic and lead found in Sample BG04SS exceed the Preliminary Remediation Goals (PRGs) for residential soil established by EPA Region 9.

5.2.2 Background Sediment

5.2.2.1 Sample Locations

Two background sediment samples (BG02SD and BG03SD) were collected from Broadford Slough at locations upstream of all probable points of entry (PPEs) from the site. Background sediment sample BG02SD was collected approximately 50 feet north and upstream of the most upstream PPE, and about 15 feet north of the Broadford Street bridge that crosses Broadford Slough, just east of the site entrance. Background sediment sample BG03SD was collected approximately 650 feet north and upstream of the most upstream PPE. Background sediment types were similar to those of samples collected at potential targets downstream. The analyte concentrations found in target sediment samples were compared to the highest concentration of each analyte found in the two background sediment samples.

5.2.2.2 Sample Results

Twelve inorganics were detected in background sediment sample BG02SD, ranging in concentration from 1.0 mg/kg (estimated) cadmium to 191 mg/kg zinc. Fourteen inorganics were detected in background sediment sample BG03SD ranging in concentration from 0.22 mg/kg (estimated) mercury to 640 mg/kg zinc. The concentration of arsenic found in Sample BG02SD exceeds the PRG for residential soil established by EPA Region 9.

5.2.3 Background Ground Water

5.2.3.1 Sample Location

One background ground water sample was collected from a domestic well owned by Mick Halverson, located about 700 feet north of the site. The sample was collected from an outside spigot at the Halverson residence after flushing the line for a minimum of 10 minutes.

5.2.3.2 Sample Results

Eleven inorganics were detected in background sample BG01GW, ranging in concentration from 0.33 micrograms per liter (µg/L) antimony to 115 µg/L zinc.

6.0 Potential Sources

This section describes sampling locations, sampling rationale, and analytical results for the Minnie Moore Mine Site. Table 6-1 summarizes analytes detected at each potential source location investigated. Laboratory analytical results and data validation summaries for all samples are in provided in Appendix C.

6.1 Surface Soils Sources

Sources of contamination identified at the site and confirmed by sample collection and analysis include a tailings pile, two dry tailings ponds, and soil generally surrounding the former mill operations.

6.1.1 Soil Sample Locations

A total of eleven surface soil samples (samples MM02SS, MM03SS, MM04SS, MM05SS, MM06SS, MM07SS, MM08SS, MM09SS, MM10SS, MM11SS MM12SS) were collected across the Minnie Moore Mine site. The samples were collected from two locations in the vicinity of former mill operations, five locations on the tailings pile, one location in each of the dry tailings ponds, one location at the soil berm on the east side of the tailings pile, and one location at a gray pile of material on top of the southwestern end of the tailings pile (Figure 3-1). No soil odors were noted during sample collection. Visual observations made during sample collection are provided in Table 3-1.

6.1.2 Soil Sample Results

Source sample results are summarized in Table 6-1. Nine inorganic compounds were detected at significant concentrations in onsite surface soil samples, ranging from 1.1 mg/kg mercury to 18,500 mg/kg lead. Antimony, arsenic, cadmium, copper, lead, manganese, mercury, silver, and zinc were detected at significant concentrations in more than half of the samples collected onsite. Remediation goals (PRGs) are included in Table 6-1. Concentrations of lead and arsenic exceeded both residential and industrial PRGs in all of the tailings samples collected and in the surface soil sample (MM02SS) collected in the vicinity of the former mill. Concentrations of manganese exceeded the residential PRG in all of the tailings samples. In addition, the residential PRG for cadmium was exceeded in two tailings samples.

6.1.3 Soil Source Volumes

During the field sampling effort, tailings were observed in the tailings pile and in the two dry tailings overflow ponds. Most of the tailings pile is unvegetated and rises about 20 feet high, with a fairly level surface. The top of the unvegetated flat portion of the pile measures

Table 6-1. Source surface soil sample analytical results, Minnie Moore Mine Site, Blaine County, Idaho.

EPA Sample No.	202116	202117	202103	202104	202105	202106	202107	202108	202109	202110	202111	202124	202125	
CLP Number	MJ4015	MJ4016	MJ4002	MJ4003	MJ4004	MJ4005	MJ4006	MJ4007	MJ4008	MJ4009	MJ4010	MJ4023	MJ4024	
Sample Location	BG04SS (SQL)	BG05SS (SQL)	MM02SS	MM03SS	MM04SS	MM05SS	MM06SS	MM07SS	MM08SS	MM09SS	MM10SS	MM11SS	MM12SS	EPA Region 9
Sample Type	Background	Background	Source	Source	Source	Source	Source	Source	Source	Source	Source	Source	Source	PRGs [a] Res (Ind)
Target Analyte List Metals (milligrams/kilogram)														
Antimony	**2.2 JK**	**12.4 JK**	**10.1 JK**	12.4 UJK	**52.6 JK**	**7.4 JK**	**3.5 JK**	**18.9 JK**	**253 JK**	**24.7 JK**	**22.3 JK**	9.6 UJK	**29.5 JH**	31 (410)
Arsenic	**27.3**	**11.6**	**1210**	**35.6**	**911**	**1700**	**3300**	**1500**	**6180**	**1240**	**1120**	**10.3**	**1200**	22 (260)
Barium	**121**	**109**	**135**	**208**	**85.0**	**79.2**	**56.6**	**40.6**	**238**	**54.2**	**51.5**	**47.0**	**69.3**	5,400 (67,000)
Beryllium	0.78 J (0.93)	0.55 J (1.04)	**1.2**	**1.6**	**0.92**	.069 J	**0.92**	0.79 J	0.12 J	0.53 J	0.63 J	**1.0**	0.70 J	150 (1,900)
Cadmium	**4.8**	**2.9**	**25.0**	**4.6**	**57.4**	**33.8**	**36.9**	**27.3**	**12.1**	**20.1**	**22.0**	.040 J	**39.4**	37 (450)
Chromium	**24.7**	**18.3**	**28.7**	**49.4**	**29.8**	**20.3**	**27.4**	**26.6**	**5.4**	**18.0**	**18.2**	1.3 J	**21.6**	210 (450)
Cobalt	7.5 J (9.3)	5.5 J (10.4)	**11.0**	**14.4**	**8.9**	**11.1**	**13.1**	7.3 J	**2.3 JK**	7.8 J	**9.3**	1.7 J	**1.0**	900 (1,900)
Copper	**26.4**	**12.7**	**68.0**	**12.9**	**229**	**101**	**489**	**257**	**588**	**55.5**	**49.5**	**6.1**	**135 JL**	3100 (41,000)
Lead	**507**	**1.7**	**4260**	**187**	**7240**	**2590**	**3750**	**3610**	**18500**	**1600**	**1360**	**23.5**	**3340 JK**	400 (750)
Manganese	**321**	**224**	**811**	**187**	**3950**	**2050**	**2960**	**7090**	**1020**	**2780**	**3740**	**103**	**5210 JK**	1,800 (19,000)
Mercury	**0.18**	**0.08**	**1.7**	0.091 J	**3.5**	**4.2**	**1.5**	**1.1**	**1.1**	**1.2**	**1.5**	0.047 J	**1.5**	23 (310)
Nickel	**26.4**	**19.5**	**13.5**	**20.7**	**40.2**	**39.2**	**39.0**	**27.0**	**8.7**	**26.2**	**30.7**	2.4 J	**33.9**	–
Silver	**3.6**	**0.12**	**17.3**	**0.71**	**37.6**	**14.5**	**16.2**	**25.9**	**55.5**	**8.4**	**10.4**	1.6 U	**26.1 JH**	390 (5,100)
Vanadium	**31.4**	**23.2**	**44.7**	**74.2**	**69.4**	**39.2**	**42.1**	**39.2**	**12.6 JK**	**29.7**	**33.0**	7.7 J	**45.6**	550 (7,200)
Zinc	**796**	**283**	**5330**	**454**	**6460**	**3530**	**3700**	**3340**	**2040**	**2240**	**2540**	**24.3**	**4350 JK**	23,000 (100,000)

Key:

CLP	= Contract Laboratory Program		
EPA	= Environmental Protection Agency.		
J	= The result is below the contract required quantitation limit (CRQL), but above the instrument detection limit (IDL). The associated numerical value is an estimate.		
JK	= The result is an estimated quantity; unknown bias.	JH	= The result is an estimated quantity; biased high.
JL	= The result is an estimated quantity; biased low.	Res	= Residential.
Ind	= Industrial	PRGs	= Preliminary Remediation Goals.
SQL	= Sample quantitation limit.		
U	= The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.		
UJK	= Undetected; the reported quantitation limit is approximate, bias unknown.		

Analytical results presented in **bold** type show concentrations of contaminants in source samples detected above the CRQL.

Analytical results presented in **bold** type and underlined indicate significant concentrations of contaminants in source samples with respect to background concentrations.

[a] EPA 2002d.

approximately 325 feet by 550 feet, based on GPS measurements. According to one of the property owners, the tailings pile may extend as deep as 10 feet below ground surface (EPA 2002a). Three sides of the pile slope down to the surrounding ground fairly steeply; the fourth side (southeast) gradually slopes down, extending another 200 feet to the southeast. This end of the pile is partially covered with soil and light vegetation. The tailings pile is not contained (EPA 2002a). The volume of the tailings pile is estimated to be 236,500 cubic yards; the surface area is estimated to be 281,050 square feet. Each of the tailings overflow ponds is approximately 150 by 200 feet; depth is unknown. Significant levels of several metals are present in soils at the vicinity of the former mill. Current data are not adequate to estimate the areal extent of contamination in mill soils.

7.0 Migration/Exposure Pathways and Targets

This section describes migration/exposure pathways and potential targets within the site's range of influence (Figures 7-1 and 7-2). Laboratory analytical results and data validation summaries are provided in Appendix C.

7.1 Ground Water Migration Pathway

7.1.1 Pathway Description

The aquifers of Upper Big Wood River, Silver Creek, and Camas Creek consist of valley and lake sediments underlain by basalts and bedrock. Sediments were deposited within the valley when Big Wood River and Camas Creek were blocked by lava flows which occurred intermittently near Picabo in the southeast corner of the basin and near Stanton Crossing in the center portion of the basin. Lake deposits consist of discontinuous layers of fine-grained sediments intermixed with coarse sands and gravels.

In the southern part of the basin, the fine-grained layers become more continuous with extensive silt and clay layers forming confining layers and producing artesian conditions. Springs and seeps occur where shallow ground water overrides discontinuous fine-grained layers. Generally, the direction of ground water flow is from north to south. Seasonal fluctuations can vary from a few feet to as much as 40 feet.

Ground water exists locally within a mixture of sand, gravel and some clay. There is a well on site originally drilled to supply water for industrial purposes, but is now used for domestic drinking water by the on-site residents, according to Mr. Johnston, one of the site owners. Water is present between 25 feet and 47 feet below ground surface, according to well logs. From 47 feet to 82 feet below ground surface, there are layers of fine sand and some clay. Another domestic well is present just east of the site, across Broadford Slough. According to the well log, water is present at about 20 feet below ground surface, and continues for 60 feet through layers of sand, gravel and clay (EPA 2002a).

Average annual precipitation at Hailey (5 miles northwest of the site) is 15.89 inches (WRRC 2003). Ground water within 4 miles of the site is used for domestic and irrigation purposes (IDWR various dates). The site is located in the Big Wood River Valley. This area was selected as the location of the pilot project for Idaho under EPA's national pilot program on source water protection. The drinking water systems in the Big Wood River Valley share a common ground water resource. This resource is characterized by a shallow aquifer with high velocity, making the aquifer highly vulnerable to contamination. A unified source water protection plan is under development (EFC 2003).

7.1.2 Targets

One hundred and forty-one domestic drinking water wells are known to exist within a 4-mile radius of the site; the nearest is located on site (EPA 2002a). Based on an average of 2.40

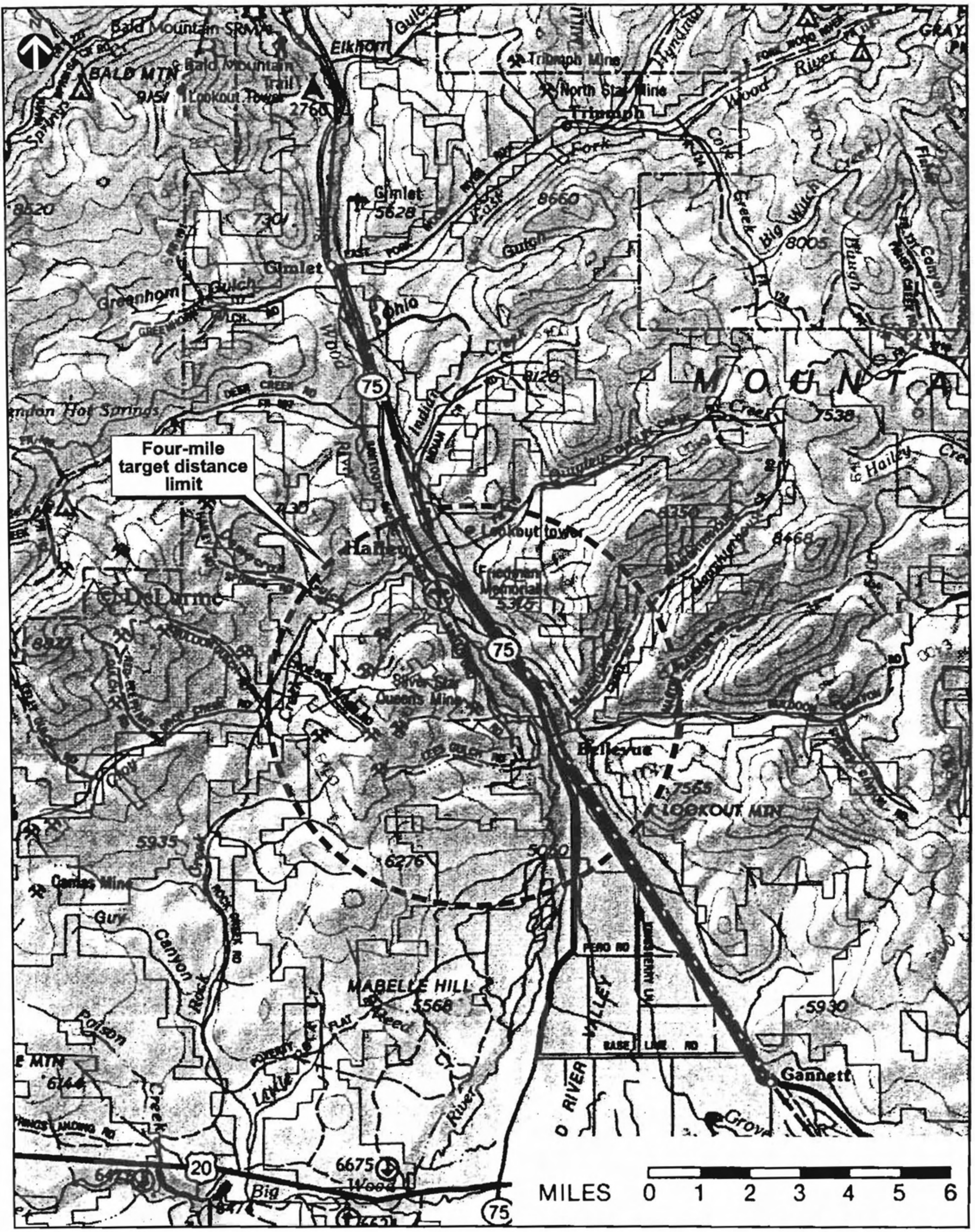

Figure 7-1. Four-mile target distance limit map of the Minnie Moore mine site, Blaine County, Idaho.

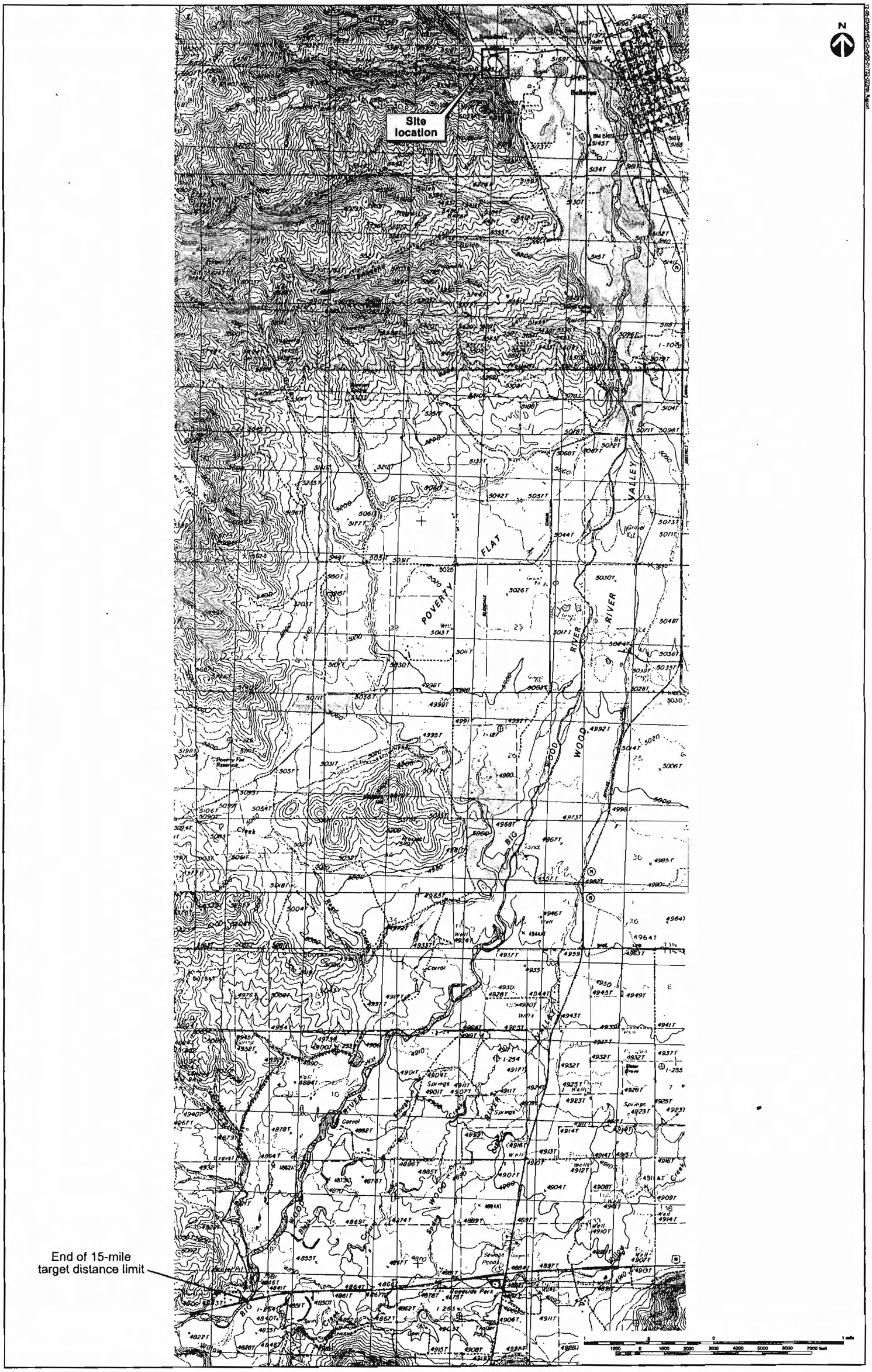

Figure 7-2. Fifteen-mile target distance limit map of the Minnie Moore Mine site, Blaine County, Idaho.

persons per household in Blaine County (USCB 2000), these wells serve approximately 338 people. The City of Bellevue operates one municipal well located between ½ and 1 mile from the site, that serves 850 households, or an estimated 2,040 persons. The ground water drinking population served by wells within designated distance rings is provided in Table 7-1.

Table 7-1. Ground water drinking population within a 4-mile radius of the Minnie Moore Mine site, Blaine County, Idaho.

