Preliminary Assessments and Site Investigations Report
Lower Pend Oreille River Mines and Mills
Pend Oreille County, Washington
TDD: 01-08-0009

Contract: 68-S0-01-01
March 2002

Region 10

START-2

Superfund Technical Assessment and Response Team

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PRELIMINARY ASSESSMENTS AND SITE INVESTIGATIONS REPORT
LOWER PEND OREILLE RIVER MINES AND MILLS
PEND OREILLE COUNTY, WASHINGTON

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LIST OF ACRONYMS

Acronym	Definition
AC	adjusted concentration
bgs	below ground surface
BLM	United States Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLP	Contract Laboratory Program
cfs	cubic feet per second
CRDL	Contract Regulated Detection Limits
CRQL	Contract Regulated Quantitation Limits
DQOs	data quality objectives
E & E	Ecology and Environment, Inc.
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
gpm	gallons per minute
GPS	global positioning system
GRC	Gulf Resources & Chemical Corporation
IDW	investigation-derived waste
μg/L	micrograms per liter
mg/kg	milligrams per kilogram
MS/MSD	matrix spike/matrix spike duplicate
PAs	preliminary assessments
PCBs	polychlorinated biphenyls
PPE	probable point of entry
%R	percent recovery
QA/QC	quality assurance/quality control
RFC	Resource Finance Corporation
RPD	relative percent difference
SEPA	State Environmental Policy Act

LIST OF ACRONYMS (CONTINUED)

Acronym	Definition
SIs	site inspections
SOPs	standard operating procedures
SQAP	sampling and quality assurance plan
SQL	sample quantitation limit
SVOCs	semivolatile organic compounds
START	Superfund Technical Assessment and Response Team
TAL	target analyte list
TDD	Technical Direction Document
TM	Task Monitor
TOC	total organic carbon
USFS	United States Forest Service
Weston	Roy F. Weston, Inc.
XRF	X-ray fluorescence

LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INVESTIGATIONS REPORT
PEND OREILLE COUNTY, WASHINGTON

1. INTRODUCTION

The United States Environmental Protection Agency (EPA) has tasked Ecology and Environment, Inc. (E & E) to provide technical support in investigating potential contaminant sources to the lower reach of the Pend Oreille River. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) activities included preliminary assessments (PAs) and site investigations (SIs) for 21 mines/mills located near the lower reach of the Pend Oreille River in Pend Oreille County, Washington. The PAs and SIs were conducted under the authority of CERCLA of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986. Of the 21 mines and mills investigated, those identified by The Confederated Tribes of the Colville Indian Reservation to the EPA for assessment under CERCLA include the Pend Oreille Mine/Mill, Grandview Mine/Mill, Josephine Mine, Blue Bucket Mine, Bella May Mine, West Contact Mine and Metaline Mine (Cawston 1999; Passmore 2000). The remaining 16 mines visited were identified by EPA based on the mine/mill location relative to tributaries to the Pend Oreille River and available information regarding volume of or produced. A list of the 21 mines and mills visited as part of this field event are presented in Table 1-1. The lower reach of the Pend Oreille River is defined for this assessment as the segment of the river beginning at approximately Metaline and ending at Boundary Dam near the International Border (Figures 1-1 and 1-2).

CERCLA PA and SI activities were conducted at 21 mine/mill facilities and tributaries (e.g., creeks and streams) near these facilities that empty into the lower reach (as defined above) of the Pend Oreille River.

The PA and SI are phases in the site assessment process of determining whether a site is releasing, or has the potential to release, hazardous substances, pollutants, or contaminants into the environment and whether it requires further detailed investigations and/or response action that is authorized by CERCLA. The assessment process does not include extensive or complete site characterization, contaminant fate determination, or quantitative risk assessment.

The objectives of the PAs and SIs are to:

- Identify potential contaminant sources to the lower reach of the Pend Oreille River;
- Determine whether the mine or mill is releasing, or has the potential to release hazardous constituents into the environment;
- Document a threat or potential threat to public health or the environment posed by the mine or mill;
- Assess the need for additional detailed investigation and/or response action at the mine or mill; and
- Determine the potential for placement of the mine or mill on the National Priorities List.

The PA and SI field activities were conducted through a combined effort involving Superfund Technical Assessment and Response Team (START) -2 contractor firms, E & E and Roy F. Weston, Inc. (Weston). E & E conducted sampling activities along the lower reach of the Pend Oreille River, a number of its tributaries, and mines and mills where potential contaminant sources were identified. E & E activities were conducted under START-2 contract No. 68-S0-01-01 and Technical Direction Document (TDD) No. 01-02-0028. Weston collected mine/mill-specific background samples as determined necessary by the EPA. Weston activities were conducted under START-2 contract No. 68-S0-01-02 and TDD No. 01-02-0001-A.

Activities conducted as part of this assessment include reviewing existing mine/mill-specific information, regional characteristics, collecting receptor information within the mine or mill's range of influence, conducting mine/mill visits, executing the sampling plan, and producing this report.

In accordance with the SQAP, attempts were made to conduct in-situ field screening of metals concentrations at potential contaminant sources using X-Ray Fluorescence (XRF) equipment. Due to field conditions, the instruments exceeded operating temperatures on several occasions. It was determined that the equipment was not able to function properly in a high temperature environment and its use was discontinued. A memo presenting the results of the limited XRF screening conducted is included in Appendix D.

Section 2 of this document includes a discussion of the area and regional characteristics. Section 3 provides a description of the PA and SI field activities conducted by the START-2 E & E and Weston in coordination with Washington State Department of Ecology (Ecology), Bureau of Land Management (BLM), and the United States Forest Service (USFS) staff. Quality assurance/quality control (QA/QC) criteria are included in Section 4. Reporting criteria, reporting methods, and background sample analytical results are discussed in Section 5. Mine and mill locations, descriptions, and START-2 visits

are discussed in Section 6. Section 7 provides a discussion of the potential sources, surface water migration pathways, targets, and corresponding EPA Contract Laboratory Program (CLP) and subcontracted laboratory sampling results. PA and SI findings and recommendations are summarized in Section 8. Photographic documentation are provided in Appendix A. Global positioning system (GPS) coordinates are provided in Appendix B. Copies of the START-2 logbooks are provided in Appendix C. Data quality assurance review memorandums and analytical data forms are provided in Appendix D. The data for the samples collected at Myers Dam and the Metaline Falls municipal water intake are provided in Appendices E and F, respectively. The trip report prepared by Weston is provided in Appendix G.