Distance (Miles)	Wells	Population [a]
0-0.25	3 (Domestic)	7.2
0.25-0.5	8 (Domestic)	19.2
0.5-1	15 (Domestic)	36.0
	1 (Municipal)	2,040
1-2	25 (Domestic)	60.0
2-3	22 (Domestic)	52.8
3-4	68 (Domestic)	163.2
Total	**141 Domestic** **1 Municipal**	**338.4 Domestic** **2,040 Municipal** **2,378.4 Total**

Source: EPA 1990.

[a] Domestic well population was estimated based on the average number of persons per household for Blaine County of 2.40 people (USCB 2000), well logs within 1 mile of the site (IDWR assorted dates), and EPA 2002a.

7.1.3 Ground Water Sample Locations

Two ground water samples were collected from domestic wells that may be affected by sources of contamination at the site. Sample MM01GW was collected from the domestic well used by onsite residents of the bunkhouse. The well is located about 150 feet west of the tailings pile and serves 9 people. The sample was collected from an outdoor spigot located on an outside wall of the bunkhouse after flushing the line for a minimum of 10 minutes.

Sample PC01GW was collected from the domestic well that serves the Pace residence. The well is located about 150 feet northeast of the tailings pile, east of Broadford Slough. The sample was collected from the kitchen tap of the Pace residence after flushing the line for a minimum of 10 minutes.

7.1.4 Ground Water Sample Results

Ground water sample results are summarized in Table 7-2. Metals concentrations were compared to a background sample collected upgradent from the site, and to EPA maximum contaminant levels (MCLs). Cadmium was detected in the onsite domestic well at a concentration of 6.0 µg/L, exceeding the MCL of 5.0 µg/L. No other inorganics were detected above MCLs listed in EPA Drinking Water Regulations.

Table 7-2. Ground water well sample analytical results, Minnie Moore Mine, Blaine County, Idaho.

EPA Sample Number	202102	202101	202112	
CLP Number	MJ4001	MJ4000	MJ4011	
Sample Location	BG01GW (SQL)	MM01GW	PC01GW	MCL
Sample Type	Background	Target	Target	(MCLG)
Selected Target Analyte List Metals (micrograms per liter)				
Antimony	0.040 U	1.3 J	0.45 U	6
Arsenic	0.75 J (1)	**1.0**	0.72 J	10
Barium	**45.1**	**42.2**	**54.6**	2000
Cadmium	1.0 U	**6.0**	1.0 U	5
Chromium	1.6 J (2)	**2.8**	1.4 J	100
Cobalt	0.50 U	0.16 U	**0.78**	NA
Copper	**21.5 JK**	**3.4 JK**	**8.7 JK**	1300
Lead	**1.9**	0.46 U	0.11 U	15 (0)
Manganese	0.41 U	0.46 U	**0.90**	NA
Mercury	0.07 J (0.2)	0.15 J	0.18 J	2
Nickel	0.51 J (1)	**1.2**	**2.9**	NA
Selenium	1.6 J (5)	2.4 J	1.8 J	50
Vanadium	0.79 U	1.2 U	**1.2**	NA
Zinc	**111**	**425**	**37.7**	NA

Key:
CLP = Contract Laboratory Program.
EPA = Environmental Protection Agency.
J = The result is below the contract required quantitation limit (CRQL) but above the instrument detection limit (IDL); the associated numerical value is an estimate.
JL = The result is an estimated quantity; biased low.
JK = The result is an estimated quantity; unknown bias.
U = The analyte was analyzed for, but was not detected; the associated numerical value is the sample quantitation limit.
MCL = Maximum Contaminant Level (40 CFR 141).
MCLG = Maximum Contaminant Level Goal.
NA = Not available.
SQL = Sample quantitation limit. For water samples analyzed for TAL metals, the SQL = the contract required quantitation limit.
TAL = Target Analyte List.

Analytical results presented in bold type show concentrations of contaminants in target samples detected above laboratory detection limits.

Analytical results presented in bold type and underlined indicate elevated concentrations of contaminants in target samples with respect to background concentrations.

7.2 Surface Water Migration Pathway

7.2.1 Pathway Description

The Broadford Slough flows southeast along the northeast edge of the tailings pile; the distance between the slough and the tailings pile ranges from 5 to 25 feet. The 15-mile target distance limit (TDL) begins in Broadford Slough on the south side of the Broadford Road bridge, where runoff from the northernmost end of the tailings pile would enter the slough; however, runoff from the tailings may enter the slough along the entire portion of the slough that borders the tailings pile. Downstream PPEs are not clearly defined, but may exist east of the two dry tailings ponds. Dense vegetation prevented close examination of the ground surface between the slough and this area during the sampling event.

Downstream of the site, the TDL continues 2.1 miles to the slough's confluence with Big Wood River (Figure 7-2). The TDL continues along Big Wood River, ending 2 miles downstream of the Stanton Crossing, where the river crosses State Route 20. EPA estimated that Broadford Slough flows at 30 cubic feet per second (cfs); no stream flow data were available. Mean annual flow for the Big Wood River at Hailey (four miles upstream) is about 568 cfs and at Stanton Crossing mean annual flow is about 419 cfs; therefore, stream flow at the confluence of Broadford Slough is estimated to be between 419 and 568 cfs (EPA 2002a).

Soil survey information in the area is not readily available. Based on observations during the EPA site visit, soils were described as generally silty, sandy loams. The two-year 24-hour rainfall event for Bellevue is 1.5 inches (WRRC 2002). The site lies in the 100-year floodplain (FEMA 2002). Upland drainage for the site is estimated to be 143 acres (USGS 1986a; EPA 2002).

7.2.2 Targets

There are no public drinking water intakes along the TDL (EPA 2003b). Commercial and subsistence fishing do not occur within the TDL; sport fishing does occur within the TDL in the Big Wood River (IDFG 2001). Anglers catch whitefish, and both rainbow and brown trout. Fish catch data is not available for this area. It is probable that at least one pound of fish is caught annually for human consumption within the surface water TDL 1 mile downstream of the confluence of Broadford Slough with Big Wood River, and 3.1 miles from the PPE.

Big Wood River south of Bellevue and Broadford Slough are diverted for irrigation (EPA 2002a). Federal threatened species are believed to use portions of the TDL as habitat, but have not been observed in the last five years. The bald eagle (*Haliaeetus leucocephalus*) may winter within the TDL (ICDC 2001, EPA 2002a).

Wetlands along Broadford Slough are classified as forested, scrub-shrub, and emergent palustrine system wetlands (USFWS 1990a; USFWS 1990b), confirmed by a wetland specialist present during PA/SI field activities (based on dominant vegetation and the presence of indicator species). Pacific willow, black cottonwood, red-osier dogwood, quaking aspen, reed canarygrass, and sedges were common species observed in the vicinity of sediment sample collection locations along the slough. Forested, scrub-shrub, and emergent palustrine wetlands meet the 40 Code of Federal Regulations (CFR) 230.3 definition of an applicable wetland for Hazard Ranking System scoring purposes (EPA 1992). It is estimated from National Wetland Inventory (NWI) maps that 9 miles of wetland frontage exist along the surface water TDL.

7.2.3 Sediment Sample Locations

Six sediment samples were collected within the wetlands present in and along Broadford Slough. A diversion dam is present in the slough east of the southern end of the tailings pile, allowing some of the flow to be diverted into a small ditch. At the time of sampling, a small fraction of the flow was being diverted from the main slough. Sediment samples included one collected from the ditch, just below the diversion dam (DD01SD); the other samples were collected from the slough.

7.2.4 Sediment Sample Results

Sample results are summarized in Table 7-3. Seven inorganics (antimony, arsenic, copper, lead, manganese, silver, and zinc) were detected at elevated concentrations in downstream sediment samples, ranging in concentration from 5.9 mg/kg silver to 6,950 mg/kg manganese.

7.3 Soil Exposure Pathway

Access to the Minnie Moore site is unrestricted and the tailings pile is an area of observed contamination. There is one family living in the onsite bunkhouse, approximately 150 feet west of the tailings pile. According to Mr. Johnston, nine people currently live in the bunkhouse, including several children. Three recreational vehicles were also observed on the site. According to Mr. Johnston, each summer a few mobile home owners reside in their RVs on the property for the season. The Pace residence is located across Broadford Slough, approximately 150 feet east of the tailings pile. The Pace's work facility, a metal shop, is also located across the Broadford Slough, approximately 100 feet east of the tailings pile.

There are an estimated 85 people living within one mile of the site (USCB 2002; IDWR various dates). There are no continuously operating schools or designated recreation areas onsite. Dirt bike tracks and homemade jumps were observed at the tailings pile, suggesting that the site sees recreational use. There are no terrestrial sensitive environments in the contaminated area. No commercial agriculture or silviculture is present within an area of potential contamination. Table 7-4 provides population within a 1-mile radius of the site.

7.4 Air Migration Pathway

An estimated 85 individuals live within 1 mile of the Minnie Moore Mine; the nearest individual lives onsite. An estimated 5,113 people live within the 4-mile TDL (USCB 2002, IDWR various dates).

The bald eagle (*Haliaeetus leucocephalus*), a Federally listed threatened species, has been observed within the 4-mile TDL, but not within the last 5 years; part of the TDL is a "wintering area" for the bald eagle (ICDC 2001). Wetland acreage and population within 4 miles of the site are presented in Table 7-5.

Table 7-3. Sediment sample analytical results, Minnie Moore Mine, Blaine County, Idaho.

EPA Sample Number	202114	202115	202118	202119	202120	202121	202122	202123
CLP Number	MJ4013	MJ4014	MJ4017	MJ4018	MJ4019	MJ4020	MJ4021	MJ4022
Sample Location	BG02SD (SQL)	BG03SD (SQL)	BS01SD	BS02SD	BS03SD	BS04SD	BS05SD	DD01SD
Sample Type	Background	Background	Target	Target	Target	Target	Target	Target
Selected Target Analyte List Metals (milligrams per kilogram)								
Antimony	17.4 UJK	32.1 UJK	**8.7 JK**	**29.5 JK**	7.0 UJK	**5.3 JK**	**45.4 JK**	**4.9 JK**
Arsenic	**38.8**	**13.9**	**258**	**207**	**116**	**158**	**1200**	**224**
Barium	**73.7**	**157**	**108**	**87.4**	**92.3**	**92.4**	**78.7**	**125**
Beryllium	0.67 J (1.45)	1.1 J (2.67)	0.82 J	0.74 J	0.81 J	0.86 J	0.83 J	0.98 J
Cadmium	1.0 J (1.45)	**6.8**	**8.9**	**10.2**	**6.9**	**9.1**	**9.2**	**8.6**
Chromium	**24.8**	**36.5**	**26.9**	**22.3**	**24.8**	**24.8**	**27.9**	**31.8**
Cobalt	6.6 J (14.5)	7.9 J (26.7)	7.2 J	6.8 J	7.5 J	7.2 J	9.6 J	7.5 J
Copper	**8.4**	**37.1**	**46.7**	**64**	**35.1**	**34.8**	**227**	**63.0**
Lead	**130**	**228**	**746**	**1840**	**647**	**604**	**3280**	**989**
Manganese	**125**	**129**	**881**	**1060**	**763**	**969**	**6950**	**550**
Mercury	0.15 U	0.22 J (0.267)	**0.25**	**0.28**	**0.28**	**0.29**	**0.34**	**0.47**
Nickel	**11.6**	**32.6**	**22.5**	**17.4**	**16.5**	**18.1**	**20.2**	**24.6**
Silver	2.9 U	1.1 J (5.34)	**7.5**	**17.4**	**5.9**	**8.1**	**39.7**	**9.0**
Vanadium	**28.1**	**33.9**	**33.5**	**34.3**	**33.2**	**31.2**	**55.2**	**38.2**
Zinc	**191**	**640**	**1150**	**1540**	**1030**	**1170**	**2170**	**967**

Key:
J = The result is below the contract required quantitation limit (CRQL), but above the instrument detection limit (IDL); the associated numerical value is an estimate.
JK = The result is an estimated quantity ; unknown bias.
SQL = Sample quantitation limit.
UJK = Undetected; the reported quantitation limit is approximate, bias unknown.
U = The analyte was analyzed for, but was not detected; the associated numerical value is the sample quantitation limit.
Analytical results presented in **bold** type show concentrations of contaminants in samples detected above laboratory detection limits.
Analytical results presented in **bold** type and underlined indicate elevated concentrations of contaminants in samples with respect to background concentrations.

Table 7-4. Human population within a 1-mile radius of the Minnie Moore Mine site, Blaine County, Idaho.

Distance Ring (Miles)	Population
Onsite	8
0-0.25	13
0.25-0.5	24
0.5-1	40
Total	85

Sources: U.S. EPA 2000a; IDWR various dates.

Table 7-5. Human population and wetlands within a 4-mile radius of the Minnie Moore Mine site, Blaine County, Idaho.

Distance Ring (Miles)	Population	Wetlands (Acreage)
Onsite	8	0
0-0.25	13	5
0.25-0.5	24	15
0.5-1	40	27
1-2	1,298	46
2-3	1,417	31
3-4	2,313	12
Total	**5,113**	**136**

Sources: USCB 2002, EPA 2002a.

8.0 Site Summary and Conclusions

In May 2003, the START conducted SI sampling activities at the Minnie Moore Mine site located in Blaine County, Idaho. The site is a former silver mine and mill, located along Broadford Slough, approximately one mile west of the City of Bellevue.

The SI involved collection of samples from potential hazardous substance sources onsite, from target areas potentially impacted by contaminant migration, and from background locations. A total of 24 samples were collected for the SI, including onsite surface soil and tailings, Broadford Slough wetland sediments, and domestic ground water wells. Samples were analyzed by independent laboratories under contract to the EPA.

8.1 Sources

Surface soil samples were collected from eleven locations across the site. With the exception of samples MM03SS and MM11SS, all of the soil samples contained significant concentrations of inorganic elements, including arsenic, cadmium copper, lead, manganese, mercury, silver and zinc. Sample MM03SS was collected near the bunkhouse; a lawn is present around the bunkhouse exterior, inferring that potentially contaminated soil may have been covered with topsoil. Sample MM11SS was collected from a small grey pile (possibly a discarded cement or mortar mixture) that was perched on the toe of the tailings pile.

Results from the remaining nine samples were compared to EPA Region 9 PRGs for residential and industrial soils. Concentrations of arsenic, cadmium, lead, and manganese were above the residential PRGs for almost all samples; concentrations of arsenic and lead were also above the industrial PRGs in almost all samples. The tailings pile, tailings overflow ponds, and surface soil in the mill operations area are confirmed contaminant sources with significant metals concentrations.

8.2 Targets

Wetland sediment samples were collected at six locations downgradient of site sources. Elevated concentrations of arsenic, lead, manganese, mercury, and silver were detected in all samples; the highest concentrations were found in sample BS05SS, the most upstream of the target sediment samples. This sample also had elevated concentrations of copper and zinc.

Elevated concentrations of antimony, cadmium, and zinc were found in the bunkhouse well sample. The concentration of cadmium exceeded the MCL. In addition, several metals were detected in the sample collected from the Pace domestic well that were not detected in the upgradient ground water sample.

8.3 Conclusions

Results of the SI indicate that the Minnie Moore Mine site is a source of hazardous inorganic substance contamination. The SI documented that contaminants have been released to ground water beneath the site and to Broadford Slough through runoff from the site. This contamination could potentially impact nearby sport fisheries, wetlands, and other sensitive environments in Broadford Slough and Big Wood River. In addition, onsite and nearby residents may be exposed to harmful levels of inorganic contaminants through direct contact, inhalation of airborne contaminated particles, or ingestion of contaminated ground water.

9.0 References

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APPENDIX A

Photographic Documentation

Minnie Moore Mine Site
Site Investigation
Photographic Log

TDD #: 02-04-0004

Camera Types: Olympus Digital, Fugifilm Quicksnap **Site Name: Minnie Moore Mine Site Inspection**

Photo No.	Dir.	By	Date	Time	Description
1-1	D	JH	6/30/03	1152	Pace well, Sample PC01GW location
1-2	W	JH	6/30/03	1327	Bunkhouse well, Sample MM01GW location, shop in background
1-3	D	JH	6/30/03	1350	Sample MM02SS collected near mill foundation
1-4	W	JH	6/30/03	1420	Sample MM03SS
1-5	N	GC	6/30/03	1425	JH points to location of sample MM03SS
1-6	N	JH	6/30/03	1425	Sample MM02SS location at mill feature
1-7	NE	JH	6/30/03	1518	Sample BG01GW at Halverson domestic well
1-8	D	JH	6/30/03	1600	Sample MM04SS (eastern end of lower tailings pond)
1-9	E	JH	6/30/03	1608	Southeastern end of lower tailings pond; piece of former berm visible in background on left
1-10	NE	GC	6/30/03	1610	Sample MM04SS location at lower tailings pond
1-11	SE	GC	6/30/03	1615	Sample MM05SS location; upper tailings pond
1-12	NNW	JH	6/30/03	1625	Sample MM05SS location; trailer in background
1-13	W	JH	6/30/03	1650	Sample MM06SS (top of tailings pile)
1-14	SE	JH	6/30/03	1700	Sample MM07SS (tailings pile drainage channel)
1-15	SE	JH	6/30/03	1710	Gray crust visible on northeast corner of tailings pile
1-16	D	JH	6/30/03	1720	Sample MM08SS
1-17	NE	JH	6/30/03	1720	Sample MM08SS location north corner of tailings pile; Broadford Road in background.
1-18	D	JH	6/30/03	1730	Sample MM09SS (soil from berm between pile and slough)
1-19	NW	JH	6/30/03	1745	Tailings overflowing edge of berm on east side of pile
1-20	NW	JH	6/30/03	1745	East edge of tailings pile, fence posts may mark a property boundary
1-21	ESE	JH	6/30/03	1750	Slough and wetlands from north edge of tailings pile
1-22	NE/D	JH	6/30/03	1755	Sample MM10SS (drainage feature on east side of pile)
1-23	E	JH	6/30/03	1755	Sample MM10SS location
1-24	SSE	JH	6/30/03	1800	Old trough supports running parallel to the eastern edge of tailings pile
1-25	N	JH	6/30/03	1805	Shower system on top of west side of tailings pile
1-26	W	JH	6/30/03	1805	Shower enclosure at foot of pile near RV-3
1-27	SE	JH	6/30/03	1805	RVs at SW corner of tailings pile

TDD #: 02-04-0004

Camera Types: Olympus Digital, Fugifilm Quicksnap **Site Name: Minnie Moore Mine Site Inspection**

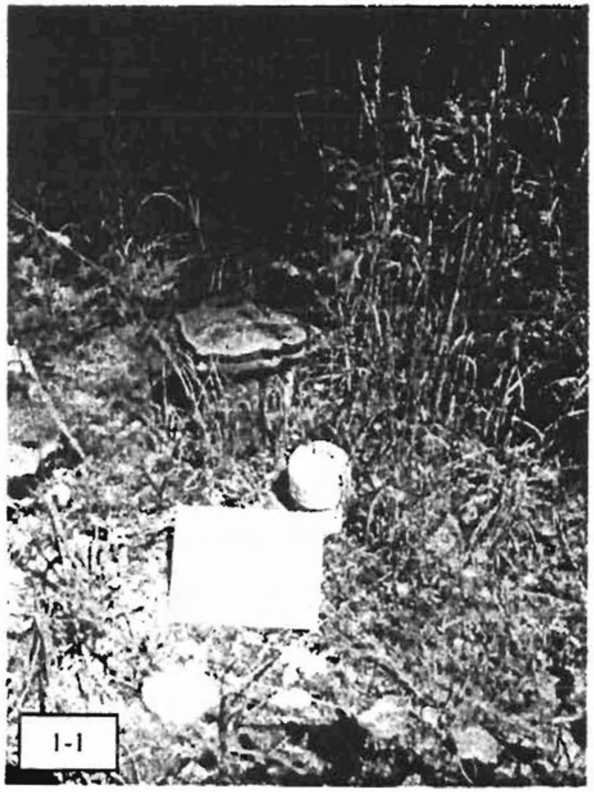
Photo No.	Dir.	By	Date	Time	Description
1-28	D	JH	6/30/03	1810	Inside of vertical pipe protruding from the tailings pile
1-29	S	JH	6/30/03	1818	Vertical pipe protruding from south end of tailings pile
1-30	W	JH	7/1/03	1145	Sample BS01SD
1-31	W	JH	7/1/03	1145	Sample BS01SD location
1-32	W	JH	7/1/03	1205	Diversion dam on Broadford Slough
1-33	S	JH	7/1/03	1215	Sample BS02SD, Broadford Slough
1-34	W	JH	7/1/03	1230	Sample DD01SD location, from drainage ditch created by diversion dam
1-35	NW	JH	7/1/03	1240	Looking upstream (Broadford Slough) from diversion dam
1-36	N	JH	7/1/03	1300	Sample BS03SD
1-37	N	JH	7/1/03	1325	Sample BS03SD location in aquatic bed
1-38	N	JH	7/1/03	1345	Sample BS04SD location, looking upstream
1-39	S	JH	7/1/03	1345	Sample BS04SD location, looking downstream
1-40	E	JH	7/1/03	1345	Sample BS04SD location (collected 15 feet from far edge)
1-41	NE	JH	7/1/03	1405	Sample BS05SD
1-42	NE	JH	7/1/03	1410	Sample BS05SD location
1-43	D	JH	7/1/03	1545	Sample BG02SD
1-44	S	GC	7/1/03	1545	Sample BG02SD location
1-45	N	GC	7/1/03	1615	Sample BS03SD location
1-46	D	JH	7/1/03	1615	Sample BS03SD
1-47	D	JH	7/1/03	1650	Sample BG04SS
1-48	SW	JH	7/1/03	1655	Sample BG04SS location
1-49	D	JH	7/1/03	1720	Sample BG05SS
1-50	SW	JH	7/1/03	1725	Sample BG05SS location
1-51	E	JH	7/2/03	0918	West side of tailings pile, RV-3
1-52	E	JH	7/2/03	0920	South end of tailings pile, quarry on hillside
1-53	NE	GC	7/2/03	0922	Berm on southwest side of overflow pond
1-54	NNE	GC	7/2/03	0924	Southern end of overflow pond
1-55	NNW	GC	7/2/03	0928	North berm of overflow pond
1-56	SE	JH	7/2/03	0930	End of Minnie Moore Mine site road and RV-1; road continues to Old Broadford town site
1-57	E	JH	7/2/03	0935	Berm across middle of overflow pond delineating edge of Evans property, tailings visible throughout area
1-58	W	JH	7/2/03	0940	Western side of north end of overflow pond with RV-2
1-59	NW	JH	7/2/03	0940	Northern end of overflow pond
1-60	N	JH	7/2/03	0955	East side of tailings pile, old trough supports on right

TDD #: 02-04-0004

Camera Types: Olympus Digital, Fugifilm Quicksnap **Site Name: Minnie Moore Mine Site Inspection**

Photo No.	Dir.	By	Date	Time	Description
2-1	NW	GC	7/2/03	1005	RV-3, shower, tailings pile
2-2	E	GC	7/2/03	1005	RV-3, tailings pile
2-3	NE	GC	7/2/03	1010	West side of tailings pile, south of bunkhouse, JH for scale
2-4	N	JH	7/2/03	1010	2-4 through 2-14: Panoramic view of site from atop a 10 -foot wall on the southeast edge of mill structure
2-5	NE	JH	7/2/03	1010	"
2-6	E	JH	7/2/03	1010	"
2-7	SE	JH	7/2/03	1010	"
2-8	S	JH	7/2/03	1010	"
2-9	SSW	JH	7/2/03	1010	"
2-10	SW	JH	7/2/03	1010	"
2-11	WSW	JH	7/2/03	1010	"
2-12	W	JH	7/2/03	1010	"
2-13	NW	JH	7/2/03	1010	"
2-14	NNW	JH	7/2/03	1010	"
2-15	SW	JH	7/2/03	1015	East side of mill area, debris
2-16	W	JH	7/2/03	1015	North end of mill area
2-17	W	JH	7/2/03	1020	Front of bunkhouse (residence) and garden
2-18	S	JH	7/2/03	1020	Remnants of burned shop (left side)
2-19	SW	JH	7/2/03	1020	Remnants of burned shop (right side)
2-20	S	JH	7/2/03	1025	Remnants of burned shop (closer)
2-21	SW	JH	7/2/03	1025	Sample MM11SS location
2-22	D	JH	7/2/03	1025	Sample MM11SS
2-23	D	JH	7/2/03	1045	Sample MM12SS
2-24	W	JH	7/2/03	1045	Sample MM12SS location, bunkhouse in background
2-25	SE	GC	7/2/03	1055	North side of tailings pile from Broadford Road, JH for scale
2-26	SW	GC	7/2/03	1055	Corner of tailings pile from Broadford Road, JH for scale

Key:
E = East
N = North
S = South
W = West
D = down
JH = Julie Howe
GC = Gina Catarra
RV = recreational vehicle



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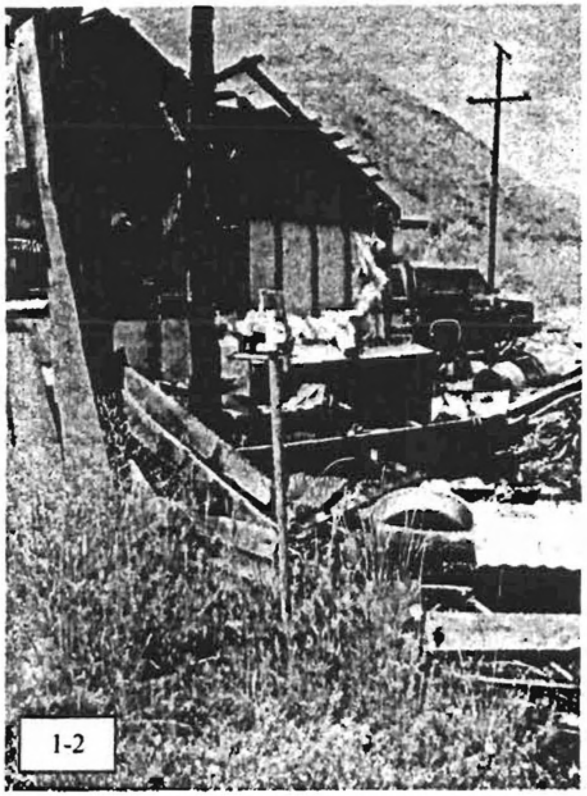

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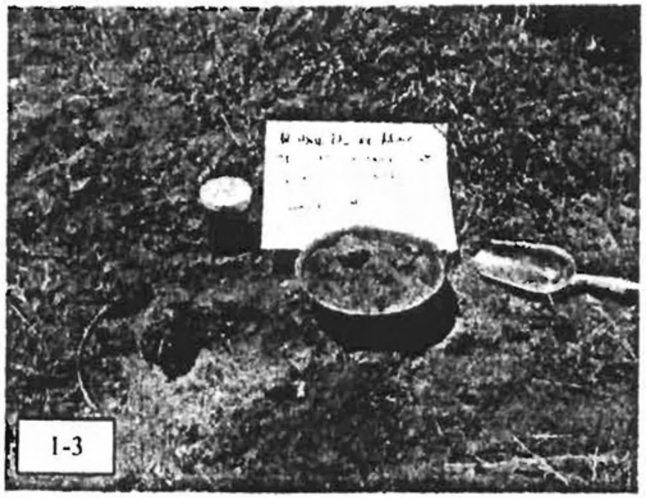

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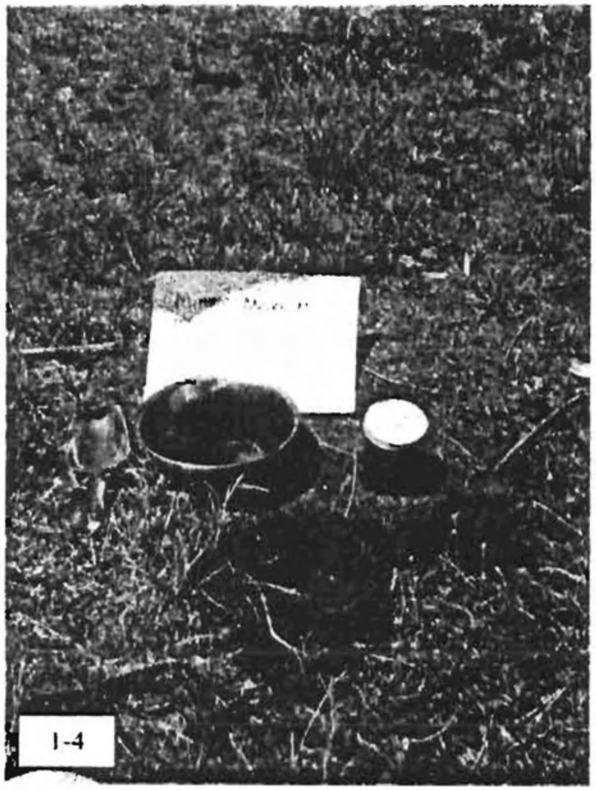
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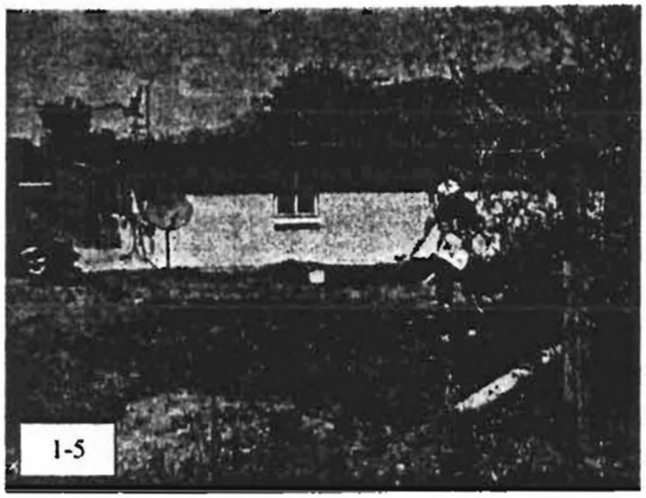
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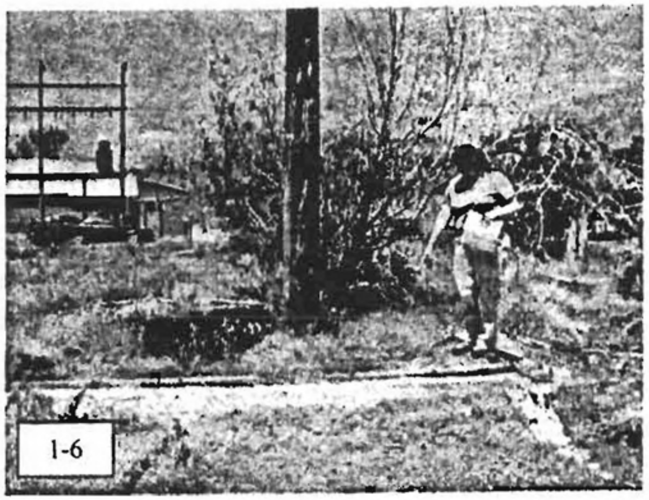
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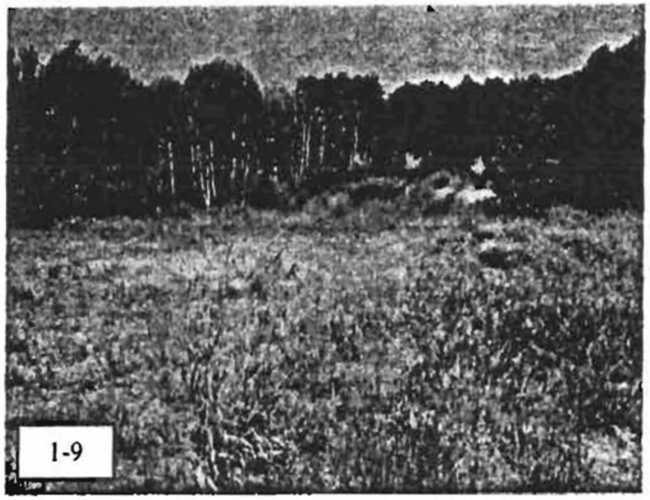
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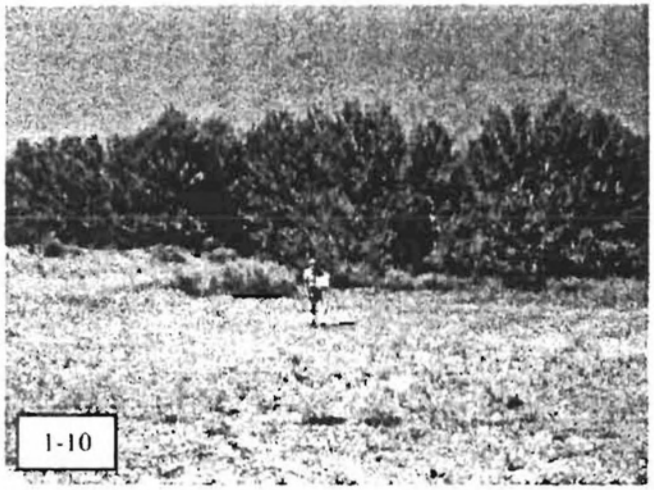

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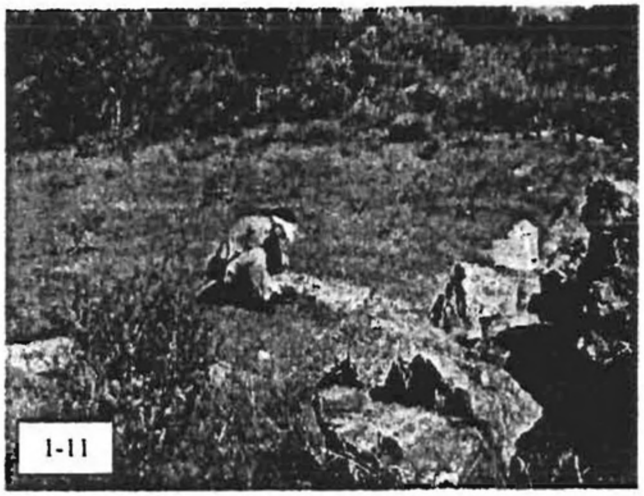

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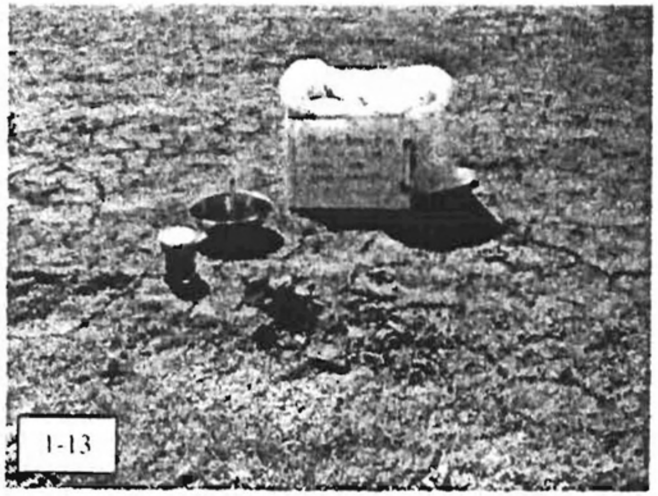

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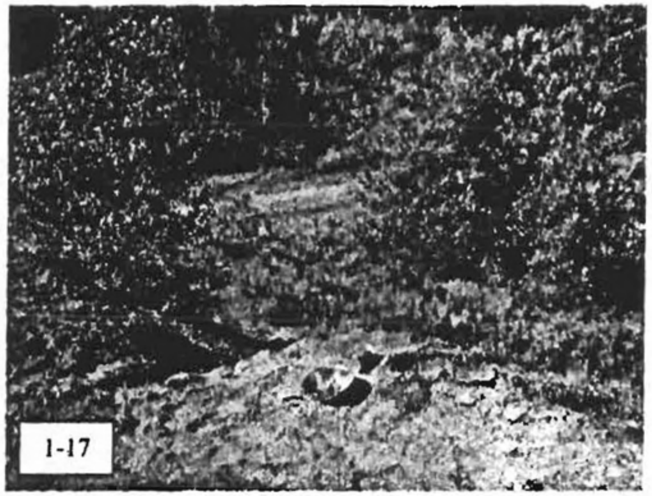

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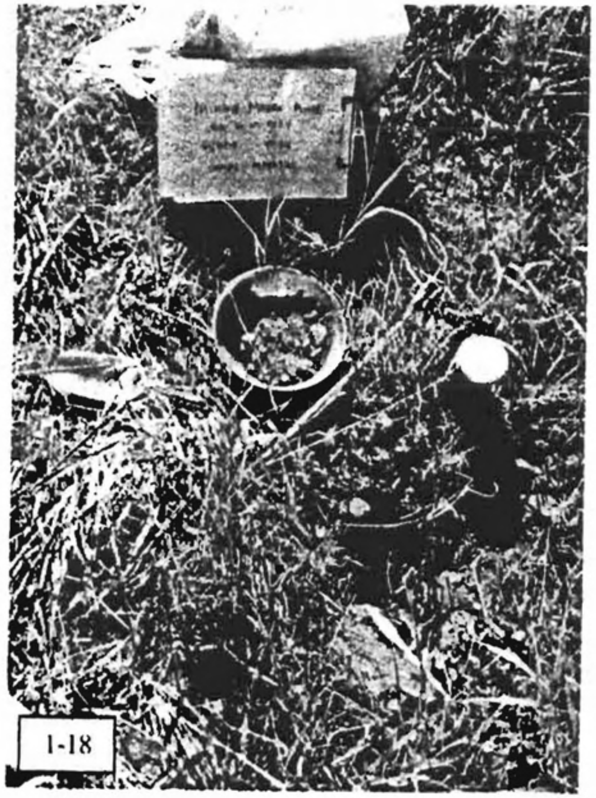

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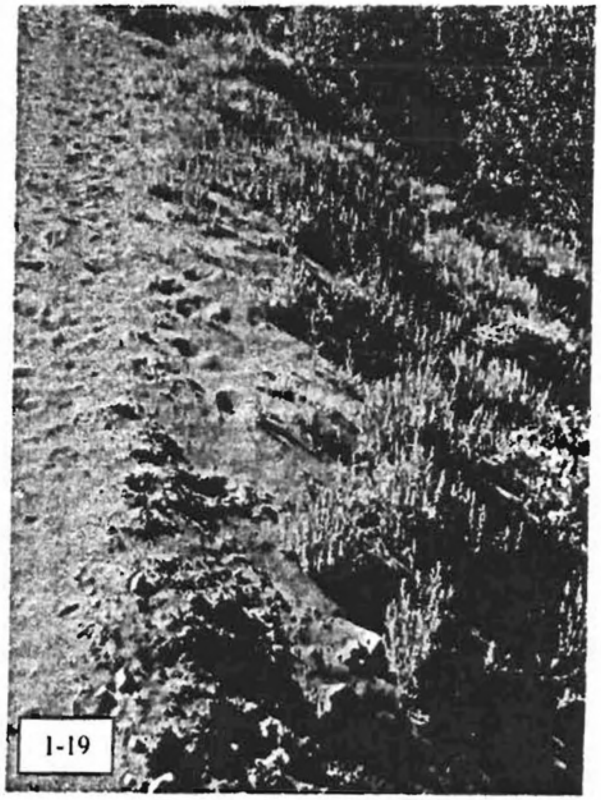