Table 1-1

MINES AND MILLS
LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

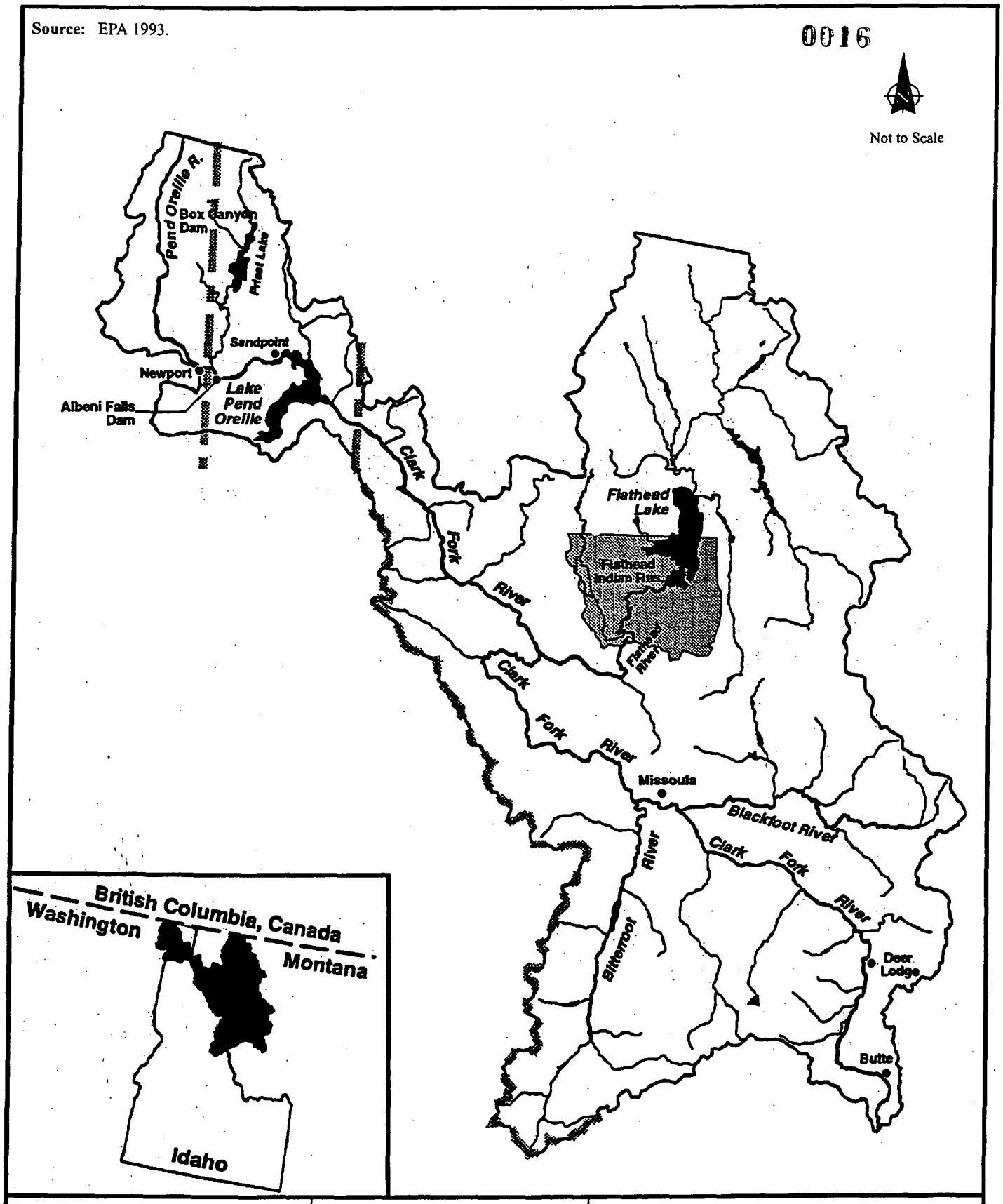
Mine/Mill Name	Mine/Mill	LAT			LONG			S	T	R	River System(s)
Red Top	Mine	48	59	52.08	117	11	02.76	1,2	40N	44E	Overland, Lead Creek, Canada
King Tut	Mine	48	59	21.48	117	11	28.32	2,11	40N	44E	Overland, Unnamed Tributary, Canada
Lead Hill	Mine	48	58	12.72	117	11	49.56	11, 12, 13, 14, 22, 23, 27	40N	44E	Slate Creek , Pend Oreille River (5 miles south of Boundary Dam).
Lead Queen	Mine	48	58	46.56	117	19	37.20	11	40N	43E	Overland (1 mile), Pend Oreille River (1,000 ft north of Boundary Dam).
Z Canyon	Mine	48	58	41.52	117	20	34.08	11	40N	43E	Overland (1,400 ft), Pend Oreille River (2,500 ft north of Boundary Dam).
Lead King	Mine	48	56	16.44	117	21	13.32	27	40N	43E	Lower Lead King Lake, Everett Creek
Lucky Strike	Mine	48	55	49.80	117	19	51.24	35	40N	43E	Overland (800 ft), Pend Oreille River (4 miles south of Boundary Dam).
Hoage	Mine	48	56	57.48	117	21	18.00	22	40N	43E	Upper Lead King Lake, Lower Lead King Lake, Everett Creek
Yellowhead	Mine	48	52	59.88	117	22	14.16	16	39N	43E	Overland (1,000 ft), Pend Oreille River (8 miles south of Boundary Dam).
Grandview	Mine/Mill	48	52	22.04	117	21	26.16	14,15,22,30	39N	43E	Overland, Pend Oreille River (9 miles south fo Boundary Dam).
Pend Oreille	Mine/Mill	48	52	54.12	117	21	36.00	10,11,14,15	39N	43E	Overland, Pend Oreille River (9 miles south fo Boundary Dam).
Josephine	Mine	48	52	48.00	117	22	15.96	16	39N	43E	Overland, Pend Oreille River (9 miles south fo Boundary Dam).
Oriole	Mine	48	51	36.72	117	24	46.44	19	39N	43E	Linton Creek, Pend Oreille River at River Mile 29.25.
Lehigh No. 2	Mine	48	51	31.68	117	24	52.20	30	39N	43E	Linton Creek, Pend Oreille River at River Mile 29.25.
West Contact	Mine	48	51	07.92	117	24	56.88	30	39N	43E	Linton Creek, Pend Oreille River at River Mile 29.25.
Lehigh No. 1	Mine	48	51	02.52	117	24	14.04	29	39N	43E	Unnamed Creek, through Metaline, Pend Oreille River at River Mile 29.
Diamond R.	Mine	48	51	12.60	117	25	19.20	30	39N	43E	Unnamed Creek, through Metaline, Pend Oreille River at River Mile 29.
Bella May	Mine	48	50	53.16	117	24	16.20	29	39N	43E	Unnamed Creek, through Metaline, Pend Oreille River at River Mile 29.
Blue Bucket	Mine	48	50	37.68	117	23	53.52	32	39N	43E	Overland (1,700 ft), Pend Oreille River at River Mile 29.
Metaline	Mine	48	50	32.64	117	23	24.00	32	39N	43E	Overland (1,700 ft), Pend Oreille River at River Mile 29.
Sterling	Mine	48	50	10.32	117	23	29.04	32	39N	43E	Overland (1,700 ft), Pend Oreille River at River Mile 29.

Key:

E	= East.
ft	= feet.
Lat	= Latitude.
Long	= Longitude.
N	= North.
R	= Range.
S	= Section.
T	= Township.

Source: EPA 1993.

0016



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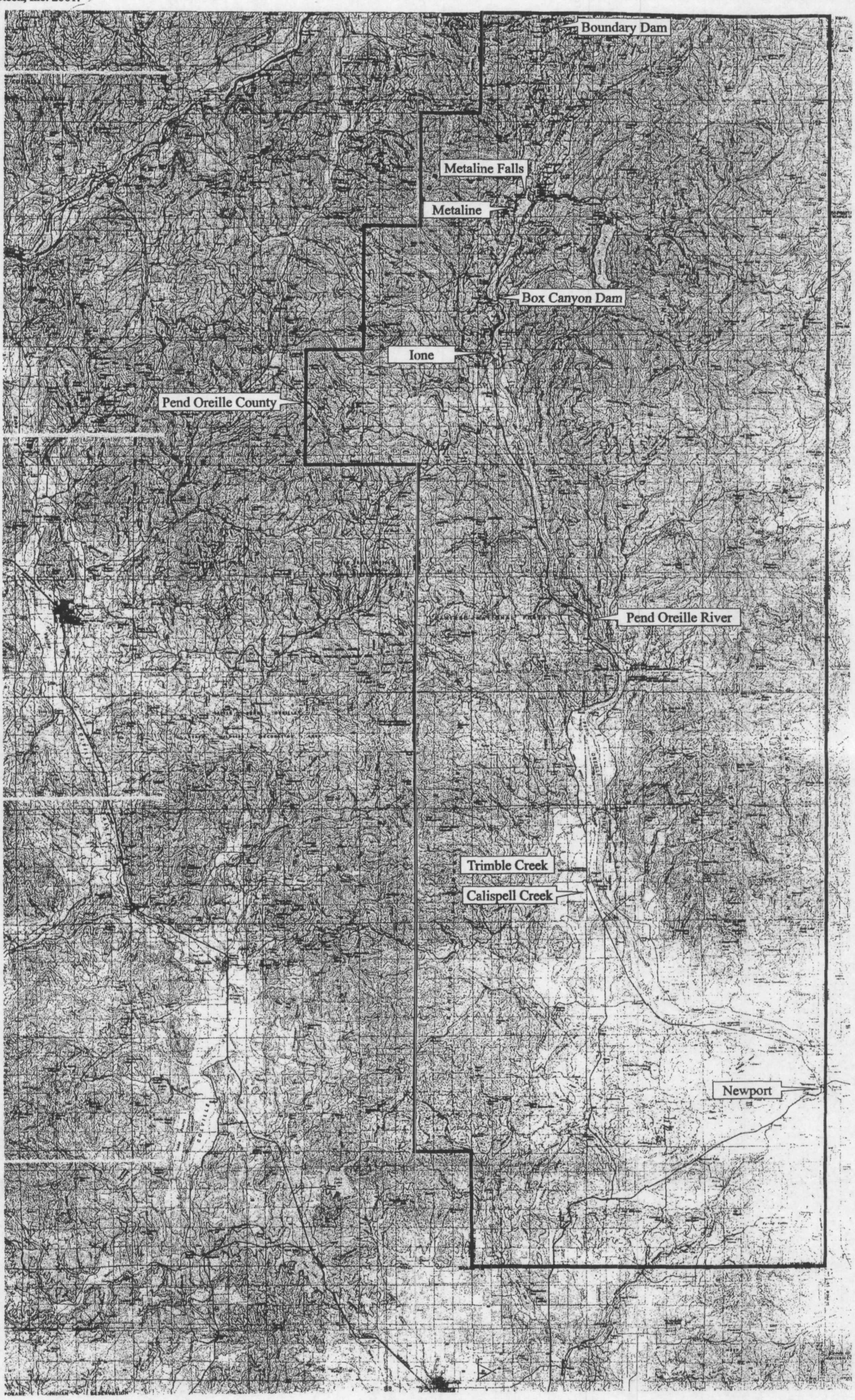
Seattle, Washington

LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 1-1
CLARK FORK - PEND OREILLE BASIN

Date:	Drawn by:	
2-28-02	AES	10:START-2\01080009\S714\fig 1-1

Source: Maptech, Inc. 2001.



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LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
Pend Oreille, Washington

0 5.25
Approximate Scale in Miles

Figure 1-2
PROJECT AREA

Date:	Drawn by:	
2/28/02	AES	10:START-2\01080009\S714\fig 1-2

0017

2. BACKGROUND

2.1 REGIONAL CHARACTERISTICS AND DESCRIPTIONS

The lower reach of the Pend Oreille River (as defined in Section 1) is located in Pend Oreille County, Washington. Pend Oreille County is located in the northeast corner of Washington State. Bordered on the north by Canada, the east by Idaho, the south by Spokane County, and the west by Stevens County, Pend Oreille County is roughly 66 miles long and 22 miles wide. Within the county, the Pend Oreille River, the second largest river in Washington, flows north into Canada (Pend Oreille County 2001).

The Clark-Fork/Pend Oreille Basin system flows from Montana as the Clark Fork River into Lake Pend Oreille in Idaho (Figure 1-1). The Pend Oreille River, originating as the outflow from Lake Pend Oreille, enters Washington flowing north through the northeast corner of the state into Canada, where it drains to the Columbia River just above the International Border (Figures 1-2 and 7-1; Ecology 1991). The Columbia River in Canada flows south into Washington State. The Clark-Fork/Pend Oreille Watershed covers approximately 26,000 square miles in Montana, Idaho, and Washington (USGS 2000).

The area, as defined for this project, includes: 21 mine/mill facilities identified as potential sources of contaminants, and tributaries (e.g., creeks and streams) near these facilities that empty into the lower reach (as defined in Section 1) of the Pend Oreille River (Tables 1-1 and 2-1).

2.2 OWNERSHIP INFORMATION

The majority of lands in the upper reaches of the project area are public lands managed by the BLM and federal lands managed by USFS. Privately held or leased lands are scattered throughout the project area. Livestock grazing occurs on privately held lands and through grazing leases on publicly held lands.

Much of the river basin's land within Pend Oreille County falls within the boundaries of the Kaniksu and Colville national forests. Two-thirds of the northern and central parts of the county are government owned; the southern portion of the study area is mostly privately owned. (EPA 1993) Owners/contact persons for the mines/mills visited are included in Section 6. Owners of tributaries visited as part of this field event are identified in Table 2-1.

2.3 REGIONAL OPERATIONS AND WASTE CHARACTERISTICS

2.3.1 Historic Mining

The Metaline mining district surrounding the town of Metaline in Pend Oreille County is one of the oldest in the state, predating statehood. Mining in the vicinity of the Pend Oreille River dates back to 1855 (Barlee 1932). Commercial development of the Metaline district can be traced to Lewis P. Larsen and Jens Jensen. During 1904, they began prospecting the area around Metaline Falls and initiated development of the Lehigh Cement Co. Plant and quarries. This was followed by the opening of several lead-zinc mines. (Barlee 1932)

The north and south ends of the county proved to contain some of the richest deposits of lead and zinc in the Pacific Northwest. However, through the turn of the century, the Metaline area languished in virtual isolation. Access was limited to steamers plying the Pend Oreille River from Newport to only as far downstream as south Ione. In 1906, the channel at Box Canyon was dynamited making the river navigable all the way downstream to Metaline Falls. This cleared the way for commercial drilling and mining, which expanded rapidly through the 1930s. Large quantities of another mineral, limestone, was discovered and comprised the backbone of the country's cement industry, at that time the largest in the state. (Economic History 2001)

The lead-zinc ores of the Metaline district are of low grade and contain only minor amounts of silver. The average grade of the 19.3 million tons of ore mined from 1906 to 1977 in the district was 1.14 percent lead and 2.25 percent zinc (Lasmanis 1995).

Historically, metal extraction and processing were relatively inefficient, yielding large volumes of metal-rich tailings that were deposited in and near nearby streams (USGS 2000). Mine tailings in the study area typically contain elevated levels of arsenic, cadmium, copper, lead, mercury, and zinc. These tailings and mines continue to provide a source of metals to streams, lakes, and reservoirs as surface water meanders through and erodes tailings deposits and transports these metals downstream or directly to the Pend Oreille River. (USGS 2000)

In 1963, the Metaline mining district was the 12th largest lead and zinc producer in the Nation (USDA 1992).

Table 2-1

TRIBUTARY OWNERS
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

Tributary	County	Owner	Contact Information
Pewee Creek	Pend Oreille County, WA	Seattle City Light	Harris Martin Seattle City Light 700 Fifth Avenue, Suite 3300 Seattle, WA 98104-5031 (206) 386-4577
Everett Creek	Pend Oreille County, WA	Seattle City Light	Harris Martin Seattle City Light 700 Fifth Avenue, Suite 3300 Seattle, WA 98104-5031 (206) 386-4577
Sullivan Creek	Pend Oreille County, WA	Lafarge Corp.	David Carroll Lafarge Corp. 12950 Worldgate Drive, Suite 500 Herndon, VA
Lime Creek	Pend Oreille County, WA	U.S. Forest Service	Nora Rasure U.S. Forest Service 765 South Main Colville, WA 99114 (509) 684-7000
Ledbetter Lake Creek	Pend Oreille County, WA	U.S., public land	
Slate Creek	Pend Oreille County, WA	U.S. Forest Service	Nora Rasure U.S. Forest Service 765 South Main Colville, WA 99114 (509) 684-7000
Beaver Creek	Pend Oreille County, WA	U.S., public land	
Flume Creek	Pend Oreille County, WA	Bureau of Land Management	Elaine Zielinski Bureau of Land Management 1515 SW Fifth Avenue Portland, OR 97201
Linton creek	Pend Oreille County, WA	City of Metaline	Kelly Curtiss Town of Metaline P.O. Box 33 Metaline, WA 99152

3. FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

A sampling quality assurance plan (SQAP) for the Lower Pend Oreille River Mines and Mills PA and SI activities WAS developed by the START-2 prior to performing the field sampling (E & E 2001a). The SQAP was based on background information collected by E & E. The SQAP describes the sampling strategy, sampling methodology, and analytical program to identify potential hazardous substance source areas and impacts to potential targets. With few exceptions, field activities were conducted in accordance with the approved SQAP. Deviations from the SQAP are described when applicable. Field activities were conducted in coordination with BLM, USFS, and Ecology staff.