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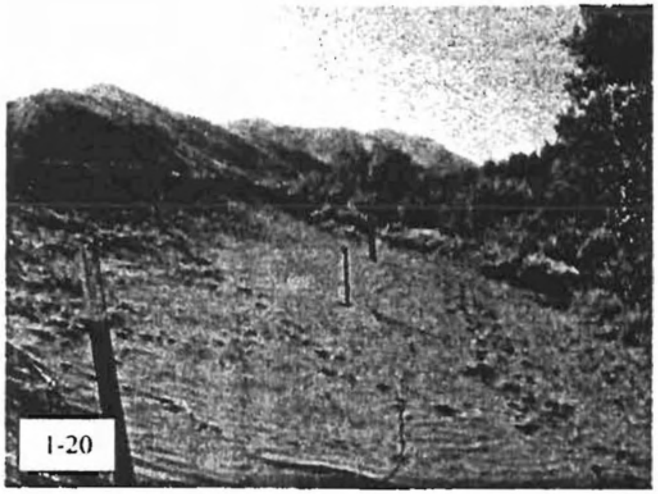
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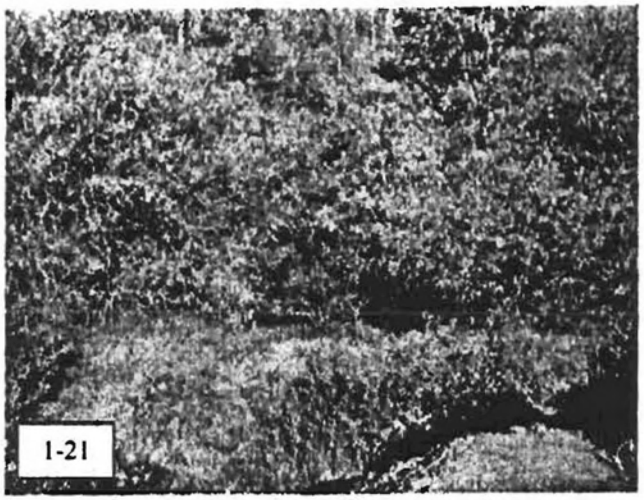
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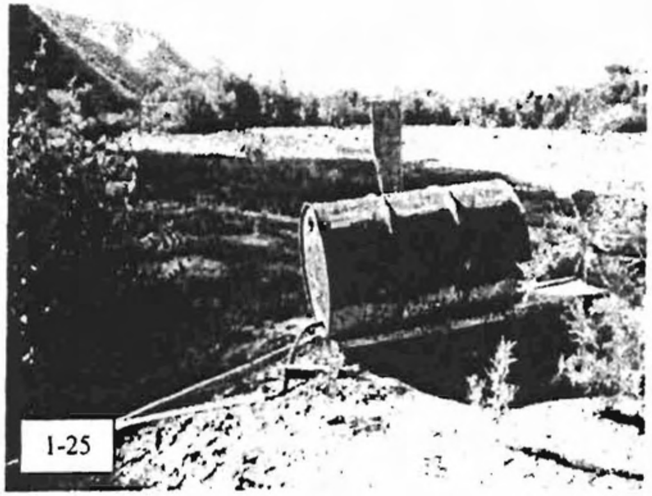
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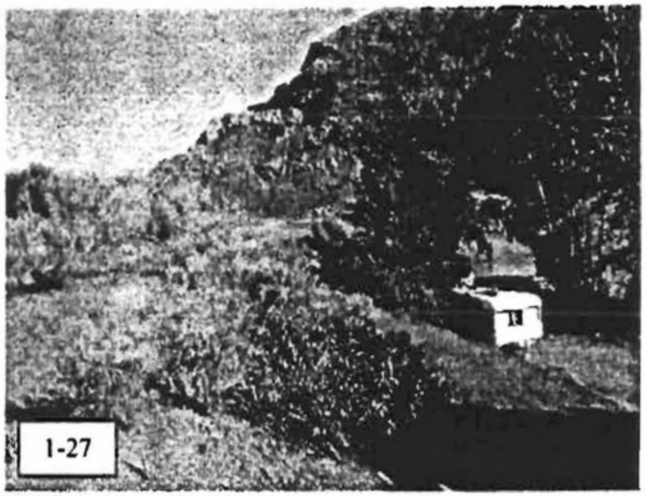
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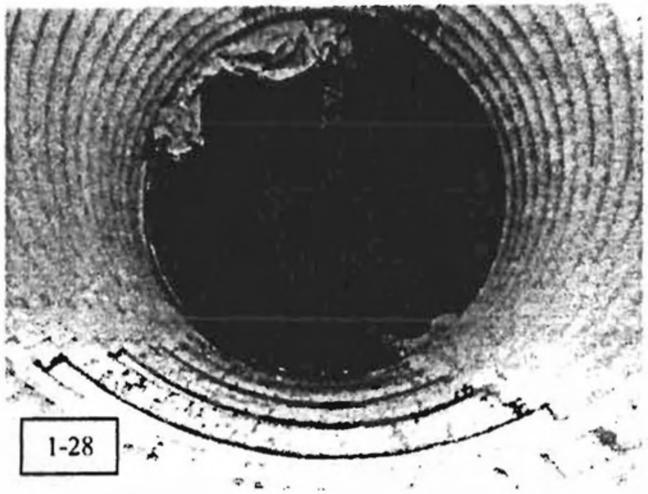
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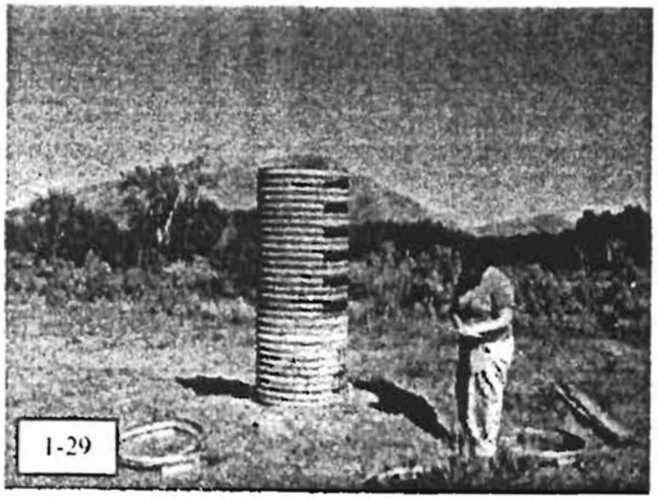
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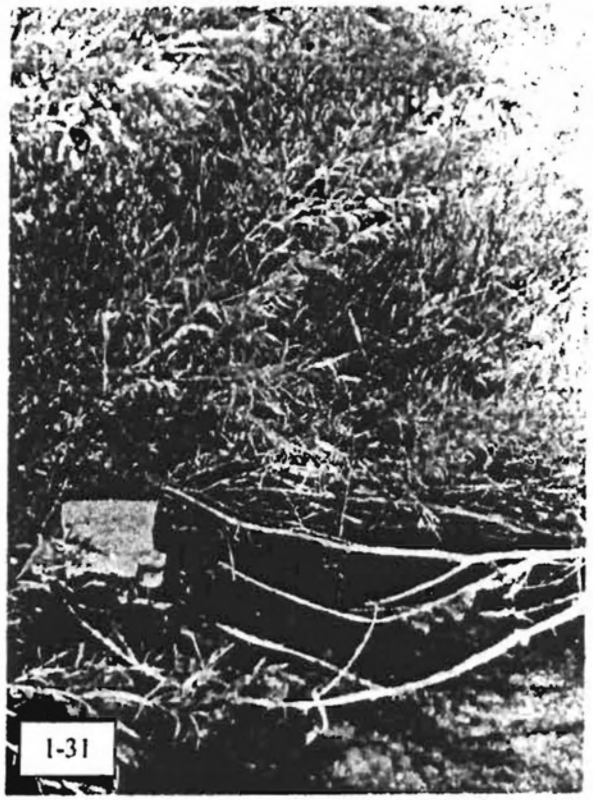
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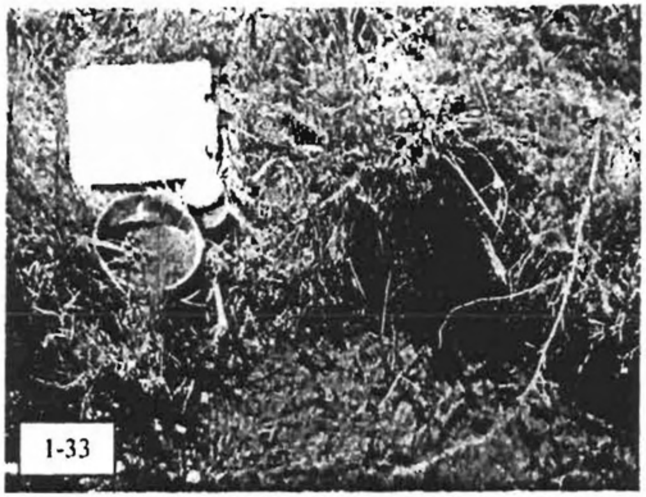
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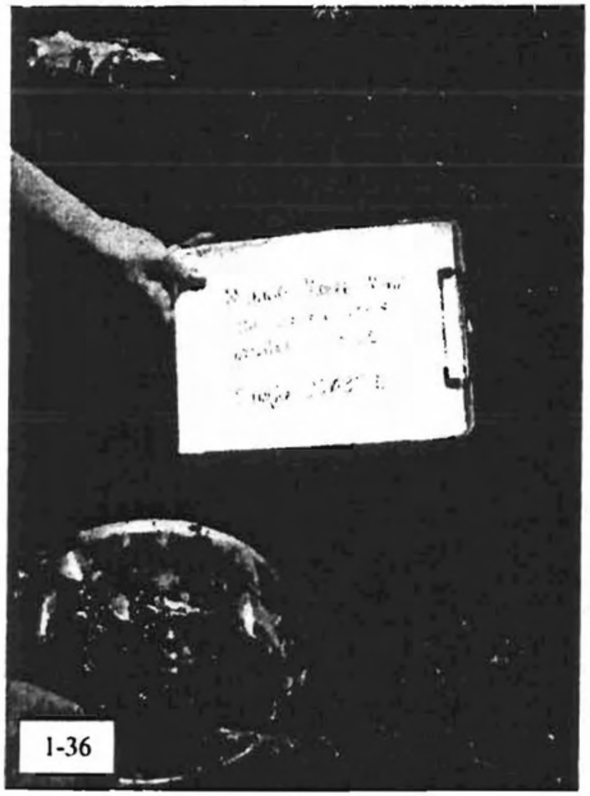
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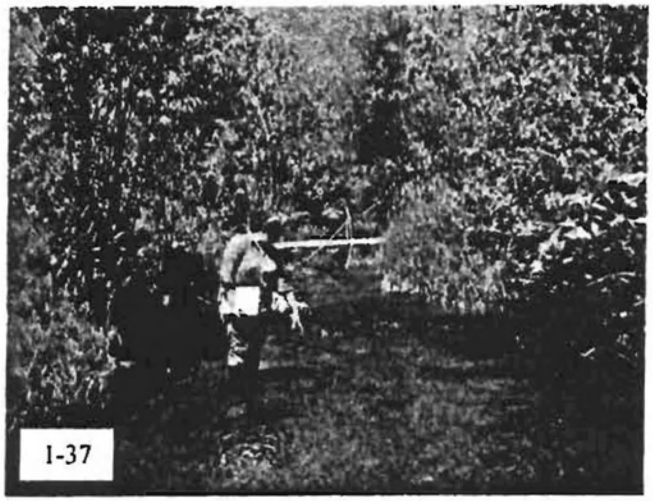
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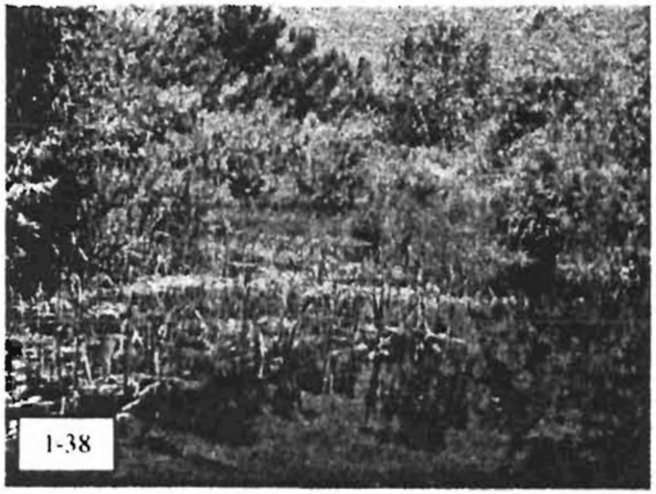

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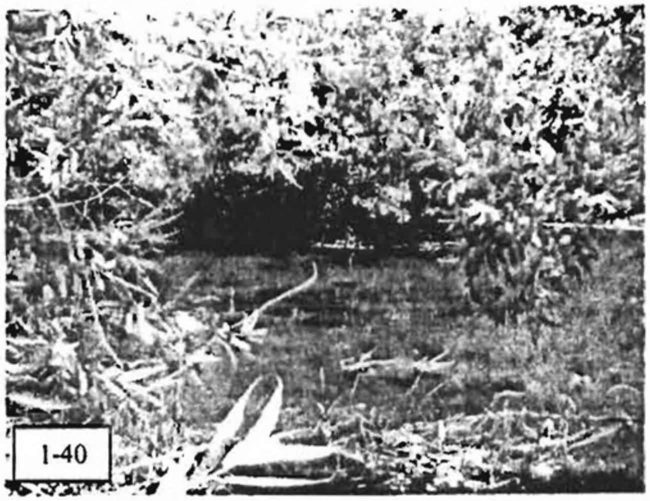