The field event was conducted from June 17 to 30, 2001. Sampling was conducted at 5 of the 21 mines/mills visited. Rationale applied by field personnel in determining whether to conduct sampling at a mine/mill include observations of potential contaminant sources and the potential for contaminants originating from potential sources to migrate and impact possible receptors via the surface water overland flow pathway.

Locations considered possible receptors of contamination originating from potential sources were also identified and sampled. As described in the SQAP, potential contaminant sources include tailings piles/ponds, waste rock piles, adits, and stained soil areas surrounding improperly stored or disposed drums and containers. Potential receptors/targets may include wetland areas, fisheries, surface water intakes, sensitive environments, etc. as defined in the EPA Harzard Ranking System (HRS); Final Rule. The contaminants of concern are Target Analyte List (TAL) metals, pesticides/polychlorinated biphenyls (pest/PCBs), and semivolatie organic compounds (SVOCs). Total organic carbon (TOC) data was also collected.

A total of 48 soil/sediment samples and 16 surface water samples were collected and analyzed under the EPA CLP for TAL metals. A portion, 34 sediment samples were also analyzed under the EPA CLP for pesticides/PCBs. One sediment sample was analyzed for SVOCs. A total of 34 sediment samples were submitted to a commercial laboratory for TOC analysis.

Sample types and the methods of collection are described below. A list of all samples collected for laboratory analysis under the PA and SI activities are contained in Table 3-1 at the end of this section.

A discussion of sample results is contained in Sections 6 and 7. Photographic documentation of the PA and SI field activities are contained in Appendix A.

Information provided to E & E regarding the Weston sampling event is included in Appendix G.

3.1 SAMPLING METHODOLOGY

Sampling for surface soil, surface water, and sediment followed the standard operating procedures (SOPs) contained in Appendix A of the SQAP (E & E 2001a). Grass, leaves and other vegetative material, rocks and other debris unsuitable for analysis were removed from soil samples before being placed into the sampling containers. Surface soil and sediment samples were homogenized in dedicated plastic bowls (except for pest/PCB analysis) prior to containerization in sample jars. Dedicated plastic spoons and scoops were used to extract, homogenize, and place sample material into sample containers (except for pest/PCB analysis). Dedicated steel bowls and steel spoons were used for the collection and homogenization of pest/PCB samples.

Water samples were collected by hand-dipping a 1-liter poly bottle sample containers into the water at well-mixed locations within the stream, or by using an unused sample container as a scoop to obtain water samples in areas of low flow. An aliquot of each sample was tested in the field for temperature and pH. After preservation, pH was again checked to ensure that the appropriate pH level had been achieved.

All samples were stored on ice in coolers continuously maintained under chain of custody. Vehicles were locked if the sampling team had to walk out of visual range of the 4 x 4 vehicles. Sample coolers from all teams were moved into a single occupied location (motel room) each evening to ensure custody control and to re-ice as needed.

3.1.1 EPA CLP Surface Soil Samples

A total of 14 surface soil samples, including two background samples, were collected. Soil samples were discrete grab samples collected from potential source and background areas. Surface soil samples were collected from 0 to 6 inches below ground surface (bgs). Samples were analyzed for TAL metals.

3.1.2 EPA CLP Sediment Samples

Sediment samples were collected as outlined in the text of the SQAP (E & E 2001a). Sediment samples were collected from below the apparent water line from 0 to 8 inches below the sediment surface

in order from most downstream locations to most upstream locations. Samples were analyzed for TAL metals, pesticides/PCBs, and TOC. MDSB01SD was additionally analyzed for SVOCs.

3.1.3 EPA CLP Surface Water Samples

Surface water samples were collected prior to collecting co-located sediment samples and from the most downstream locations to the most upstream locations. Water samples were analyzed for TAL metals.

3.2 ANALYTICAL PROTOCOLS

All samples collected were shipped off-site for chemical analysis, with the exception of field measurement for pH. Analytical methods applied to E & E samples consisted of: EPA CLP TAL metals, EPA CLP pesticides/PCBs, EPA CLP SVOCs, and EPA SW-846 TOC. These analyses were applied to samples collected from suspected sources or targets in varying combinations based on the SQAP. Laboratories performing the analyses were Sentinel, Inc., in Huntsville, Alabama (EPA CLP TAL metals); Envirosystems Inc., in Columbia, Maryland (EPA CLP pesticides/PCBs and EPA CLP SVOCs); and Analytical Services Center, E & E, Lancaster, New York (EPA SW-846 TOC). Analytical methods applied to Weston samples are noted in Section 4.

3.3 GLOBAL POSITIONING SYSTEM

Trimble™ Pathfinder Professional XL global positioning system (GPS) survey units and data loggers were used by the START-2 to approximate the horizontal location coordinates of sample points. Except as noted for specific sample locations, the units provided three dimensional differentially corrected sample coordinates with ± 1 meter accuracy. Due to the combination of the mountainous terrain and limited satellite coverage over this area, the GPS units were often operating in no more than two dimensional mode.

Sample coordinates were plotted onto a digitized map and then incorporated into Geographic Information System databases to develop a station/sample location map. The START-2 was not able to obtain accurate GPS coordinates at some locations due to mountainous terrain. These station locations were estimated on the sample location map based on field observations. GPS coordinates by sample point are provided in Appendix B. Weston GPS coordinates are found in Appendix G.

3.4 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) generated during the sampling effort consisted of used personal protective clothing and disposable sampling equipment. IDW was disposed of as non-hazardous solid waste at a municipal landfill. No IDW generated by the START-2 remains in the project area.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	E & E Sample ID	Station Location ID	CLP Organic No.	CLP Inorganic No.	Matrix	Depth	Sampler	Date	Time	TAL Metals	Pesticdes/ PCBs	TOC	SVOCs	Sample Description
Blue Bucket Mine														
01264268	NU	BBPP01SW	NU	MJ0F13	SW	-	AJ	06/26/01	13:00	X				Clear water, no odor.
01264267	01050280	BBPP01SD	J0F16	MJ0F16	SD	0-6	AJ	06/26/01	13:00	X	X	X		Very sandy, multicolored.
01264270	NU	BBPP02SW	NU	MJ0F15	SW	-	AJ	06/26/01	13:05	X				Clear water, no odor.
01264269	01050279	BBPP02SD	J0F14	MJ0F14	SD	0-6	AJ	06/26/01	13:05	X	X	X		Gray and dark brown, fine-grained.
Joesphine Mine														
01264356	NU	JOSP01SW	NU	MJ0FK9	SW	-	TK	06/26/01	15:10	X				Clear, no odor.
01264423	01050247	JOPP01SD	J0GN2	MJ0GN2	SD	0-8	RN	06/28/01	09:35	X	X	X		Gray, fine to course sand and fine gravel.
Oriole Mine														
01264271	NU	ORSP01SW	NU	MJ0F17	SW	-	NA	06/27/01	12:35	X				Clear, no odor.
01264272	01050274	ORSP01SD	J0F18	MJ0F18	SD	0-8	NA	06/27/01	12:40	X	X	X		Light gray to light brown, sand to coarse gravel.
01264273	01050273	ORSP02SD	J0F19	MJ0F19	SD	0-8	NA	06/27/01	14:05	X	X	X		Brown, moist fine sand.
Pend Oreille Mine														
01264266	NU	POCK01SW	NU	MJ0F11	SW	-	AJ	06/25/01	16:20	X				Clear water, no odor.
01264263	01050277	POCK01SD	J0F08	MJ0F08	SD	0-8	AJ	06/25/01	16:28	X	X	X		Dark, sandy material.
01264401	NU	POPP01SW	NU	MJ0GL0	SW	-	CG	06/25/01	08:45	X				Clear water, no odor, warm.
01264410	NU	POPP02SW	NU	MJ0GL9	SW	-	DW	06/26/01	13:35	X				Clear, no odor, cold.
01264411	01050239	POPP02SD	J0GM0	MJ0GM0	SD	0-8	DW	06/26/01	13:40	X	X	X		Brown fine to medium sand (80-90%), fines (10-20%).
01264412	NU	POPP03SW	NU	MJ0GM1	SW	-	DW	06/26/01	14:20	X				Clear water, no odor, cold.
01264413	01050240	POPP03SD	J0GM2	MJ0GM2	SD	0-8	DW	06/26/01	14:25	X	X	X		Brown fine to medium sand, trace gravel.
01264351	01050260	POSP01SD	J0FK4	MJ0FK4	SD	0-8	TK	06/26/01	09:11	X	X	X		Dark gray, lots of very fine clay.
01264352	01050261	POSP02SD	J0FK5	MJ0FK5	SD	0-8	TK	06/26/01	09:35	X	X	X		Gray, almost all clay.
01264252	NU	POTP01SS	NU	MJ0EZ7	SS	0-6	AJ	06/25/01	09:35	X				Moist, gray, clayey with rocks.
01264253	NU	POTP02SS	NU	MJ0EZ8	SS	0-6	AJ	06/25/01	10:25	X				Moist brown/dark brown, medium soil.
01264254	NU	POTP03SS	NU	MJ0EZ9	SS	0-6	AJ	06/25/01	10:45	X				Brown and light brown, sandy, slightly moist.
01264255	NU	POTP04SS	NU	MJ0F00	SS	0-6	AJ	06/25/01	11:25	X				Mixture of sand and tailings, white and brown, dry.
01264256	NU	POTP05SS	NU	MJ0F01	SS	0-6	AJ	06/25/01	11:45	X				Mixture of sand and tailings, white and dark brown, dry.
01264257	NU	POTP06SS	NU	MJ0F02	SS	0-6	AJ	06/25/01	12:00	X				Brown/dark brown, slightly moist, with rocks and organic matter.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	E & E Sample ID	Station Location ID	CLP Organic No.	CLP Inorganic No.	Matrix	Depth	Sampler	Date	Time	TAL Metals	Pesticides/ PCBs	TOC	SVOCs	Sample Description
01264258	NU	POTP07SS	NU	MJ0F03	SS	0-6	AJ	06/25/01	14:05	X				Brown, fine, mixture of tailings and soil (gray and white), dry.
01264259	NU	POTP08SS	NU	MJ0F04	SS	0-6	AJ	06/25/01	14:12	X				Fine gray and brown sand and tailings.
01264260	NU	POTP09SS	NU	MJ0F05	SS	0-6	AJ	06/25/01	14:22	X				Brown and gray.
01264353	NU	POWP01SS	NU	MJ0FK6	SS	0-6	TK	06/26/01	10:20	X				Dark gray, lots of rocks, very coarse sand to gravel.
01264354	NU	POWP02SS	NU	MJ0FK7	SS	0-6	TK	06/26/01	10:35	X				Gray, lots of rocks, very coarse sand to gravel.
01264355	NU	POWP03SS	NU	MJ0FK8	SS	0-6	TK	06/26/01	10:45	X				Brown and gray, lots of rocks, very coarse sand to gravel.
01264264	01050278	TCBK01SD	J0F09	MJ0F09	SD	0-8	AJ	06/25/01	15:50	X	X	X		Large beige sandy material with larger black rocks.
01264265	NU	TCBK01SW	NU	MJ0F10	SW	-	AJ	06/25/01	15:55	X				Clear water, no odor.
Pend Oreille River														
01264402	01050231	PRRS01SD	J0GL1	MJ0GL1	SD	0-8	DW	06/25/01	11:00	X	X	X		Medium brown, moderate to very fine sand 80%, silt and clay 20%.
01264404	01050233	PRRS02SD	J0GL3	MJ0GL3	SD	0-8	DW	06/25/01	12:30	X	X	X		Medium brown, moderate to very fine sand 80-90%, silt and clay 10-20%.
01264409	01050238	PRRS03SD	J0GL8	MJ0GL8	SD	0-8	DW	06/26/01	11:40	X	X	X		Brown, fine sand 70-80%, fines 20-30%.
01264414	01050241	PRRS04SD	J0GM3	MJ0GM3	SD	0-8	DW	06/27/01	11:45	X	X	X		Dark brown, silt and clay 70-80%,sand 20-30%, sulfur odor.
01264403	01050232	PRTB01SD	J0GL2	MJ0GL2	SD	0-8	DW	06/25/01	12:00	X	X	X		Light gray to brown silt and clay 60-70%, fine sand 30-40%.
01264405	01050234	PRTB02SD	J0GL4	MJ0GL4	SD	0-8	DW	06/25/01	13:45	X	X	X		Dark brown, fine sand 80%, fines 20%.
01264406	01050235	PRTB03SD	J0GL5	MJ0GL5	SD	0-8	DW	06/25/01	14:15	X	X	X		Dark brown, silt and clay 70%, sand 30%.
01264407	01050236	PRTB04SD	J0GL6	MJ0GL6	SD	0-8	DW	06/26/01	10:10	X	X	X		Light gray to brown, silt and clay 60%, fine sand 30-40%.
01264408	01050237	PRTB05SD	J0GL7	MJ0GL7	SD	0-8	DW	06/26/01	10:45	X	X	X		Gray to black fine to coarse sand.
01264421	01050245	PRTB06SD	J0GN0	MJ0GN0	SD	0-8	DW	06/27/01	17:15	X	X	X		Brown, fine to medium sand 80-90%, fines 10-20%.
01264422	01050246	PRTB07SD	J0GN1	MJ0GN1	SD	0-8	DW	06/27/01	18:05	X	X	X		Dark to medium brown, fine to medium sand 70%, clay 30%.
01264424	01050248	PRTB08SD	J0GN3	MJ0GN3	SD	0-8	RN	06/28/01	12:35	X	X	X		Brown, fine to coarse sand and trace fine gravel 90-100%.
01264425	01050249	PRTB09SD	J0GN4	MJ0GN4	SD	0-8	RN	06/28/01	13:10	X	X	X		Brown, fine to medium and, trace gravel 95%, trace fines 0-5%.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	E & E Sample ID	Station Location ID	CLP Organic No.	CLP Inorganic No.	Matrix	Depth	Sampler	Date	Time	TAL Metals	Pesticdes/ PCBs	TOC	SVOCs	Sample Description
Metaline Falls Municipal Water Intake														
01264429	NU	MF01SW	NU	MJ0GN8	SW	0	LD	06/28/01	11:50	X				Clear, no odor, 64 gallons per minute.
01264430	NU	MF02SW	NU	MJ0GN9	SW	0	LD	06/28/01	12:00	X				Clear, no odor, 48 gallons per minute.
Grandview Mine*														
01264415	NU	GMPP04SW	NU	MJ0GM4	SW	0	DW	06/27/01	12:05	X				Clear, no odor, cold.
01264416	01050242	GMPP04SD	J0GM5	MJ0GM5	SD	0-8	DW	06/27/01	12:10	X	X	X		Gray, multicolored, sand medium to very fine 95-100%, fines 0-5%.
01264417	NU	GMPP05SW	NU	MJ0GM6	SW	0	DW	06/27/01	12:30	X				Clear, no odor, cold.
01264418	01050243	GMPP05SD	J0GM7	MJ0GM7	SD	0-8	DW	06/27/01	12:35	X	X	X		Medium brown, silt and clay 60-70%, fine to very fine sand 30-40%.
Background Samples														
01264358	NU	BK02SS	NU	MJ0FL1	SS	0-6	AJ	06/27/01	10:40	X				Dark brown, clay-loam, 10% or less sand.
01264274	NU	BK03SS	NU	MJ0F20	SS	0-6	NA	06/27/01	13:30	X				Dark brown, slightly moist, some organic matter.
01264419	NU	POBK01SW	NU	MJ0GM8	SW	0	DW	06/27/01	12:55	X				Dark brown, slightly moist, some organic matter.
01264420	01050244	POBK01SD	J0GM9	MJ0GM9	SD	0-8	DW	06/27/01	13:00	X	X	X		Brown clay and silt 60-70%, sand 30-40%.
01264426	01050250	PRBK01SD	J0GN5	MJ0GN5	SD	0-8	RN	06/28/01	13:55	X	X	X		Brown fine to medium sand 90%, trace fines 0-10%.
01264427	01050251	PRBK02SD	J0GN6	MJ0GN6	SD	0-8	RN	06/28/01	14:05	X	X	X		Brown silt and clay 70-80%, fine to very fine sand 20-30%.
01264428	01050252	PRBK03SD	J0GN7	MJ0GN7	SD	0-8	RN	06/28/01	14:15	X	X	X		Brown fine to very fine sand 70-80%, clay and silt 20-30%.
Meyers Dam														
01374222	01090441	MDSB01SD	J0KK8	MJ0KK8	SD		MT	09/12/01	09:38	X	X	X	X	Gray sandy silt.