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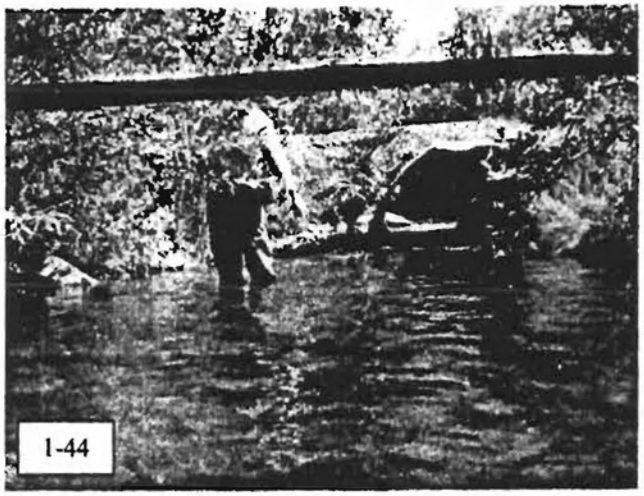
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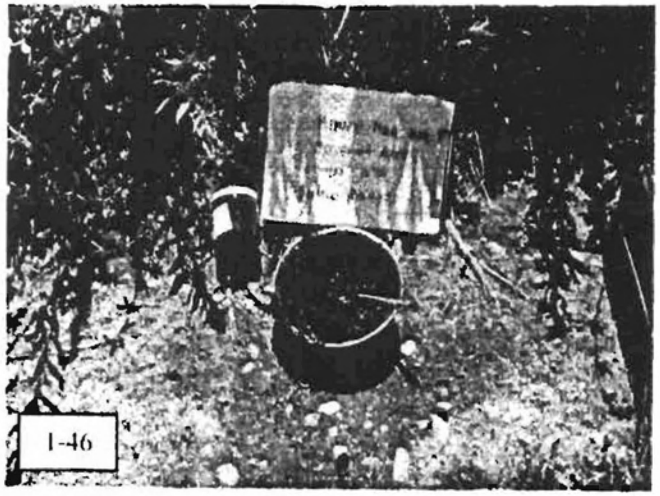
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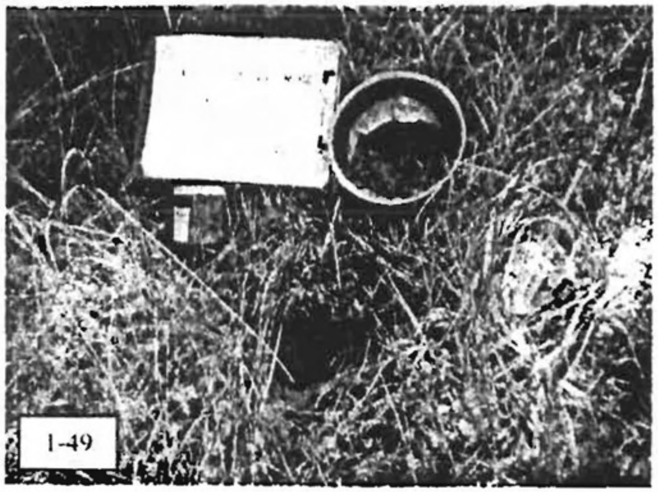
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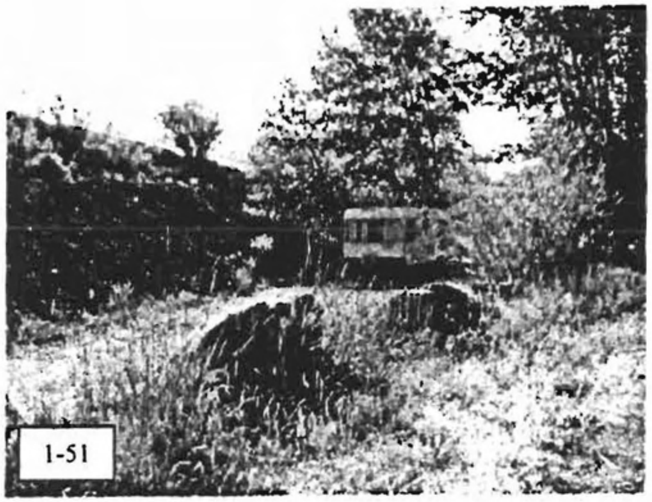
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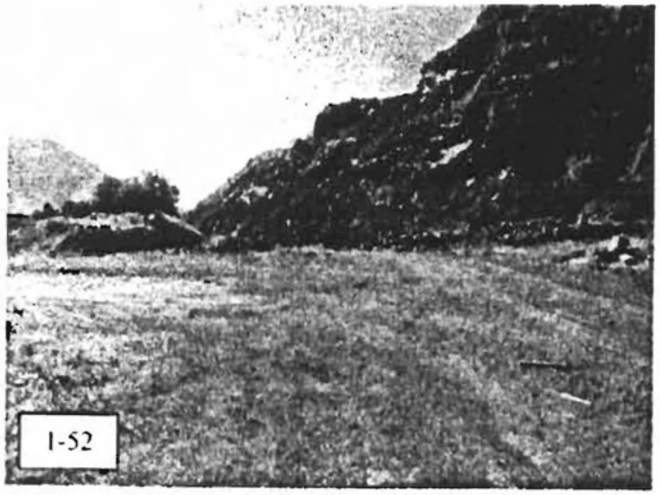
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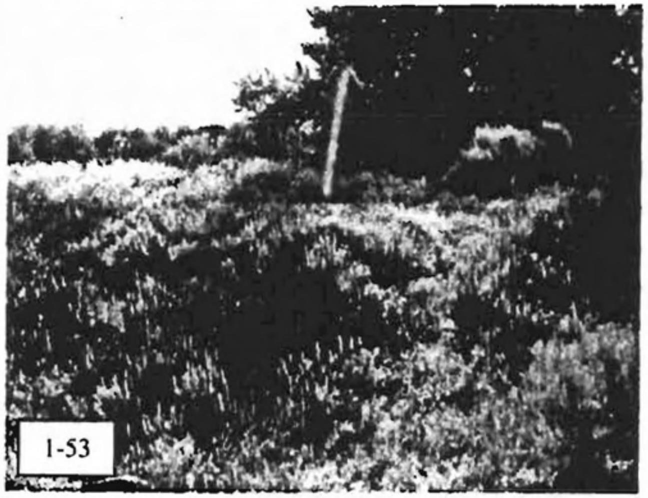
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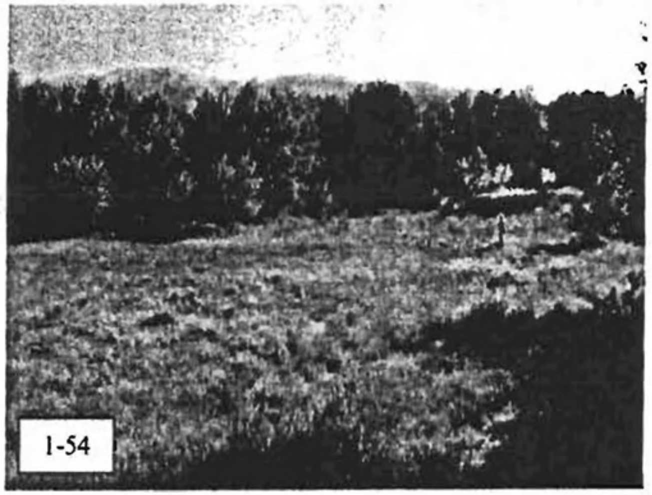
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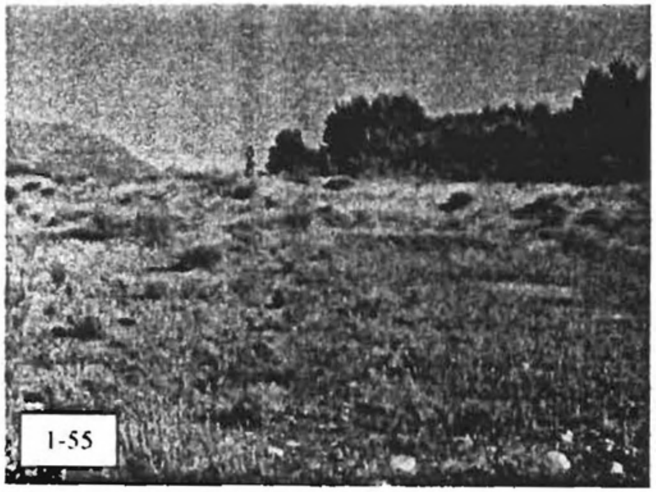
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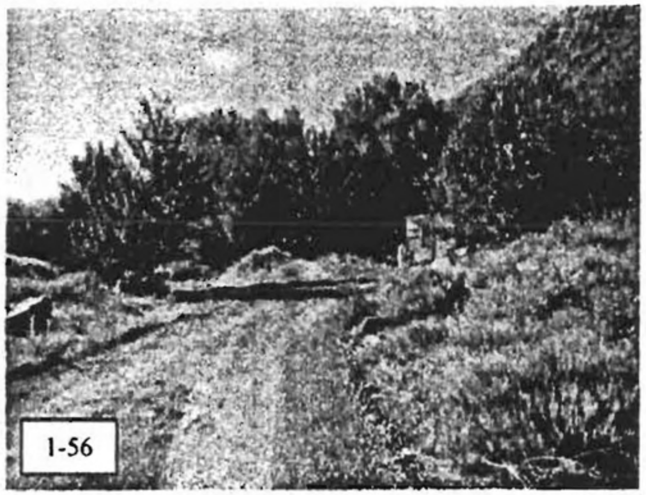
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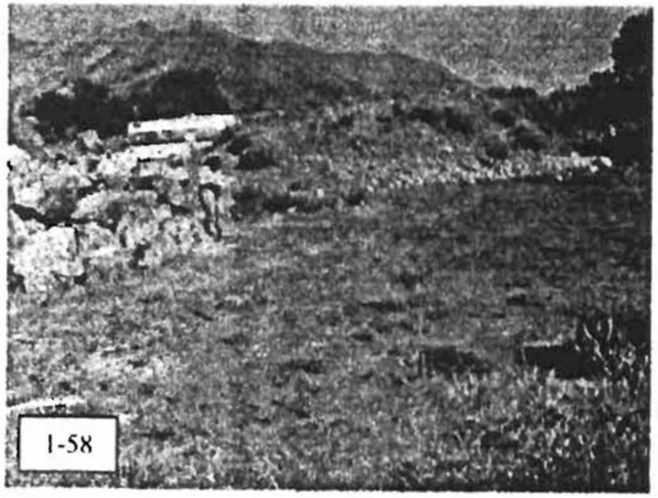
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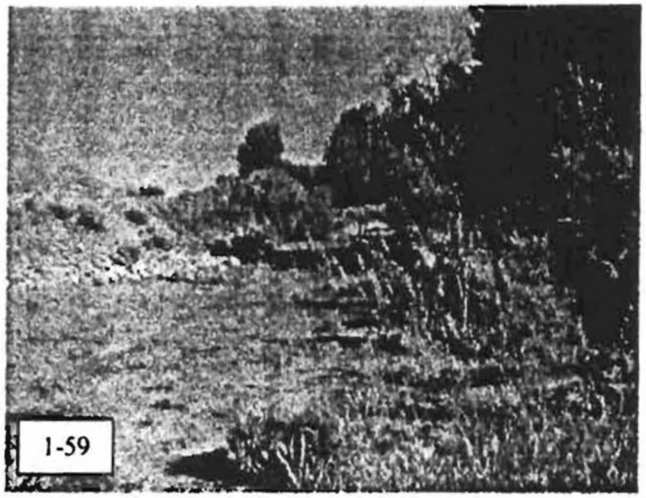
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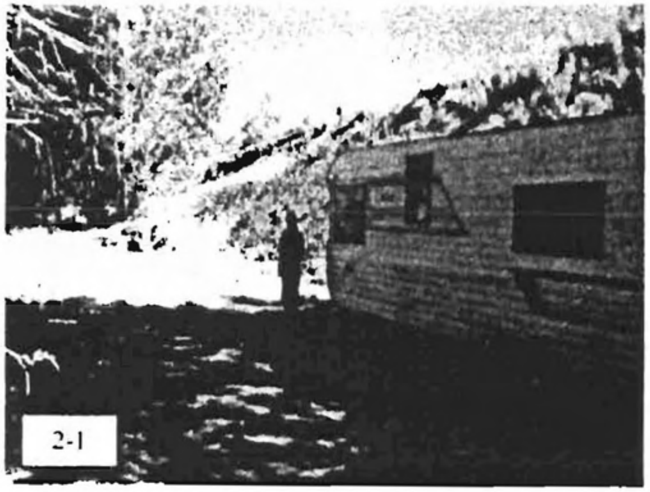
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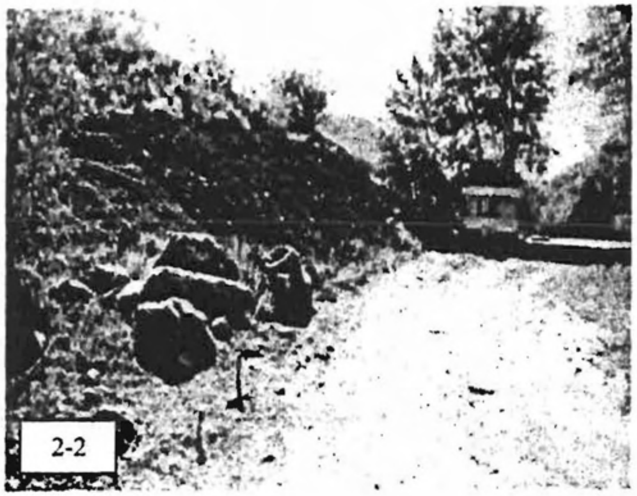
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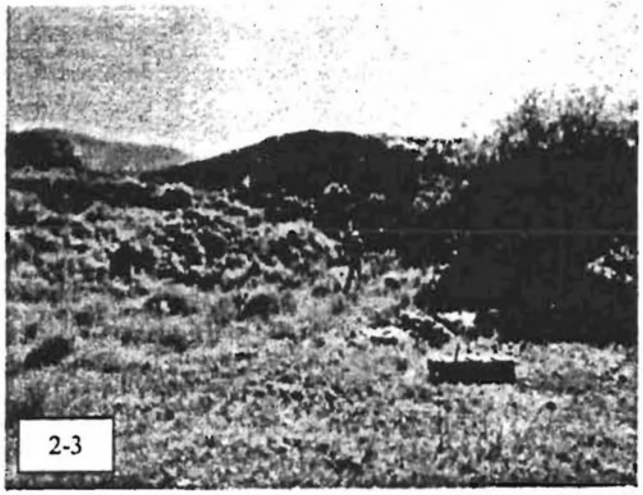
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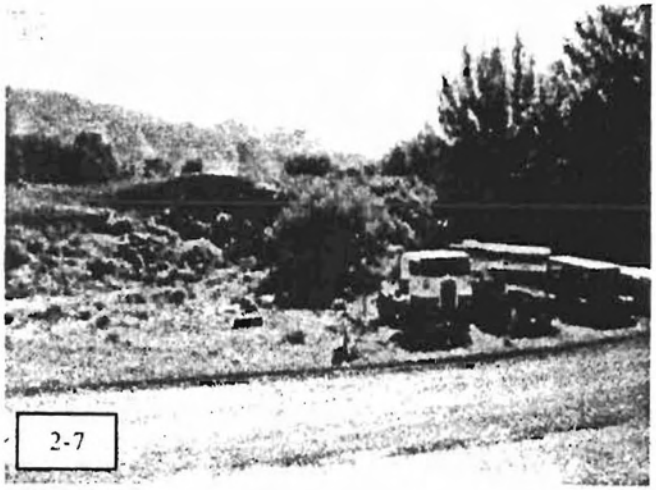
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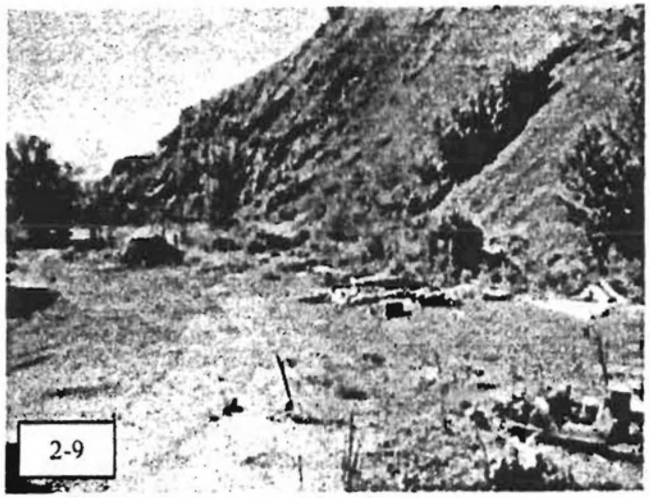
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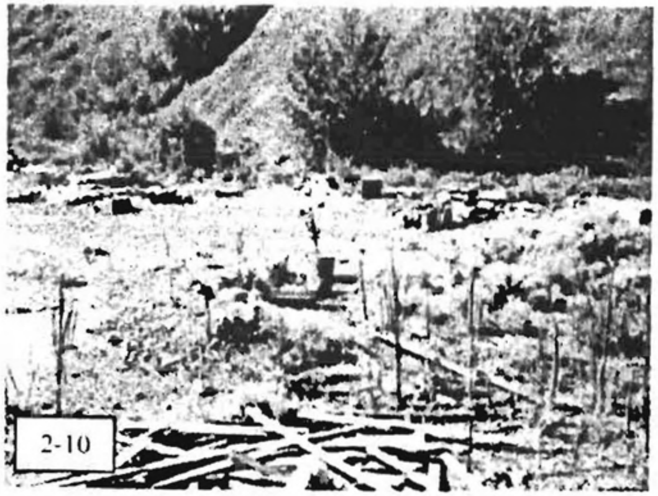
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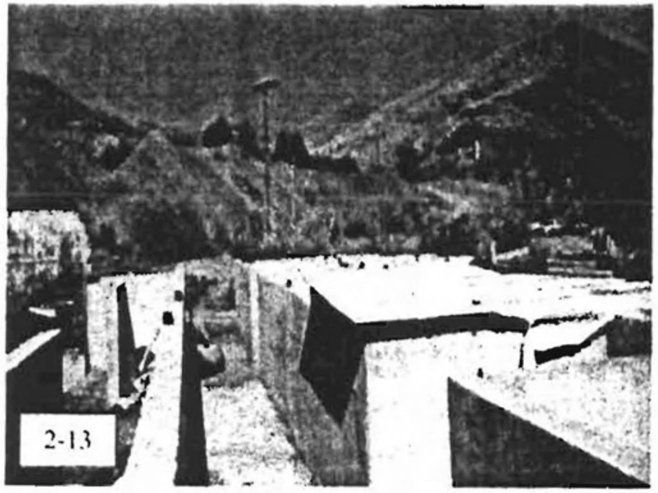
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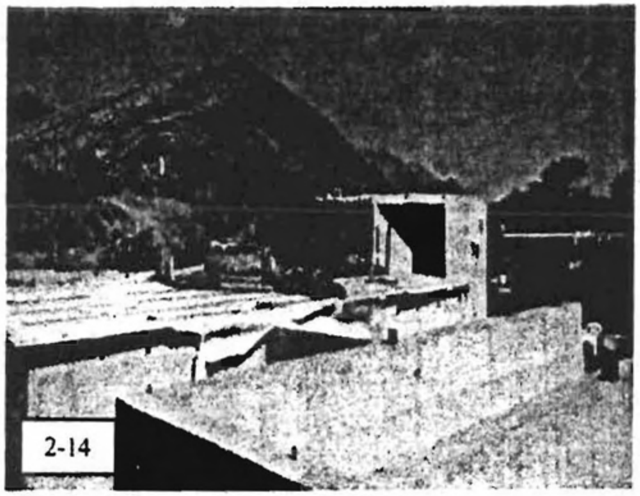
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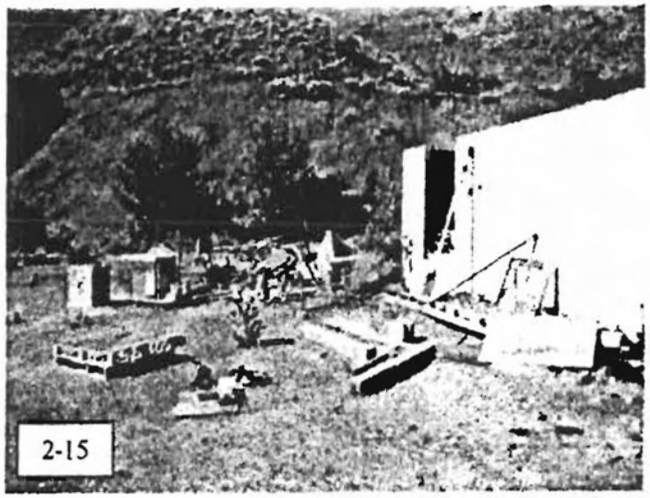
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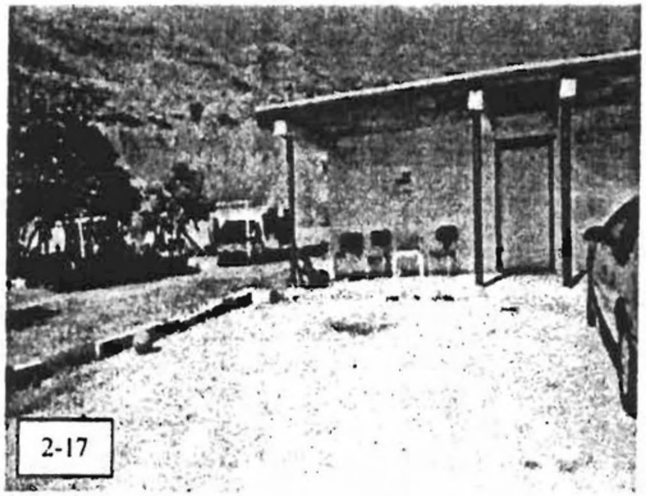
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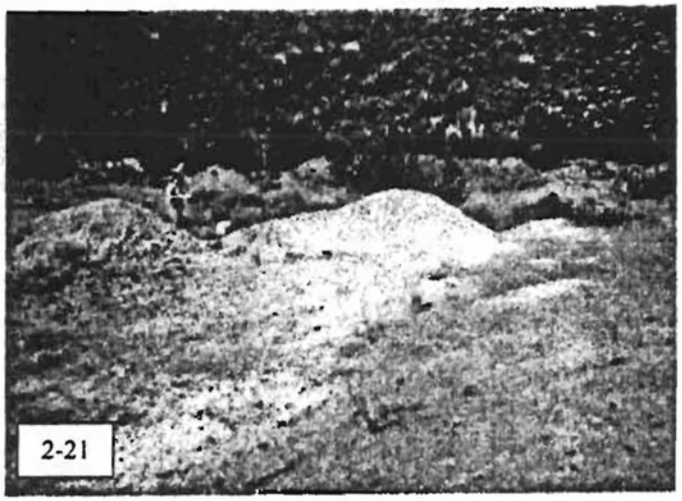

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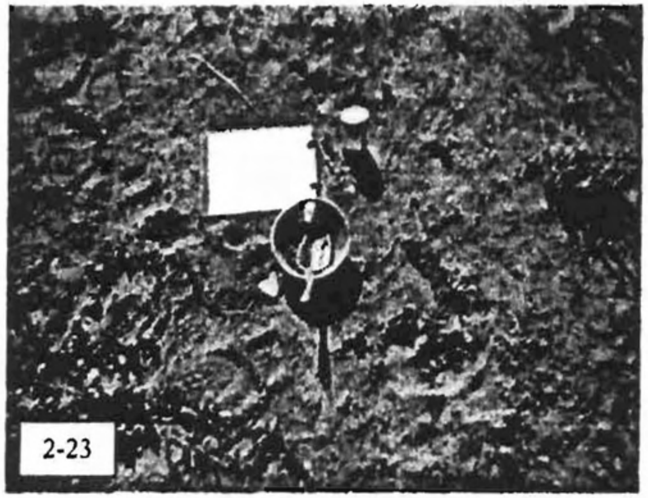

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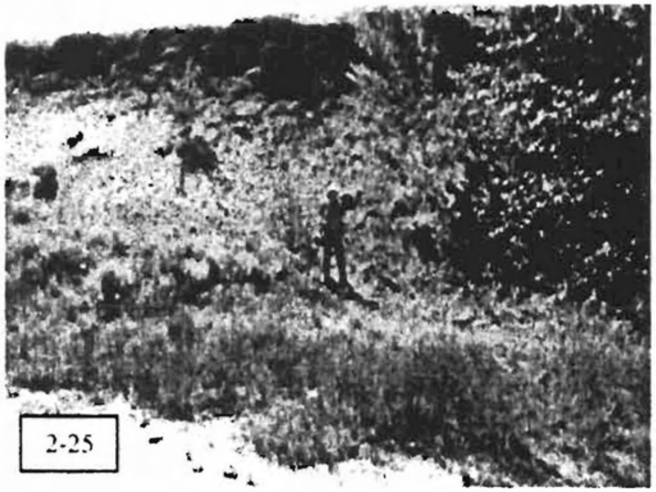

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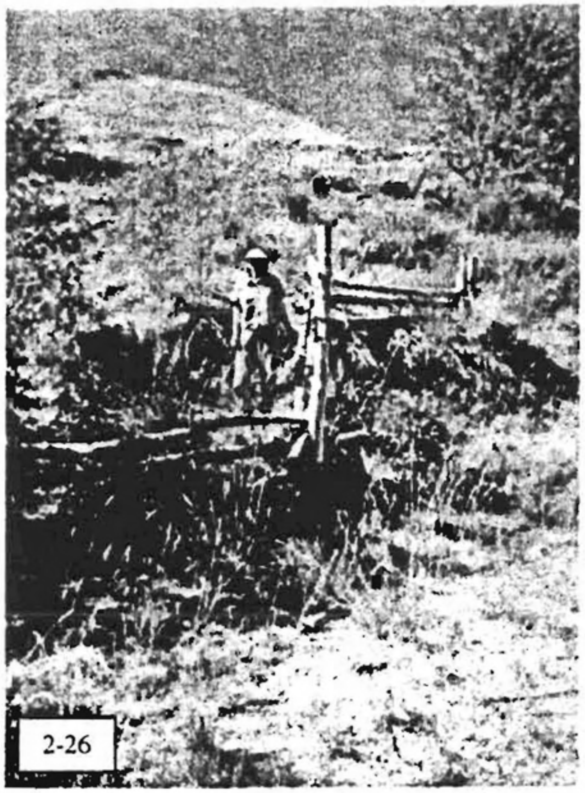

2-26

APPENDIX B

GPS Sample Location Data

GPS Data for Minnie Moore Mine Site Investigation Samples

Comment	EPA ID No.	Latitude	Longitude	Horizontal Datum	Method
PC01GW	202112	1565778.363	656868.528	NAD 1983	GPS
MM01GW	202101	1565103.647	656599.777	NAD 1983	GPS
MM02SS	202103	1565110.067	656437.286	NAD 1983	GPS
MM03SS	202104	1565101.367	656503.784	NAD 1983	GPS
BG01GW	202102	1565042.939	657255.859	NAD 1983	GPS
MM04SS	202105	1566197.169	655774.878	NAD 1983	GPS
MM05SS	202106	1566014.522	655991.376	NAD 1983	GPS
MM06SS	202107	1565687.055	656412.613	NAD 1983	GPS
MM07SS	202108	1565639.299	656544.281	NAD 1983	GPS
MM08SS	202109	1565574.321	656744.899	NAD 1983	GPS
MM09SS	202110	1565608.988	656761.334	NAD 1983	GPS
BS01SD	202118	1566125.907	656132.674	NAD 1983	GPS
BS02SD	202119	1565950.099	656309.578	NAD 1983	GPS
DD01SD	202123	1565925.144	656308.473	NAD 1983	GPS
BS03SD	202120	1565893.788	656401.816	NAD 1983	GPS
BS04SD	202121	1565876.295	656526.799	NAD 1983	GPS
BS05SD	202122	1565663.039	656744.680	NAD 1983	GPS
BG02SD	202114	1565615.759	656876.024	NAD 1983	GPS
BG03SD	202115	1565520.236	657393.569	NAD 1983	GPS
BG04SS	202116	1564483.984	657618.404	NAD 1983	GPS
BG05SS	202117	1564282.807	658571.446	NAD 1983	GPS
MM10SS	202111	1565755.786	656658.771	NAD 1983	GPS
MM11SS	202124	1565645.724	656121.474	NAD 1983	GPS
MM12SS	202125	1565304.629	656566.991	NAD 1983	GPS

Notes:
The GPS unit used is resource grade. Post-processed differentially corrected.
The coordinate system is US State Plane, the zone is Idaho Central 1102.