Table 3-1

SAMPLE COLLECTION AND ANALYTICAL SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	E & E Sample ID	Station Location ID	CLP Organic No.	CLP Inorganic No.	Matrix	Depth	Sampler	Date	Time	TAL Metals	Pesticides/ PCBs	TOC	SVOCs	Sample Description
Weston Samples														
01264070	NU	US002SD	JX829	MJ0BQ3	SD	0-2	KB	06/28/01	09:30	X	X	X		Brown, fine to coarse sand, silt and clay, no odor.
01264067	NU	UW002SW	NU	MJ0BQ0	SW	0	KB	06/28/01	09:45	X				No description provided.
01264073	NU	US003SD	JX831	MJ0BQ5	SD	0-4	KB	06/28/01	10:45	X	X	X		Gray/brown, fine to coarse sand, some silt, no odor.
01264074	NU	UW003SW	NU	MJ0BQ6	SW	0	KB	06/28/01	10:55	X				No description provided.
01264075	NU	US004SD	JX832	MJ0BQ7	SD	0-2	KB	06/28/01	13:00	X	X	X		Dark brown, fine sand to coarse gravel, some silt, no odor.

* Samples were also collected during the Grandview Mine Site Inspection. A complete description of this site inspection can be requested from the EPA.

Key:

AJ = Al Johnson.
BB = Blue Bucket Mine.
BK = background sample.
CG = Charles Gregory.
CK = Creek 1.
CLP = Contract Laboratory Program.
DW = Dan Weiss.
E & E = Ecology & Environment, Inc.
EPA = United States Environmental Protection Agency.
GM = Grandview Mine.
ID = Identificiation.
JO = Josephine Mine.
KB = Kevin Brown.
LD = Leatta Dahlhoff.
MF = Metaline Falls municipal water intake.
MT = Monica Tonel.
NA = Neil Amick.
No. = Number.
NU = Not utilized.
OR = Oriole Mine.
PCBs = Polychlorinated biphenyls.
PO = Pend Oreille Mine.
PP = probable point of entry.
PR = Pend Oreille River.
RN = Renee Nordeen.
RS = river sediment.
SD = sediment.
SP = spring.
SS = surface soil.
SVOCs = Semivolatile Organic Compounds.
SW = surface water.
TAL = Target Analyte List.
TB = tributary.
TC = Threemile Creek.
TK = Tara Karamas.
TOC = Total Organic Compound.
TP = tailings pile.
US = Tributary sediment/soil (upstream/upland sampling location).
UW = Upland surface water.
Weston = Roy F. Weston, Inc.
WP = waste rock pile.

4. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware, and reagents. Specific QC requirements for laboratory analyses are incorporated in the *Contract Laboratory Program Statement of Work for Organic Analyses* (EPA 1999a) and in the *Contract Laboratory Program Statement of Work for Inorganic Analyses* (EPA 2000a). These QC requirements or equivalent requirements were followed for analytical work on the Lower Pend Oreille River project. This section describes the QA/QC measures taken and provides an evaluation of the usability of data presented in this report.

Some of the field work for this project was performed in conjunction with Weston. Unless otherwise noted, QA/QC information applies to all samples collected for the project. All samples were collected following the guidance of the SQAPs (E & E 2001a; Weston 2001) for the field activities. E & E soil and water inorganic analyses were performed at Sentinel, Inc., Huntsville, Alabama, a CLP laboratory, following the *CLP Statement of Work for Inorganic Analyses* (EPA 2000a). Weston soil and water inorganic analyses were performed at Datachem Laboratories, Inc., Salt Lake City, Utah, and Sentinel, Inc., Huntsville, Alabama, CLP laboratories, following the *CLP Statement of Work for Inorganic Analyses* (EPA 2000a). E & E soil and water organic analyses were performed at Envirosystems, Inc., Columbia, Maryland, a CLP laboratory, following the *CLP Statement of Work for Organic Analyses* (EPA 1999). Weston soil organic analyses were performed by the Mitkem Corporation, Warwick, Rhode Island, and Laucks Testing Laboratory, Seattle, Washington, CLP laboratories, following the *CLP Statement of Work for Organic Analyses* (EPA 1999). E & E TOC analyses were performed at the Ecology and Environment, Inc., Analytical Services Center, Lancaster, New York, a START-2 subcontracted commercial laboratory, following the Lloyd Kahn Method. Weston TOC analyses were performed by North Creek Analytical Laboratory, Inc., Bothell, Washington, a subcontracted commercial laboratory, following modified EPA Method 9060.

All data from analyses performed by the CLP laboratories were reviewed and validated by EPA and/or Environmental Services Assistance Team chemists. Data from the subcontracted commercial laboratories were reviewed and validated by E & E and/or Weston chemists. Data qualifiers were applied as necessary according to the following guidance:

- *EPA* (1994) *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review;* and
- *EPA* (1999) *Contract Laboratory Program National Functional Guidelines for Organic Data Review.*

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

4.1 SATISFACTION OF DATA QUALITY OBJECTIVES

The following EPA (1994b) guidance document was used to establish data quality objectives (DQOs) for this project:

- *Guidance for the Data Quality Objectives Process,* EPA /600/R-96/055.

The EPA Task Monitors (TMs) determined that definitive data without error and bias determination would be used for the sampling and analyses conducted during the field activities. The data quality achieved during the field work produced sufficient data that meet the data objectives stated in the SQAPs (E & E 2001a; Weston 2001).

A detailed discussion of the project data quality objectives that were accomplished is presented in the following sections.