APPENDIX C

Data Validation Memos and Laboratory Data

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

RECEIVED
SEP 30 2003

IN REPLY
REFER TO: OEA-095

September 29, 2003

MEMORANDUM

SUBJECT: Minnie Moore Mine, CLP Metals Analysis, Data Validation
Case: 31897
SDG: MJ4024

FROM: Laura Castrilli, Chemist
Technical Resources Group, OEA

TO: Tara Martich, Site Assessment Manager
Office of Environmental Cleanup

CC: Bruce Woods, Region 10 CLP TPO
Julie Howe, Herrera Environmental Consultants Inc.

The following is a validation of ICP-AES and mercury analyses of one soil sample from the Minnie Moore site. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM05.2. Analyses were conducted by Ceimic Corporation, Narragansett, Rhode Island. This validation was conducted for sample MJ4024.

Data Qualifications

The following comments refer to Ceimic's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM05.2 and the Functional Guidelines for Inorganic Data Review (July 2002); utilizing professional judgement of the reviewer.* The comments presented herein are based on the information provided for the review.

1.0 **Timeliness** - Acceptable

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The sample was collected on 07/02/03. Mercury analyses were completed on 07/15/03. ICP-AES analyses were completed on 08/06/03. All analyses were conducted within the technical water holding times, therefore no qualification was made based on holding time.

2.0 **Sample Preparation** - Acceptable

The samples were prepared for mercury analyses on 07/14/03. The samples were prepared for ICP-AES analyses on 07/17/03. No qualification was made based on sample preparation.

3.0 **Calibrations/Calibration Verifications** - Acceptable

The samples were analyzed for mercury by CVAAS on 07/15/03. The initial calibration included one blank and five standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 08/05/03 (most analyses) and 08/06/03 (dilution for lead just on the matrix spike analysis). The instrument was standardized each day of analysis according to the analytical method using one blank and at least one calibration standard for each element.

All ICP-AES and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Calibration verification samples are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%.

All ICP-AES and CVAAS (mercury) calibration verification (initial and continuing) samples bracketing reported sample results met the frequency and recovery criteria; therefore no qualification was made based on ICP-AES or CVAAS calibration verification.

4.0 **Blanks** -

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

Antimony, calcium, manganese, nickel, and sodium were detected in the preparation blank. Aluminum, barium, cobalt, iron, lead, and zinc were detected in one or more CCBs.

Based on blank contamination, sodium in sample MJ4024 was qualified 'U', undetected. Remaining analytes were greater than five times the associated blank levels and were not qualified based on blank contamination.

5.0 **ICP-AES Interference Check Sample -**

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning of each sample analysis run and recoveries must be between 80% and 120% or within ±2 times the CRQL, whichever is greater. All ICS-A and ICS-AB recoveries for reported analytes were within the recovery criteria.

Sample MJ4024 had an interfering level of iron, but the estimated interference due to high iron was negligible. No qualification was made based on suspected interference.

6.0 **Laboratory Control Samples** - Acceptable

Laboratory Control samples (LCS) are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance criteria for control samples; therefore no qualification was made on this basis.

7.0 **Duplicate Analysis** - Acceptable

Duplicate analysis was done on sample MJ4024. Soil duplicate results were within the ±35% Relative Percent Difference (RPD) or ±2XCRQL criteria for soil results < 5 times the CRQL criteria. Laboratory '*' qualifiers were removed from the copper results as the lab used the stricter water criteria to qualify results.

8.0 **Matrix Spike Analysis -**

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analysis was done on sample MJ4024. All matrix spike recoveries were within the required QC limits; with the exception of antimony (203%), copper (42%), silver (393%) and thallium (zero%). Antimony (suspected high bias), copper (suspected low bias), and silver (suspected high bias) were qualified 'J', estimated. Thallium was not detected in the sample and due to the non-recovery of the thallium spike, thallium was qualified 'R', unusable.

The lead and zinc spike levels were less than one-fourth the native sample results and couldn't be used to consider for matrix spike qualification. However, there was a large inexplicable difference between the native and spike results for lead and zinc. The native result for lead was 3,340 mg/Kg, the spike amount was 3.8 mg/Kg and the spike result was 9,570 mg/Kg. The native result for zinc was 4,350 mg/Kg, the spike amount was 93.8 mg/Kg and the spike result was

8,020 mg/Kg. Lead and zinc in sample MJ4024 were qualified 'J', estimated due to suspected sample non-homogeneity.

9.0 ICP-AES Serial Dilution -

Sample MJ4024 was analyzed by ICP-AES serial dilution to check for potential interferences. All of the analytes which exceeded the minimum concentration criterion (50 times the MDL) were within the 10%D criteria; with the exception of manganese (13%D). Manganese was qualified 'J', estimated.

10.0 Detection Limits - Acceptable

Sample results which fall below the method detection limit (MDL) are assigned the value of the <u>CRQL</u> and the 'U' qualifier is attached. For data users' convenience, the MDLs for this SDG have been attached.

Contract Required Quantitation Limit (CRQL) standards are required for most analytes to demonstrate a linear calibration curve near the CRQL. CRQL standards were run at the required frequency. The new SOW requires that CRQL standards be re-analyzed if the recovery criteria have not been met and if they are still not met, the instrument has to be re-calibrated and affected samples/analytes have to be re-analyzed. All CRQL results were within the general 70-130% (50-150% for antimony, lead, and thallium) recovery criteria.

11.0 Overall Assessment of the Data

For ILM05.2, the laboratory is required to flag all detected results below the CRQL with a 'J' concentration qualifier (result below the CRQL but above the MDL).

Also new with ILM05.2, a laboratory 'D' qualifier in the qualification column indicates that a result is reported from a dilution analysis.

There were 23 data points reported: 1 result was qualified due to blank contamination, 3 results were qualified due to matrix spike recovery, 1 result was rejected due to extremely low matrix spike recovery, 2 results were qualified due to poor agreement between the native and matrix spike results, and 1 result was qualified due to poor serial dilution results. Overall, 35 percent of the data was qualified.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (07/02) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the reported sample quantitation limit.

J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J+ - The result is an estimated quantity, but the result may be biased high*.

J- - The result is an estimated quantity, but the result may be biased low*.

R - The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

* As this is a site investigation, the ‘+’ and ‘-‘ bias modifiers to the J qualifier were not used. Instead, the ‘H’ and ‘L’ bias modifiers were used.

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

L - Low bias.

H - High bias.

K - Unknown Bias.

Also, at the request of the site assessment manager, all results that have a laboratory ‘J’ concentration qualifier (result below the CRQL but above the MDL) were assigned a ‘J’ qualifier in the Q column of the Form 1 (no bias assessment for results only qualified based on concentration) to aid in the data entry process.

USEPA - CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4024

Lab Name: Ceimic Laboratories **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** 31442 **SDG NO.:** MJ4024

Matrix (soil/water): SOIL **Lab Sample ID:** 030874-01

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 99.6

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8420			P
7440-36-0	Antimony	29.5		~~*~~ JH	P
7440-38-2	Arsenic	1200			P
7440-39-3	Barium	69.3			P
7440-41-7	Beryllium	0.70	J	J	P
7440-43-9	Cadmium	39.4			P
7440-70-2	Calcium	22200			P
7440-47-3	Chromium	21.6			P
7440-48-4	Cobalt	10.0			P
7440-50-8	Copper	135		~~N*~~ JL	P
7439-89-6	Iron	40900			P
7439-92-1	Lead	3340		JK	P
7439-95-4	Magnesium	7440			P
7439-96-5	Manganese	5210		~~*~~ JK	P
7439-97-6	Mercury	1.5			CV
7440-02-0	Nickel	33.9			P
7440-09-7	Potassium	2280			P
7782-49-2	Selenium	6.7	U		P
7440-22-4	Silver	26.1		~~*~~ JH	P
7440-23-5	Sodium	144	~~J~~	U	P
7440-28-0	Thallium	~~4.8~~	~~U~~	~~*~~ R	P
7440-62-2	Vanadium	45.6			P
7440-66-6	Zinc	4350		JK	P

9/11/03

Color Before: brown **Clarity Before:** n/a **Texture:** fine

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA - CLP

9-IN

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Ceimic Laboratories **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** 31442 **SDG NO.:** MJ4024

Instrument Type: CV **Instrument ID:** FIMS CVAA **Date:** 1/27/2003

Preparation Method: CS1

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

Analyte	Wave-Length /Mass	CRQL	MDL
Mercury	253.70	0.10	0.04

USEPA - CLP

9-IN

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Ceimic Laboratories **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** 31442 **SDG NO.:** MJ4024

Instrument Type: P **Instrument ID:** PE Optima ICP **Date:** 2/26/2003

Preparation Method: HS1

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

Analyte	Wave-Length /Mass	CRQL	MDL
Aluminum	308.22	40.00	4.67
Antimony	206.83	12.00	0.22
Arsenic	188.98	3.00	0.46
Barium	233.53	40.00	0.51
Beryllium	313.11	1.00	0.04
Cadmium	226.50	1.00	0.03
Calcium	315.89	1000.00	3.00
Chromium	267.72	2.00	0.28
Cobalt	228.62	10.00	0.15
Copper	324.75	5.00	0.29
Iron	273.96	20.00	9.99
Lead	220.35	2.00	0.16
Magnesium	279.08	1000.00	6.43
Manganese	257.61	3.00	0.06
Nickel	231.60	8.00	0.13
Potassium	766.49	1000.00	7.36
Selenium	196.03	7.00	0.67
Silver	338.29	2.00	0.09
Sodium	589.59	1000.00	2.92
Thallium	190.80	5.00	0.28
Vanadium	290.88	10.00	0.19
Zinc	206.20	12.00	1.52

USEPA - CLP

12-IN

PREPARATION LOG

Lab Name: Ceimic Laboratories **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** 31442 **SDG NO.:** MJ4024

Preparation Method: CS1

EPA Sample No.	Preparation Date	Weight (gram)	Volume(mL)
PBS01	7/14/2003	0.20	100
LCSS01	7/14/2003	0.05	100
MJ4024	7/14/2003	0.20	100
MJ4024S	7/14/2003	0.20	100
MJ4024D	7/14/2003	0.20	100

Comments:

USEPA - CLP

12-IN

PREPARATION LOG

Lab Name:	Ceimic Laboratories			**Contract:**	68-W-02-063		
Lab Code:	CEIMIC	**Case No.:**	31897	**NRAS No.:**	31442	**SDG NO.:**	MJ4024

Preparation Method: HS1

EPA Sample No.	Preparation Date	Weight (gram)	Volume(mL)
PBS01	7/17/2003	1.00	200
LCSS01	7/17/2003	1.00	200
MJ4024	7/17/2003	1.05	200
MJ4024D	7/17/2003	1.05	200
MJ4024S	7/17/2003	1.07	200

Comments:

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

IN REPLY
REFER TO: OEA-095 September 29, 2003

MEMORANDUM

SUBJECT: Minnie Moore Mine, CLP Metals Analysis, Data Validation
Case: 31897
SDG: MJ4002

FROM: Laura Castrilli, Chemist
Technical Resources Group, OEA

TO: Tara Martich, Site Assessment Manager
Office of Environmental Cleanup

CC: Bruce Woods, Region 10 CLP TPO
Julie Howe, Herrera Environmental Consultants Inc.

The following is a validation of ICP-AES and mercury analyses of twenty soil/sediment samples from the Minnie Moore site. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM05.2. Analyses were conducted by Ceimic Corporation, Narragansett, Rhode Island. This validation was conducted for the following samples:

MJ4002
MJ4003
MJ4004
MJ4005
MJ4006
MJ4007
MJ4008
MJ4009
MJ4010
MJ4013
MJ4014
MJ4015
MJ4016
MJ4017
MJ4018
MJ4019
MJ4020
MJ4021
MJ4022
MJ4023

Data Qualifications

The following comments refer to Ceimic's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM05.2 and the Functional Guidelines for Inorganic Data Review (July 2002); utilizing professional judgement of the reviewer.* The comments presented herein are based on the information provided for the review.

1.0 **Timeliness** - Acceptable

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The samples were collected between 06/30/03 and 07/02/03. Mercury analyses were completed on 07/15/03. ICP-AES analyses were completed on 08/05/03. All analyses were conducted within the technical water holding times, therefore no qualification was made based on holding time.

2.0 **Sample Preparation** - Acceptable

The samples were prepared for mercury analyses on 07/14/03. The samples were prepared for ICP-AES analyses on 07/17/03. No qualification was made based on sample preparation.

3.0 **Calibrations/Calibration Verifications** - Acceptable

The samples were analyzed for mercury by CVAAS on 07/15/03. The initial calibration included one blank and five standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 08/05/03. The instrument was standardized each day of analysis according to the analytical method using one blank and at least one calibration standard for each element.

All ICP-AES and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Calibration verification samples are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%.

All ICP-AES and CVAAS (mercury) calibration verification (initial and continuing) samples bracketing reported sample results met the frequency and recovery criteria; therefore no qualification was made based on ICP-AES or CVAAS calibration verification.

4.0 **Blanks** -

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

Calcium, lead, manganese, nickel, potassium, and sodium were detected in the preparation blank. Arsenic in the preparation blank had a negative result with an absolute value greater than the method detection limit (MDL). Barium, beryllium, iron, lead, magnesium, manganese, and zinc were detected in one or more CCBs.

Based on blank contamination, sodium in samples MJ4002, MJ4003, MJ4007, MJ4009, and MJ4013 through MJ4022 was qualified 'U', undetected. Remaining analytes were greater than five times the associated blank levels and were not qualified based on blank contamination.

5.0 ICP-AES Interference Check Sample -

The interference check sample (ICS) is analyzed by ICP-AES to verify interelement and background correction factors. Analysis is required at the beginning of each sample analysis run and recoveries must be between 80% and 120% or within ±2 times the CRQL, whichever is greater. All ICS-A and ICS-AB recoveries for reported analytes were within the recovery criteria.

A number of samples had interfering levels of iron. Based on suspected iron interference, the following qualifications were made:

- Antimony in samples MJ4002, MJ4003, MJ4005 through MJ4007, MJ4009, MJ4010, MJ4015 through MJ4017, and MJ4019 through MJ4021 was qualified 'J', estimated or 'UJ', estimated detection limit (suspected false negatives).

- Cobalt and vanadium in sample MJ4008 was qualified 'J', estimated.

- Selenium in samples MJ4015 and MJ4017 are suspected false positives. Since selenium had a very low matrix spike recovery, selenium in these samples ended up being qualified as 'R', unusable.

6.0 Laboratory Control Samples - Acceptable

Laboratory Control samples (LCS) are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance criteria for control samples; therefore no qualification was made on this basis.

7.0 Duplicate Analysis -

Duplicate analysis was done on sample MJ4005. Soil duplicate results were within the ±35% Relative Percent Difference (RPD) or ±2XCRQL criteria for soil results < 5 times the CRQL criteria; with the exception of antimony which was outside the ±2XCRQL. Antimony results were qualified 'J' estimated.

8.0 Matrix Spike Analysis -

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analysis was done on sample MJ4005. All matrix spike recoveries were within the required QC limits; with the exception of antimony (62%), selenium (24%), and thallium (zero%). Antimony results were qualified 'J', estimated (unknown bias as results were also qualified due to poor duplicate precision). With the exception of selenium in sample MJ4015, selenium and thallium were not detected in the samples and due to the non- or very low recoveries of the spikes, selenium and thallium were qualified 'R', unusable.

Since the selenium result in sample MJ4015 is likely a false positive due to high iron, it also received a final qualifier of 'R', unusable.

9.0 ICP-AES Serial Dilution -

Sample MJ4005 was analyzed by ICP-AES serial dilution to check for potential interferences. All of the analytes which exceeded the minimum concentration criterion (50 times the MDL) were within the 10%D criteria; with the exception of sodium (68%D). Sodium results were qualified 'J', estimated.

10.0 Detection Limits - Acceptable

Sample results which fall below the method detection limit (MDL) are assigned the value of the <u>CRQL</u> and the 'U' qualifier is attached. For data users' convenience, the MDLs for this SDG have been attached.

Contract Required Quantitation Limit (CRQL) standards are required for most analytes to demonstrate a linear calibration curve near the CRQL. CRQL standards were run at the required frequency. The new SOW requires that CRQL standards be re-analyzed if the recovery criteria have not been met and if they are still not met, the instrument has to be re-calibrated and affected samples/analytes have to be re-analyzed. All CRQL results were within the general 70-130% (50-150% for antimony, lead, and thallium) recovery criteria.

11.0 Overall Assessment of the Data

For ILM05.2, the laboratory is required to flag all detected results below the CRQL with a 'J' concentration qualifier (result below the CRQL but above the MDL).

Also new with ILM05.2, a laboratory 'D' qualifier in the qualification column indicates that a result is reported from a dilution analysis. The 'D' qualifiers were removed during the review process.

There were 460 data points reported: 14 results were qualified due to blank contamination, 20 results were qualified due to poor duplicate precision, 20 results were qualified due to matrix spike recovery, 40 results were rejected due to extremely low matrix spike recovery, 17 results were qualified due to suspected interference, and 20 results were qualified due to poor serial dilution results. Overall, 18 percent of the data was qualified.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (07/02) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the reported sample quantitation limit.

J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J+ - The result is an estimated quantity, but the result may be biased high*.

J- - The result is an estimated quantity, but the result may be biased low*.

R - The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.

UJ - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

* As this is a site investigation, the '+' and '-' bias modifiers to the J qualifier were not used. Instead, the 'H' and 'L' bias modifiers were used.

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

L - Low bias.

H - High bias.

K - Unknown Bias.

Also, at the request of the site assessment manager, all results that have a laboratory 'J' concentration qualifier (result below the CRQL but above the MDL) were assigned a 'J' qualifier in the Q column of the Form 1 (no bias assessment for results <u>only</u> qualified based on concentration) to aid in the data entry process.