4.2 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

QA samples (rinsate blanks and trip blanks) were not required for this project. Trip blank samples are only required for Volatile Organic Compound samples, which were not collected for this project. Rinsate blank samples are required for non-dedicated sampling equipment; all sampling equipment for this project was dedicated, therefore rinsate blank samples were not collected. QC samples included matrix spike/matrix spike duplicate (MS/MSD) samples for organic analyses or MS/duplicate samples for inorganic analyses at a rate of one MS/MSD or one MS/duplicate per 20 samples per matrix, excluding QA samples; these QC analyses are not applicable for QA samples. Temperature blanks were included in each sample cooler to ensure that temperature requirements were

met. Some of the Weston TOC samples were received at temperatures greater than that specified in the method; no action was taken based on these discrepancies.

4.3 PROJECT-SPECIFIC DATA QUALITY OBJECTIVES

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

4.3.1 Precision

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

The RPD values were reviewed for all laboratory samples. Twenty five sample results (approximately 1.2%) were qualified as estimated quantities (J) based on laboratory duplicate QC outliers. The DQO for precision of 85% was met.

4.3.2 Accuracy

Accuracy measures the reproducibility of the sampling and analytical methodology. Laboratory accuracy is defined as the surrogate spike percent recovery (% R) for each pesticide/PCBs analysis or the MS % Rs for all analyses. The surrogate % R values were reviewed for all appropriate sample analyses. No results were qualified based on surrogate QC outliers.

The MS % R values were reviewed for all MS/MSD analyses. Sixty results (approximately 2.8%) were qualified as estimated quantities (J or UJ) based spike QC outliers. Overall, the project DQO for accuracy of 85% was met.

4.3.3 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All laboratory data were reviewed for data validation and usability. None of the data were rejected, therefore the project DQO for completeness of 90% was met.

4.3.4 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental condition. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices. The DQO for representativeness of 85% was met.

4.3.5 Comparability

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

4.4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PARAMETERS

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

4.4.1 Holding Times

All samples were analyzed within holding time limits, therefore no results were qualified based on holding time QC outliers.

4.4.2 Laboratory Blanks

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

- Pesticides: none;
- SVOCs: bis(2-ethylhexyl)phthalate; and
- TAL Inorganics: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, potassium, sodium, silver, selenium, thallium, and zinc.

Any associated sample result less than five times the positive blank contamination (10 times for common laboratory contaminants) were qualified as not detected (U). Associated sample results less than five times the absolute value of negative inorganic blank contamination were qualified as estimated quantities (J or UJ). A total of 126 inorganic results (approximately 5.9 %) were qualified as not detected (U) or as estimated quantities (J or UJ) based on laboratory blank contamination. See Appendix D for results that were qualified based on blank contamination.

5. ANALYTICAL RESULTS REPORTING AND BACKGROUND SAMPLES

This section describes the reporting criteria and reporting methods applied to EPA CLP analytical results presented in Sections 6 and 7 of this report. A discussion of background sample locations and results also is provided. A list of all samples collected for laboratory analysis is presented in Table 3-1.

5.1 ANALYTICAL RESULTS EVALUATION CRITERIA

Analytical results presented in the summary tables in Sections 6 and 7 show all analytes detected above laboratory detection limits in bold type. Analytical results indicating significant concentrations of contaminants in source samples (Section 6) with respect to background concentrations are shown underlined and in bold type. Similarly, analytical results indicating elevated concentrations of contaminants in target samples (Section 7) with respect to background concentrations also are underlined and in bold type. For the purposes of this investigation, significant/elevated concentrations are defined, using Table 2-3 of the EPA HRS model criteria for observed release (significant or elevated concentrations) as follows.

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

Specifically for this report, elevated concentrations in the surface water samples for the Blue Bucket and Oriole mines are defined as equal to or greater than the EPA *National Recommended Water Quality Criteria - Correction,* April 1999 or EPA Ecotox Screening Thresholds (EPA 1999b).

The analytical summary tables present all detected analytes, but only those detected analytes at potential sources or in targets meeting the significant/elevated concentration criteria are discussed in the report text. All detected concentrations are discussed for background samples, including those concentrations which were qualified as estimated because they were detected below the SQL (JB).

Because both tailings and waste rock are unique soil waste matrices placed on surface soil, analytical results of the tailings and waste rock samples collected were compared to the results for background surface soil. The background surface soil samples consisted of native soil.

For analytical results qualified as estimated, the sample concentration was adjusted as described in *Using Qualified Data to Document an Observed Release and Observed Contamination* (EPA 1996) before determination of whether the concentration was significant/elevated. Analytical results are qualified as estimated (flagged "J") when the analyte is positively identified as either present or absent and based on the quality control data provided by the laboratory. The associated numerical value is the approximate concentration of the analyte in the sample. Additional qualifiers were applied when necessary to indicate potential bias of estimated quantities including low, unknown, high, or the result was estimated because it was below the sample quantitation limit:

- B = The detected concentration is below the method reporting limit/CRDL, but is above the instrument detection limit;
- H = The numerical result is likely biased high, above the actual concentration;
- L = The numerical result is likely biased low, below the actual concentration;
- K = The bias of the numerical value is unknown; and
- Q = The detected concentration is below the method reporting limit/CRQL, but is above the method detection limit.

The tables in Section 6 and 7 provide adjusted concentrations (AC) in parenthesis when the adjusted result is elevated with respect to background. For comparison purposes, the CRQL/CRDL is provided in parenthesis for background results that are qualified because they are below the CRQL/CRDL when the analyte is present in target samples at elevated concentrations. When samples were diluted for reanalysis at a laboratory, the dilution results were considered for evaluation and are provided in the tables. For target locations, only those analytes that also were detected in a source at the mine/mill were evaluated to determine whether their concentrations were elevated. All hazardous substances detected using EPA CLP results at target locations and meeting evaluation criteria can be used to document an observed release from the source at the mines/mills to the target.

5.1.1 Sample Results Reporting

When a given analyte was detected at significant/elevated concentrations in four or more samples, the number of samples and the concentration ranges are reported. When an analyte was detected at significant/elevated concentrations in three or fewer samples, the concentration of the analyte

in each sample is reported. Analytical results summary tables in each section list detected analytes and concentrations.

Based on EPA Region 10 policy, evaluation of the common earth crust elements aluminum, calcium, iron, magnesium, potassium, and sodium generally is employed only in water mass tracing, which is beyond the scope of this report.

5.2 BACKGROUND SAMPLES

Background samples were collected for each of the naturally occurring medium from which samples were collected. Those media are surface soil, surface water and sediment. Background samples were collected for comparison to downstream sample results as defined in Section 5.1. Results for the appropriate background sample(s) appear as the first column(s) in the analytical results summary tables in Sections 6 and 7 for comparison against source or target results.

5.2.1 Background Surface Soil

5.2.1.1 Sample Locations

Two upgradient background locations (BK02SS and BK03SS) were sampled within the project area. Sample locations are listed in Table 3-1. BK02SS was located north of the Circle Motel in Metaline Falls and was upgradient of any mining activity and reflects background concentrations for surface soil samples collected at mines/mills located on the east side of the Pend Oreille River in the project area (Figure 7-1). BK03SS was located approximately 650 feet northwest from the adit/shaft at the Oriole Mine and upgradient of any mining activity (Figures 6-3 and 7-1).

The surface soil samples were collected from 0 to 6 inches bgs. The matrix of the samples appeared similar to that of the native soil observed at the mines.

To determine if analyte concentrations are significant/elevated, source/target sample data were compared to the highest background concentrations for each analyte.

In this report, background concentrations of TAL metals will be compared to source and target sample concentrations, as described in sections 6 and 7, which have been analyzed by the same method (i.e., CLP).

5.2.1.2 Sample Results

Nine TAL metals were detected, ranging from a concentration of 3.5 milligrams per kilogram (mg/kg) arsenic to 989 mg/kg manganese in sample BK02SS (Table 6-9). Nine TAL metals were

detected, ranging from a concentration of 6.7 mg/kg arsenic to 4,050 mg/kg manganese in sample BK03SS (Table 6-9).

5.2.2 Background Surface Water

5.2.2.1 Sample Locations

Two upgradient background locations (TCBK01SW and POBK01SW) were sampled within the project area. Sample locations are listed in Table 3-1. TCBK01SW was located on Threemile Creek upgradient of any mining activity and reflects background concentrations for the Creek 1 sampled at the Pend Oreille Mine/Mill (Figure 6-12). The sample location was co-located with sediment sample TCBK01SD.

POBK01SW was located on the Pend Oreille River upgradient of the Josephine Mine, Grandview Mine/Mill, and Pend Oreille Mine/Mill and reflects background concentrations for the Pend Oreille River and the Josephine Mine, Grandview Mine/Mill, and Pend Oreille Mine/Mill (Figure 6-12). The sample location was co-located with sediment sample POBK01SD.

To determine if analyte concentrations are significant/elevated, source/target sample data were compared to the highest background concentrations for each analyte.

5.2.2.2 Sample Results

No TAL metals were detected in TCBK01SW (Table 7-3). No TAL metals were detected in POBK01SW (Tables 6-5, 6-7, and 6-10).

5.2.3 Background Sediment

5.2.3.1 Sample Locations

Six upgradient background locations (PRBK01SD, PRBK02SD, PRBK03SD, TCBK01SD, POBK01SD, and US004SD) were sampled within the project area. Sample locations are listed in Table 3-1.

PRBK01SD, PRBK02SD, and PRBK03SD were collected on the west side of the Pend Oreille River downgradient of the Box Canyon Dam and upgradient of the mines/mills investigated as part of this project. These data reflect background concentrations for Blue Bucket and Oriole mines (Figure 7-1). To determine if analyte concentrations are significant/elevated, source/target sample data were compared to the highest background concentrations for each analyte.

TCBK01SD was located on Threemile Creek upgradient of mining activity and reflects background concentrations for the Creek 1 sampled at the Pend Oreille Mine/Mill (Figure 6-12). The sample location was co-located with TCBK01SW.

POBK01SD was located on the Pend Oreille River upgradient of the Josephine Mine, Grandview Mine/Mill, and Pend Oreille Mine/Mill and reflects background concentrations for the Pend Oreille River, and the Josephine Mine, Grandview Mine/Mill, and Pend Oreille Mine/Mill (Figure 6-12). The sample location was co-located with POBK01SW.

US004 was located on Linton Creek upgradient of the Oriole Mine and reflects background concentrations for the Oriole Mine (Figure 7-1).

To determine if analyte concentrations are significant/elevated, source/target sample data were compared to the highest background concentrations for each analyte.

5.2.3.2 Sample Results

Nine TAL metals were detected, ranging from a concentration of 5.2 mg/kg arsenic to 243 mg/kg manganese in sample PRBK01SD (Tables 6-2 and 6-4). Nine TAL metals were detected, ranging from a concentration of 5.3 mg/kg arsenic to 429 mg/kg manganese in sample PRBK02SD (Tables 6-2and 6-4). Nine TAL metals were detected, ranging from a concentration of 5.3 mg/kg arsenic to 345 mg/kg manganese in sample PRBK03SD (Tables 6-2 and 6-4). Six TAL metals were detected, ranging from a concentration of 5.7 mg/kg chromium to 211 mg/kg manganese in sample TCBK01SD (Table 7-4). Nine TAL metals were detected, ranging from a concentration of 16.3 mg/kg arsenic to 921 mg/kg manganese in sample POBK01SD (Tables 6-6, 6-8, and 6-11). Eight TAL metals were detected, ranging from a concentration of 2.6 mg/kg arsenic to 699 mg/kg manganese in sample US004SD (Table 6-4).

6. MINES AND MILLS, LOCATIONS/DESCRIPTIONS, START-2 VISITS

This section identifies the mines and mills visited by EPA and the START-2 personnel as part of this field event. Mine/mill location, historical information, description, and ownership information are presented for each mine/mill. This section also presents field observations for the START-2 contractor and/or EPA personnel during the visits. For the five mines and mills where sampling was conducted, analytical results are presented in this section (Figures 6-1 through 6-12).

6.1 STERLING MINE

6.1.1 Mine Location

Latitude:	48° 50' 10.32"N
Longitude:	117° 23' 29.04"W
Legal Description:	E½ Section 32, Township 39N, Range 43E
CERCLIS ID:	WAN001002331
County:	Pend Oreille
Mine Owner/Contact:	Bureau of Land Management Contact: Joe Buesing 1103 North Fancher Road Spokane, Washington 99212-1275 (509) 536-1221 Shoshone Tree Farms/Riley Creek Lumber Contact: Bob Boeh 69 Riley Creek Park Drive Laclede, Idaho 83841 (208) 263-7574

6.1.2 Historical Information

The Sterling Mine is a former lead, zinc, and silver mine located in the Metaline mining district (Derkey 1990). The mine is reported to have produced in 1918 and 1926 (Derkey 1990). Historical ownership from the time of patent to the present is unknown.

6.1.3 Mine Description/Features

The Sterling Mine is located approximately 100 to 200 yards south of the Metaline Mine, along an unnamed tributary, approximately 150 feet west of the Pend Oreille River. The mine is located in the Yellowhead horizon (Derkey 1990). Mineralization occurs in the Metaline Formation (Derkey 1990).

6.1.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the Sterling Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 2, Pages 17 and 18). The mine area consisted of a shaft measuring approximately 30 feet by 60 feet by 25 feet deep (Appendix A; Photo 11-16), wood debris, and a partial concrete foundation (Appendix A; Photo 11-17). The START-2 observed a creek flowing an estimated 60 to 80 gallons per minute (gpm) approximately 100 feet south of the mine area. The mine is approximately 150 feet west of the Pend Oreille River. The mine area is in a low point geographically; potential overland drainage routes flow to the southeast. No residents were observed on the property. No potential sources, such as tailings or waste rock, or targets were observed at the property. Therefore, based on EPA TM guidance, no samples were collected.

6.2 METALINE MINE

6.2.1 Mine Location

Latitude:	48° 50' 32.64"W
Longitude:	117° 23' 24.00"N
Legal Description:	NE¼ Section 32, Township 39N, Range 43E
CERCLIS ID:	WAN001002328
County:	Pend Oreille
Mine Owner/Contact:	Shoshone Tree Tarms/Riley Creek Lumber Contact: Bob Boeh 69 Riley Creek Park Drive PO Box 220 Laclede, Idaho 83841 (208) 263-7574

6.2.2 Historical Information

The Metaline Mine is a former lead, zinc, and silver mine located in the Metaline mining district (Derkey 1990). The Metaline Mine was the name given to an adit for mining the combined ore bodies of the Bella May, Blue Bucket, and West Contact deposits (Derkey 1990). The mine is reported to have produced 410,724 tons of ore valued at $2,573,294 from 1938 to 1947 (Derkey 1990). The mine came

under the ownership of Pend Oreille Properties in 1949 (Battien 1998). Additional historical ownership information from the time reported to the present is unknown.

6.2.3 Mine Description/Features

The Metaline Mine is located six miles from Metaline Falls (Battien 1998). Mineralization is in the dolomitic limestone and is in the Josephine horizon of the Metaline Formation (Derkey 1990). Ore at the various properties of the Metaline Mine occurs in the upper part of the Metaline Formation, within approximately 200 feet of its contact with the Ledbetter Slate (Derkey 1990).

6.2.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the Metaline Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 2, Page 17). The mine area consisted of two shafts and two waste rock piles. The upper shaft measured 4 feet by 6 feet with unknown depth (Appendix A; Photos 11-13 through 11-15). The lower shaft, located approximately 50 feet downgradient from the