USEPA-CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4002

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-01

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 99.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11100			P
7440-36-0	Antimony	10.1	J	~~N*~~ JK	P
7440-38-2	Arsenic	1210			P
7440-39-3	Barium	135			P
7440-41-7	Beryllium	1.2			P
7440-43-9	Cadmium	25.0			P
7440-70-2	Calcium	7490			P
7440-47-3	Chromium	28.7			P
7440-48-4	Cobalt	11.0			P
7440-50-8	Copper	68.0			P
7439-89-6	Iron	31100			P
7439-92-1	Lead	4260			P
7439-95-4	Magnesium	6770			P
7439-96-5	Manganese	811			P
7439-97-6	Mercury	1.7			CV
7440-02-0	Nickel	13.5			P
7440-09-7	Potassium	5370			P
7782-49-2	Selenium	~~6.8~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	17.3			P
7440-23-5	Sodium	103	~~J~~	~~N~~ UJK	P
7440-28-0	Thallium	~~4.9~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	44.7			P
7440-66-6	Zinc	5330			P

09/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4003

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-02

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 87.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	16700			P
7440-36-0	Antimony	12.4	U	~~N*~~ JK	P
7440-38-2	Arsenic	35.6			P
7440-39-3	Barium	208			P
7440-41-7	Beryllium	1.6			P
7440-43-9	Cadmium	4.6			P
7440-70-2	Calcium	5320			P
7440-47-3	Chromium	49.4			P
7440-48-4	Cobalt	14.4			P
7440-50-8	Copper	12.9			P
7439-89-6	Iron	26900			P
7439-92-1	Lead	187			P
7439-95-4	Magnesium	9690			P
7439-96-5	Manganese	599			P
7439-97-6	Mercury	0.091	J	J	CV
7440-02-0	Nickel	20.7			P
7440-09-7	Potassium	7760			P
7782-49-2	Selenium	~~7.2~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	0.71	J	J	P
7440-23-5	Sodium	171	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~5.2~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	74.2			P
7440-66-6	Zinc	454			P

09/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO. MJ4004

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-03

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 88.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	12600			P
7440-36-0	Antimony	52.6		~~N*~~ JK	P
7440-38-2	Arsenic	911			P
7440-39-3	Barium	85.0			P
7440-41-7	Beryllium	0.92			P
7440-43-9	Cadmium	57.4			P
7440-70-2	Calcium	46700			P
7440-47-3	Chromium	29.8			P
7440-48-4	Cobalt	8.9			P
7440-50-8	Copper	229			P
7439-89-6	Iron	41500			P
7439-92-1	Lead	7240		~~D~~	P
7439-95-4	Magnesium	11700			P
7439-96-5	Manganese	3950			P
7439-97-6	Mercury	3.5			CV
7440-02-0	Nickel	40.2			P
7440-09-7	Potassium	2860			P
7782-49-2	Selenium	~~5.9~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	37.6			P
7440-23-5	Sodium	321	J	~~N~~ JK	P
7440-28-0	Thallium	~~4.2~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	69.4			P
7440-66-6	Zinc	6460			P

09/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

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1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4005

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-04

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 92.5

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8510			P
7440-36-0	Antimony	7.4	J	~~N*~~ JK	P
7440-38-2	Arsenic	1700			P
7440-39-3	Barium	79.2			P
7440-41-7	Beryllium	0.69	J	J	P
7440-43-9	Cadmium	33.8			P
7440-70-2	Calcium	54000			P
7440-47-3	Chromium	20.3			P
7440-48-4	Cobalt	11.1			P
7440-50-8	Copper	101			P
7439-89-6	Iron	31700			P
7439-92-1	Lead	2590			P
7439-95-4	Magnesium	7020			P
7439-96-5	Manganese	2050			P
7439-97-6	Mercury	4.2			CV
7440-02-0	Nickel	39.2			P
7440-09-7	Potassium	2050			P
7782-49-2	Selenium	~~5.4~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	14.5			P
7440-23-5	Sodium	174	J	~~E~~ JK	P
7440-28-0	Thallium	~~3.9~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	39.2			P
7440-66-6	Zinc	3530			P

08/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4006

Lab Name: Ceimic Corporation
Contract: 68-W-02-063
Lab Code: CEIMIC **Case No.:** 31897
NRAS No.:
SDG NO.: MJ4002
Matrix (soil/water): SOIL
Lab Sample ID: 030873-05
Level (low/med): LOW
Date Received: 7/3/2003
% Solids: 86.1
Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	12000			P
7440-36-0	Antimony	3.5	J	~~N*~~ JK	P
7440-38-2	Arsenic	3300			P
7440-39-3	Barium	56.6			P
7440-41-7	Beryllium	0.92			P
7440-43-9	Cadmium	36.9			P
7440-70-2	Calcium	46700			P
7440-47-3	Chromium	27.4			P
7440-48-4	Cobalt	13.1			P
7440-50-8	Copper	489			P
7439-89-6	Iron	41100			P
7439-92-1	Lead	3750			P
7439-95-4	Magnesium	11300			P
7439-96-5	Manganese	2960			P
7439-97-6	Mercury	1.5			CV
7440-02-0	Nickel	39.0			P
7440-09-7	Potassium	3590			P
7782-49-2	Selenium	~~5.9~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	16.2			P
7440-23-5	Sodium	271	J	~~N~~ JK	P
7440-28-0	Thallium	~~4.2~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	42.1			P
7440-66-6	Zinc	3700			P

9/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium
Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4007

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-06

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 87.9

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9330			P
7440-36-0	Antimony	18.9		~~N*~~ JK	P
7440-38-2	Arsenic	1500			P
7440-39-3	Barium	40.6			P
7440-41-7	Beryllium	0.79	J	J	P
7440-43-9	Cadmium	27.3			P
7440-70-2	Calcium	48300			P
7440-47-3	Chromium	26.6			P
7440-48-4	Cobalt	7.3	J	J	P
7440-50-8	Copper	257			P
7439-89-6	Iron	53500			P
7439-92-1	Lead	3610			P
7439-95-4	Magnesium	7420			P
7439-96-5	Manganese	7090			P
7439-97-6	Mercury	1.1			CV
7440-02-0	Nickel	27.0			P
7440-09-7	Potassium	1680			P
7782-49-2	Selenium	~~6.4~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	25.9			P
7440-23-5	Sodium	115	~~J~~	~~N~~ UJK	P
7440-28-0	Thallium	~~4.6~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	39.2			P
7440-66-6	Zinc	3340			P

09/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4008

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-07

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 95.9

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1710			P
7440-36-0	Antimony	253		~~N*~~ JK	P
7440-38-2	Arsenic	6180		~~D~~	P
7440-39-3	Barium	238			P
7440-41-7	Beryllium	0.12	J	J	P
7440-43-9	Cadmium	12.1			P
7440-70-2	Calcium	24000			P
7440-47-3	Chromium	5.4			P
7440-48-4	Cobalt	2.3	J	JK	P
7440-50-8	Copper	588			P
7439-89-6	Iron	57700			P
7439-92-1	Lead	18500		~~D~~	P
7439-95-4	Magnesium	1020	J	J	P
7439-96-5	Manganese	1020			P
7439-97-6	Mercury	1.1			CV
7440-02-0	Nickel	8.7			P
7440-09-7	Potassium	2950			P
7782-49-2	Selenium	~~7.2~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	55.5			P
7440-23-5	Sodium	282	J	~~E~~ JK	P
7440-28-0	Thallium	~~5.1~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	12.6		JK	P
7440-66-6	Zinc	2040			P

JK 07/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4009

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-08

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 99.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5920			P
7440-36-0	Antimony	24.7		~~N*~~ JK	P
7440-38-2	Arsenic	1240			P
7440-39-3	Barium	54.2			P
7440-41-7	Beryllium	0.53	J	J	P
7440-43-9	Cadmium	20.1			P
7440-70-2	Calcium	7580			P
7440-47-3	Chromium	18.0			P
7440-48-4	Cobalt	7.8	J	J	P
7440-50-8	Copper	55.5			P
7439-89-6	Iron	26400			P
7439-92-1	Lead	1600			P
7439-95-4	Magnesium	4600			P
7439-96-5	Manganese	2780			P
7439-97-6	Mercury	1.2			CV
7440-02-0	Nickel	26.2			P
7440-09-7	Potassium	1610			P
7782-49-2	Selenium	~~6.8~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	8.4			P
7440-23-5	Sodium	134	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~4.8~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	29.7			P
7440-66-6	Zinc	2240			P

07/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4010

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-09

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 99.6

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7840			P
7440-36-0	Antimony	22.3		~~N*~~ JK	P
7440-38-2	Arsenic	1120			P
7440-39-3	Barium	51.5			P
7440-41-7	Beryllium	0.63	J	J	P
7440-43-9	Cadmium	22.0			P
7440-70-2	Calcium	24300			P
7440-47-3	Chromium	18.2			P
7440-48-4	Cobalt	9.3			P
7440-50-8	Copper	49.5			P
7439-89-6	Iron	30600			P
7439-92-1	Lead	1360			P
7439-95-4	Magnesium	6000			P
7439-96-5	Manganese	3740			P
7439-97-6	Mercury	1.5			CV
7440-02-0	Nickel	30.7			P
7440-09-7	Potassium	2080			P
7782-49-2	Selenium	~~3.4~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	10.4			P
7440-23-5	Sodium	161	J	~~E~~ JK	P
7440-28-0	Thallium	~~3.9~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	33.0			P
7440-66-6	Zinc	2540			P

07/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4013

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-10

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 67.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5920			P
7440-36-0	Antimony	17.4	U	~~N*~~ JK	P
7440-38-2	Arsenic	38.8			P
7440-39-3	Barium	73.7			P
7440-41-7	Beryllium	0.67	J	J	P
7440-43-9	Cadmium	1.0	J	J	P
7440-70-2	Calcium	2990			P
7440-47-3	Chromium	24.8			P
7440-48-4	Cobalt	6.6	J	J	P
7440-50-8	Copper	8.4			P
7439-89-6	Iron	13100			P
7439-92-1	Lead	130			P
7439-95-4	Magnesium	4510			P
7439-96-5	Manganese	125			P
7439-97-6	Mercury	0.15	U		CV
7440-02-0	Nickel	11.6			P
7440-09-7	Potassium	2640			P
7782-49-2	Selenium	~~10.1~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	2.9	U		P
7440-23-5	Sodium	96.7	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~7.2~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	28.1			P
7440-66-6	Zinc	191			P

9/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4014

Lab Name: Ceimic Corporation Contract: 68-W-02-063

Lab Code: CEIMIC Case No.: 31897 NRAS No.: SDG NO.: MJ4002

Matrix (soil/water): SOIL Lab Sample ID: 030873-11

Level (low/med): LOW Date Received: 7/3/2003

% Solids: 35.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10800			P
7440-36-0	Antimony	32.1	U	~~N*~~ JL	P
7440-38-2	Arsenic	13.9			P
7440-39-3	Barium	157			P
7440-41-7	Beryllium	1.1	J	J	P
7440-43-9	Cadmium	6.8			P
7440-70-2	Calcium	24900			P
7440-47-3	Chromium	36.5			P
7440-48-4	Cobalt	7.9	J	J	P
7440-50-8	Copper	37.1			P
7439-89-6	Iron	12500			P
7439-92-1	Lead	228			P
7439-95-4	Magnesium	7550			P
7439-96-5	Manganese	129			P
7439-97-6	Mercury	0.22	J	J	CV
7440-02-0	Nickel	32.6			P
7440-09-7	Potassium	1480	J	J	P
7782-49-2	Selenium	~~18.7~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	1.1	J	J	P
7440-23-5	Sodium	176	~~J~~	~~N~~ UJK	P
7440-28-0	Thallium	~~13.4~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	33.9			P
7440-66-6	Zinc	640			P

Color Before: brown Clarity Before: n/a Texture: medium

Color After: yellow Clarity After: n/a Artifacts:

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4015

Lab Name: Ceimic Corporation
Contract: 68-W-02-063
Lab Code: CEIMIC
Case No.: 31897
NRAS No.:
SDG NO.: MJ4002
Matrix (soil/water): SOIL
Lab Sample ID: 030873-12
Level (low/med): LOW
Date Received: 7/3/2003
% Solids: 99.8
Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8290			P
7440-36-0	Antimony	2.2	J	~~N*~~ JK	P
7440-38-2	Arsenic	27.3			P
7440-39-3	Barium	121			P
7440-41-7	Beryllium	0.78	J	J	P
7440-43-9	Cadmium	4.8			P
7440-70-2	Calcium	5580			P
7440-47-3	Chromium	24.7			P
7440-48-4	Cobalt	7.5	J	J	P
7440-50-8	Copper	26.4			P
7439-89-6	Iron	14800			P
7439-92-1	Lead	507			P
7439-95-4	Magnesium	5710			P
7439-96-5	Manganese	381			P
7439-97-6	Mercury	0.18			CV
7440-02-0	Nickel	26.4			P
7440-09-7	Potassium	1700			P
7782-49-2	Selenium	~~1.5~~	~~J~~	~~N~~ K	P
7440-22-4	Silver	3.6			P
7440-23-5	Sodium	107	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~4.6~~	~~U~~	~~N~~ K	P
7440-62-2	Vanadium	31.4			P
7440-66-6	Zinc	796			P

9/29/03

Color Before: brown
Clarity Before: n/a
Texture: medium
Color After: yellow
Clarity After: n/a
Artifacts:

Comments:

USEPA-CLP
1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4016

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-13

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 95.7

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5500			P
7440-36-0	Antimony	12.4	U	~~N*~~ JK	P
7440-38-2	Arsenic	11.6			P
7440-39-3	Barium	109			P
7440-41-7	Beryllium	0.55	J	J	P
7440-43-9	Cadmium	2.9			P
7440-70-2	Calcium	4570			P
7440-47-3	Chromium	18.3			P
7440-48-4	Cobalt	5.5	J	J	P
7440-50-8	Copper	12.7			P
7439-89-6	Iron	10800			P
7439-92-1	Lead	107			P
7439-95-4	Magnesium	4160			P
7439-96-5	Manganese	224			P
7439-97-6	Mercury	0.079	J	J	CV
7440-02-0	Nickel	19.5			P
7440-09-7	Potassium	1340			P
7782-49-2	Selenium	~~7.2~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	0.12	J	J	P
7440-23-5	Sodium	72.5	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~5.2~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	23.2			P
7440-66-6	Zinc	283			P

09/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4017

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-14

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 50.5

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8340			P
7440-36-0	Antimony	8.7	J	~~N*~~ JK	P
7440-38-2	Arsenic	258			P
7440-39-3	Barium	108			P
7440-41-7	Beryllium	0.82	J	J	P
7440-43-9	Cadmium	8.9			P
7440-70-2	Calcium	8660			P
7440-47-3	Chromium	26.9			P
7440-48-4	Cobalt	7.2	J	J	P
7440-50-8	Copper	46.7			P
7439-89-6	Iron	16700			P
7439-92-1	Lead	746			P
7439-95-4	Magnesium	6130			P
7439-96-5	Manganese	881			P
7439-97-6	Mercury	0.25			CV
7440-02-0	Nickel	22.5			P
7440-09-7	Potassium	1910			P
7782-49-2	Selenium	~~1.7~~	~~J~~	~~N~~ R	P
7440-22-4	Silver	7.5			P
7440-23-5	Sodium	165	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~7.7~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	33.5			P
7440-66-6	Zinc	1150			P

9/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4018

Lab Name: Ceimic Corporation

Contract: 68-W-02-063

Lab Code: CEIMIC

Case No.: 31897

NRAS No.:

SDG NO.: MJ4002

Matrix (soil/water): SOIL

Lab Sample ID: 030873-15

Level (low/med): LOW

Date Received: 7/3/2003

% Solids: 61.4

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6530			P
7440-36-0	Antimony	29.5		~~N*~~ JK	P
7440-38-2	Arsenic	207			P
7440-39-3	Barium	87.4			P
7440-41-7	Beryllium	0.74	J	J	P
7440-43-9	Cadmium	10.2			P
7440-70-2	Calcium	6750			P
7440-47-3	Chromium	22.3			P
7440-48-4	Cobalt	6.8	J	J	P
7440-50-8	Copper	64.0			P
7439-89-6	Iron	18400			P
7439-92-1	Lead	1840			P
7439-95-4	Magnesium	5570			P
7439-96-5	Manganese	1060			P
7439-97-6	Mercury	0.28			CV
7440-02-0	Nickel	17.4			P
7440-09-7	Potassium	2080			P
7782-49-2	Selenium	~~9.7~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	17.4			P
7440-23-5	Sodium	122	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~6.9~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	34.3			P
7440-66-6	Zinc	1540			P

8/29/03

Color Before: brown

Clarity Before: n/a

Texture: medium

Color After: yellow

Clarity After: n/a

Artifacts:

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4019

Lab Name: Ceimic Corporation
Contract: 68-W-02-063
Lab Code: CEIMIC **Case No.:** 31897
NRAS No.:
SDG NO.: MJ4002
Matrix (soil/water): SOIL
Lab Sample ID: 030873-16
Level (low/med): LOW
Date Received: 7/3/2003
% Solids: 56.9
Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7130			P
7440-36-0	Antimony	7.0	J	~~N*~~ JK	P
7440-38-2	Arsenic	116			P
7440-39-3	Barium	92.3			P
7440-41-7	Beryllium	0.81	J	J	P
7440-43-9	Cadmium	6.9			P
7440-70-2	Calcium	6560			P
7440-47-3	Chromium	24.8			P
7440-48-4	Cobalt	7.5	J	J	P
7440-50-8	Copper	35.1			P
7439-89-6	Iron	16000			P
7439-92-1	Lead	647			P
7439-95-4	Magnesium	5950			P
7439-96-5	Manganese	763			P
7439-97-6	Mercury	0.28			CV
7440-02-0	Nickel	16.5			P
7440-09-7	Potassium	2730			P
7782-49-2	Selenium	~~10.9~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	5.9			P
7440-23-5	Sodium	110	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~7.8~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	33.2			P
7440-66-6	Zinc	1030			P

09/22/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium
Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4020

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-17

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 56.5

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7440			P
7440-36-0	Antimony	5.3	J	~~N*~~ JK	P
7440-38-2	Arsenic	158			P
7440-39-3	Barium	92.4			P
7440-41-7	Beryllium	0.86	J	J	P
7440-43-9	Cadmium	9.1			P
7440-70-2	Calcium	7130			P
7440-47-3	Chromium	24.8			P
7440-48-4	Cobalt	7.2	J	J	P
7440-50-8	Copper	34.8			P
7439-89-6	Iron	15600			P
7439-92-1	Lead	604			P
7439-95-4	Magnesium	5690			P
7439-96-5	Manganese	969			P
7439-97-6	Mercury	0.29			CV
7440-02-0	Nickel	18.1			P
7440-09-7	Potassium	2120			P
7782-49-2	Selenium	~~10.8~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	8.1			P
7440-23-5	Sodium	152	~~U~~	~~N~~ UJK	P
7440-28-0	Thallium	~~7.7~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	31.2			P
7440-66-6	Zinc	1170			P

9/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4021

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-18

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 71.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6590			P
7440-36-0	Antimony	45.4		~~N*~~ JL	P
7440-38-2	Arsenic	1200			P
7440-39-3	Barium	78.7			P
7440-41-7	Beryllium	0.83	J	J	P
7440-43-9	Cadmium	9.2			P
7440-70-2	Calcium	6940			P
7440-47-3	Chromium	27.9			P
7440-48-4	Cobalt	9.6	J	J	P
7440-50-8	Copper	227			P
7439-89-6	Iron	66100			P
7439-92-1	Lead	3280			P
7439-95-4	Magnesium	9090			P
7439-96-5	Manganese	6950			P
7439-97-6	Mercury	0.34			CV
7440-02-0	Nickel	20.2			P
7440-09-7	Potassium	3030			P
7782-49-2	Selenium	~~7.5~~	~~U~~	~~N~~ L	P
7440-22-4	Silver	39.7			P
7440-23-5	Sodium	87.0	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~5.3~~	~~U~~	~~N~~ K	P
7440-62-2	Vanadium	55.2			P
7440-66-6	Zinc	2170			P

09/29/03

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4022

Lab Name:	Ceimic Corporation		Contract:	68-W-02-063	
Lab Code:	CEIMIC	Case No.: 31897	NRAS No.:		SDG NO.: MJ4002
Matrix (soil/water):	SOIL		Lab Sample ID:	030873-19	
Level (low/med):	LOW		Date Received:	7/3/2003	
% Solids:	44.0				

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10300			P
7440-36-0	Antimony	4.9	J	~~N*~~ JK	P
7440-38-2	Arsenic	224			P
7440-39-3	Barium	125			P
7440-41-7	Beryllium	0.98	J	J	P
7440-43-9	Cadmium	8.6			P
7440-70-2	Calcium	8750			P
7440-47-3	Chromium	31.8			P
7440-48-4	Cobalt	7.5	J	J	P
7440-50-8	Copper	63.0			P
7439-89-6	Iron	17400			P
7439-92-1	Lead	989			P
7439-95-4	Magnesium	6990			P
7439-96-5	Manganese	550			P
7439-97-6	Mercury	0.47			CV
7440-02-0	Nickel	24.6			P
7440-09-7	Potassium	2200	J	J	P
7782-49-2	Selenium	~~15.4~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	9.0			P
7440-23-5	Sodium	195	~~J~~	~~E~~ UJK	P
7440-28-0	Thallium	~~11.0~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	38.2			P
7440-66-6	Zinc	967			P

07/29/03

Color Before:	brown	Clarity Before:	n/a	Texture:	medium
Color After:	yellow	Clarity After:	n/a	Artifacts:	

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4023

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Matrix (soil/water): SOIL **Lab Sample ID:** 030873-20

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 94.6

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7280			P
7440-36-0	Antimony	9.6	U	~~N*~~ Jk	P
7440-38-2	Arsenic	10.3			P
7440-39-3	Barium	47.0			P
7440-41-7	Beryllium	1.0			P
7440-43-9	Cadmium	0.40	J	J	P
7440-70-2	Calcium	945			P
7440-47-3	Chromium	1.3	J	J	P
7440-48-4	Cobalt	1.7	J	J	P
7440-50-8	Copper	6.1			P
7439-89-6	Iron	5410			P
7439-92-1	Lead	23.5			P
7439-95-4	Magnesium	788	J	J	P
7439-96-5	Manganese	103			P
7439-97-6	Mercury	0.047	J	J	CV
7440-02-0	Nickel	2.4	J	J	P
7440-09-7	Potassium	921			P
7782-49-2	Selenium	~~5.6~~	~~U~~	~~N~~ R	P
7440-22-4	Silver	1.6	U		P
7440-23-5	Sodium	13100		~~*~~ Jk	P
7440-28-0	Thallium	~~4.0~~	~~U~~	~~N~~ R	P
7440-62-2	Vanadium	7.7	J	J	P
7440-66-6	Zinc	24.3			P

09/29/05

Color Before: brown **Clarity Before:** n/a **Texture:** medium

Color After: yellow **Clarity After:** n/a **Artifacts:**

Comments:

USEPA-CLP

12-IN

PREPARATION LOG

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Preparation Method: CS1

EPA Sample No.	Preparation Date	Weight (gram)	Volume(mL)
PBS01	7/14/2003	0.20	100
LCSS01	7/14/2003	0.05	100
MJ4002	7/14/2003	0.20	100
MJ4003	7/14/2003	0.20	100
MJ4004	7/14/2003	0.20	100
MJ4005	7/14/2003	0.20	100
MJ4005S	7/14/2003	0.20	100
MJ4005D	7/14/2003	0.20	100
MJ4006	7/14/2003	0.20	100
MJ4007	7/14/2003	0.20	100
MJ4008	7/14/2003	0.20	100
MJ4009	7/14/2003	0.21	100
MJ4010	7/14/2003	0.20	100
MJ4013	7/14/2003	0.20	100
MJ4014	7/14/2003	0.20	100
MJ4015	7/14/2003	0.20	100
MJ4016	7/14/2003	0.20	100
MJ4017	7/14/2003	0.20	100
MJ4018	7/14/2003	0.20	100
MJ4019	7/14/2003	0.20	100
MJ4020	7/14/2003	0.21	100
MJ4021	7/14/2003	0.20	100
MJ4022	7/14/2003	0.20	100
MJ4023	7/14/2003	0.21	100

Comments:

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12-IN

PREPARATION LOG

Lab Name: Ceimic Corporation Contract: 68-W-02-063

Lab Code: CEIMIC Case No.: 31897 NRAS No.: SDG NO.: MJ4002

Preparation Method: HS1

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
PBS01	7/17/2003	1.00	200
LCSS01	7/17/2003	1.00	200
MJ4002	7/17/2003	1.03	200
MJ4003	7/17/2003	1.10	200
MJ4004	7/17/2003	1.34	200
MJ4005	7/17/2003	1.39	200
MJ4005D	7/17/2003	1.40	200
MJ4005S	7/17/2003	1.39	200
MJ4006	7/17/2003	1.38	200
MJ4007	7/17/2003	1.24	200
MJ4008	7/17/2003	1.02	200
MJ4009	7/17/2003	1.04	200
MJ4010	7/17/2003	1.30	200
MJ4013	7/17/2003	1.02	200
MJ4014	7/17/2003	1.06	200
MJ4015	7/17/2003	1.08	200
MJ4016	7/17/2003	1.01	200
MJ4017	7/17/2003	1.28	200
MJ4018	7/17/2003	1.18	200
MJ4019	7/17/2003	1.13	200
MJ4020	7/17/2003	1.15	200
MJ4021	7/17/2003	1.32	200
MJ4022	7/17/2003	1.03	200
MJ4023	7/17/2003	1.25	200

Comments:

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9-IN

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Ceimic Corporation **Contract:** 68-W-02-063

Lab Code: CEIMIC **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4002

Instrument Type: P **Instrument ID:** PE Optima ICP **Date:** 2/26/2003

Preparation Method: HS1

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

Analyte	Wave-Length /Mass	CRQL	MDL
Aluminum	308.22	40.00	4.67
Antimony	206.83	12.00	0.22
Arsenic	188.98	3.00	0.46
Barium	233.53	40.00	0.51
Beryllium	313.11	1.00	0.04
Cadmium	226.50	1.00	0.03
Calcium	315.89	1000.00	3.00
Chromium	267.72	2.00	0.28
Cobalt	228.62	10.00	0.15
Copper	324.75	5.00	0.29
Iron	273.96	20.00	9.99
Lead	220.35	2.00	0.16
Magnesium	279.08	1000.00	6.43
Manganese	257.61	3.00	0.06
Nickel	231.60	8.00	0.13
Potassium	766.49	1000.00	7.36
Selenium	196.03	7.00	0.67
Silver	338.29	2.00	0.09
Sodium	589.59	1000.00	2.92
Thallium	190.80	5.00	0.28
Vanadium	290.88	10.00	0.19
Zinc	206.20	12.00	1.52

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9-IN

METHOD DETECTION LIMITS (ANNUALLY)

Lab Name: Ceimic Corporation Contract: 68-W-02-063

Lab Code: CEIMIC Case No.: 31897 NRAS No.: SDG NO.: MJ4002

Instrument Type: CV Instrument ID: FIMS CVAA Date: 1/27/2003

Preparation Method: CS1

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

Analyte	Wave-Length /Mass	CRQL	MDL
Mercury	253.70	0.10	0.04

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

IN REPLY
REFER TO: OEA-095   September 16, 2003   17 2003

MEMORANDUM

SUBJECT: Minnie Moore Mine, CLP Metals Analysis, Data Validation
Case: 31897
SDG: MJ4000

FROM: Laura Castrilli, Chemist
Technical Resources Group, OEA

TO: Tara Martich, Site Assessment Manager
Office of Environmental Cleanup

CC: Bruce Woods, Region 10 CLP TPO
Julie Howe, Herrera Environmental Consultants Inc.

The following is a validation of ICP-MS and mercury analyses of three water samples from the Minnie Moore site. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM05.2. Analyses were conducted by American Analytical and Technical Services, Baton Rouge, Louisiana. This ICP-MS validation was conducted for the following samples:

MJ4000   MJ4001   MJ4011

Data Qualifications

The following comments refer to American's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM05.2 and the Functional Guidelines for Inorganic Data Review (July 2002); utilizing professional judgement of the reviewer.* The comments presented herein are based on the information provided for the review.

1.0 Timeliness - Acceptable

The technical (40 CFR part 136) holding time from the date of collection for mercury in water is 28 days. The holding time for the remaining metals in water is 180 days. The samples were collected on 06/30/03. Mercury analyses were completed on 07/12/03. ICP-MS analyses were completed on 07/25/03. All analyses were conducted within the technical water holding times, therefore no qualification was made based on holding time.

2.0 **Sample Preparation** - Acceptable

The samples were prepared for mercury analyses on 07/12/03. The samples were prepared for ICP-MS analyses on 07/18/03. No qualification was made based on sample preparation.

3.0 **ICP-MS Tune** -

Prior to instrument calibrations, the tuning solution was analyzed the minimal 5 times. The mass calibrations were within 0.1 amu for each isotope in the tuning solution.

The peak widths at 5% peak height were all within the <0.75 amu functional guideline criteria; therefore, no qualification was made based on the average peak width at 5% peak height.

The %Relative Standard Deviation (RSD) for each tune mass were all within the 5% acceptance criteria. The %RSD on the raw data (counts/sec) do not agree with Form 14 but since all %RSD were <5%, no action was taken.

4.0 **Calibrations/Calibration Verifications** - Acceptable

The samples were analyzed for mercury by CVAAS on 07/12/03. The initial calibration included one blank and five standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed for aluminum and cadmium by ICP-MS on 07/25/03. Remaining ICP-MS analyses were conducted on 07/19/03.

The instrument was standardized each day of analysis according to the analytical method using one blank and at least one calibration standard for each element after tuning the instrument.

All ICP-MS and CVAAS (mercury) calibrations were performed as required and met the acceptance criteria; therefore, no qualification was made on this basis.

Calibration verification samples are required before and after sample analysis and after every 10 samples during analysis. Mercury recoveries must be within 80-120%. Other metal recoveries must be within 90-110%.

All ICP-MS and CVAAS (mercury) calibration verification (initial and continuing) samples bracketing reported sample results met the frequency and recovery criteria; therefore no qualification was made based on ICP-MS or CVAAS calibration verification.

4.0 Blanks -

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

Aluminum in the preparation blank had a negative result with an absolute value greater than the method detection limit. Antimony, barium, beryllium, cobalt, lead, manganese, nickel, silver, thallium, and vanadium were detected in one or more CCBs.

Based on blank contamination, the following qualifications were made:

- Aluminum in samples MJ4000 and MJ4001 was qualified 'J', estimated.
- Antimony in samples MJ4001 and MJ4011 was qualified 'U', undetected.
- Beryllium in samples MJ4000 and MJ4011 was qualified 'U', undetected.
- Cobalt in sample MJ4000 was qualified 'U', undetected.
- Lead in samples MJ4000 and MJ4011 was qualified 'U', undetected.
- Manganese in samples MJ4000 and MJ4001 was qualified 'U', undetected.
- Silver in samples MJ4000 and MJ4011 was qualified 'U', undetected.
- Thallium in samples MJ4000 and MJ4011 was qualified 'U', undetected.
- Vanadium in samples MJ4000 and MJ4001 was qualified 'U', undetected.

5.0 ICP-MS Interference Check Sample -

The interference check sample (ICS) is analyzed by ICP-MS to verify interelement and background correction factors. Analysis is required at the beginning of each sample analysis run and recoveries must be between 80% and 120% or within ±3 times the CRQL, whichever is greater. All ICS-A and ICS-AB recoveries for reported analytes were within the recovery criteria.

The following is noted for TPO action: the laboratory does not monitor for interferences - only data for internal standards and target analytes is provided. There is no way to assess samples for potential interferences, therefore, no action was taken based on ICS. In addition, for the 07/25/03 analysis for aluminum and cadmium, the ICS solutions were ran at 100 fold dilutions, which defeats the purpose of running an ICS. The laboratory most likely does this since the undiluted ICS true values for aluminum (100,000) are much higher than the linear range of 4500 ug/L.

6.0 **Laboratory Control Samples** - Acceptable

Laboratory Control samples (LCS) are digested and analyzed along with the samples to verify the efficiency of laboratory procedures. All recoveries associated with reported sample results met the acceptance criteria for control samples; therefore no qualification was made on this basis.

7.0 **Duplicate Analysis** -

Duplicate analysis was done on sample MJ4001. Water duplicate results were within the ±20% Relative Percent Difference (RPD) or ±CRQL criteria for water results < 5 times the CRQL criteria; with the exception of copper (65% RPD). All copper results were qualified 'J', estimated.

8.0 **Matrix Spike Analysis** - Acceptable

Matrix spike sample analyses are done to provide information about the effect of the sample matrix on digestion and measurement methods. Matrix spike recovery must be within the limits of 75 - 125%.

Matrix spike analysis was done on sample MJ4001. All matrix spike recoveries were within the required QC limits; therefore no qualification was made on this basis.

9.0 **ICP-MS Serial Dilution** - Acceptable

Sample MJ4001 was analyzed by ICP-MS serial dilution to check for potential interferences. All of the analytes which exceeded the minimum concentration criterion (50 times the MDL) were within the 10%D criteria; with the exception of copper (13%D). All copper results were qualified 'J', estimated.

10.0 **ICP-MS Internal Standards** - Acceptable

The laboratory added 3 internal standards (IS) to each sample, blank, QC sample etc. A minimum of 3 are required, however, the three chosen are supposed to bracket the masses of the reported analytes, which they did for this SDG.

The relative (to the IS response in the calibration blank) percent recoveries for the ISs reported on Form 15 were all within the 60-125% acceptance criteria; therefore no qualification was made on this basis.

11.0 Detection Limits - Acceptable

Sample results which fall below the method detection limit (MDL) are assigned the value of the <u>CRQL</u> and the 'U' qualifier is attached. For data users' convenience, the MDLs for this SDG have been attached.

Contract Required Quantitation Limit (CRQL) standards are required for most analytes to demonstrate a linear calibration curve near the CRQL. CRQL standards were run at the required frequency. The new SOW requires that CRQL standards be re-analyzed if the recovery criteria have not been met and if they are still not met, the instrument has to be re-calibrated and affected samples/analytes have to be re-analyzed. All CRQL results were within the general 70-130% recovery criteria.

12.0 Overall Assessment of the Data

For ILM05.2, the laboratory is required to flag all detected results below the CRQL with a 'J' concentration qualifier (result below the CRQL but above the MDL).

Also new with ILM05.2, a laboratory 'D' qualifier in the qualification column indicates that a result is reported from a dilution analysis.

Electronic data users should note there is a possibility that no mercury results were reported as the Computer Assisted Data Review Expert (CADRE) determined that the LCS for mercury had an extremely high recovery and rejected the detected mercury results. LCS samples are not required for <u>water</u> mercury samples. In addition, the water LCS result reported on Form 7 shows a 92% recovery. No qualification was made to mercury based on the LCS.

There were 51 data points reported: 17 results were qualified due to blank contamination, 3 results were qualified due to duplicate precision and 3 results were qualified due to poor serial dilution results. Overall, 39 percent of the data was qualified.

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (07/02) qualifiers used when validating/qualifying data from Inorganic analysis.

DATA QUALIFIERS

U - The material was analyzed for, but was not detected above the level of the reported sample quantitation limit.

J - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

J+	-	The result is an estimated quantity, but the result may be biased high*.
J-	-	The result is an estimated quantity, but the result may be biased low*.
R	-	The data are unusable. The sample results are rejected due to serious deficiencies in meeting QC criteria. The analyte may or may not be present in the sample.
UJ	-	The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

* As this is a site investigation, the '+' and '-' bias modifiers to the J qualifier were not used. Instead, the 'H' and 'L' bias modifiers were used.

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

L	-	Low bias.
H	-	High bias.
K	-	Unknown Bias.

Also, at the request of the site assessment manager, all results that have a laboratory 'J' concentration qualifier (result below the CRQL but above the MDL) were assigned a 'J' qualifier in the Q column of the Form 1 (no bias assessment for results <u>only</u> qualified based on concentration) to aid in the data entry process.

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1A-IN
INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4000

Lab Name: American Analytical & Technical Contract: 68W02064

Lab Code: AATSLA Case No.: 31897 NRAS No.: SDG NO.: MJ4000

Matrix (soil/water): WATER Lab Sample ID: 66291.01

Level (low/med): LOW Date Received: 7/3/2003

% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1.6	J	JL	MS
7440-36-0	Antimony	1.3	J	J	MS
7440-38-2	Arsenic	1.0			MS
7440-39-3	Barium	42.2			MS
7440-41-7	Beryllium	0.14	~~J~~	U	MS
7440-43-9	Cadmium	6.0			MS
7440-47-3	Chromium	2.8			MS
7440-48-4	Cobalt	0.16	~~J~~	U	MS
7440-50-8	Copper	3.4		~~E*~~ JK	MS
7439-97-6	Mercury	0.15	J	J	CV
7439-92-1	Lead	0.46	~~J~~	U	MS
7439-96-5	Manganese	0.46	~~J~~	U	MS
7440-02-0	Nickel	1.2			MS
7782-49-2	Selenium	2.4	J	J	MS
7440-22-4	Silver	0.18	~~J~~	U	MS
7440-28-0	Thallium	0.32	~~J~~	U	MS
7440-62-2	Vanadium	1.2		U	MS
7440-66-6	Zinc	425			MS

09/23/03

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4001

Lab Name: American Analytical & Technical **Contract:** 68W02064

Lab Code: AATSLA **Case No.:** 31897 **NRAS No.:** **SDG No.:** MJ4000

Matrix (soil/water): WATER **Lab Sample ID:** 66291.02

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1.9	J	JL	MS
7440-36-0	Antimony	0.40	~~J~~	U	MS
7440-38-2	Arsenic	0.75	J	J	MS
7440-39-3	Barium	45.1			MS
7440-41-7	Beryllium	1.0	U		MS
7440-43-9	Cadmium	1.0	U		MS
7440-47-3	Chromium	1.6	J	J	MS
7440-48-4	Cobalt	0.50	U		MS
7440-50-8	Copper	21.5		~~E*~~ JK	MS
7439-97-6	Mercury	0.07	J	J	CV
7439-92-1	Lead	1.9			MS
7439-96-5	Manganese	0.41	~~J~~	U	MS
7440-02-0	Nickel	0.51	J	J	MS
7782-49-2	Selenium	1.6	J	J	MS
7440-22-4	Silver	1.0	U		MS
7440-28-0	Thallium	1.0	U		MS
7440-62-2	Vanadium	0.79	~~J~~	U	MS
7440-66-6	Zinc	111			MS

09/03/03

Color Before: COLORLESS **Clarity Before:** CLEAR **Texture:**

Color After: COLORLESS **Clarity After:** CLEAR **Artifacts:**

Comments:

USEPA-CLP

1A-IN

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ4011

Lab Name: American Analytical & Technical **Contract:** 68W02064

Lab Code: AATSLA **Case No.:** 31897 **NRAS No.:** **SDG NO.:** MJ4000

Matrix (soil/water): WATER **Lab Sample ID:** 66291.05

Level (low/med): LOW **Date Received:** 7/3/2003

% Solids: 0.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4.2	J	J	MS
7440-36-0	Antimony	0.45	~~J~~	U	MS
7440-38-2	Arsenic	0.72	J	J	MS
7440-39-3	Barium	54.6			MS
7440-41-7	Beryllium	0.05	~~J~~	U	MS
7440-43-9	Cadmium	1.0	U		MS
7440-47-3	Chromium	1.4	J	J	MS
7440-48-4	Cobalt	0.78			MS
7440-50-8	Copper	8.7		E* JK	MS
7439-97-6	Mercury	0.18	J	J	CV
7439-92-1	Lead	0.11	~~J~~	U	MS
7439-96-5	Manganese	0.90			MS
7440-02-0	Nickel	2.9			MS
7782-49-2	Selenium	1.8	J	J	MS
7440-22-4	Silver	0.08	~~J~~	U	MS
7440-28-0	Thallium	0.05	~~J~~	U	MS
7440-62-2	Vanadium	1.2			MS
7440-66-6	Zinc	37.7			MS

09/05/03

Color Before: COLORLESS **Clarity Before:** CLEAR **Texture:**

Color After: COLORLESS **Clarity After:** CLEAR **Artifacts:**

Comments: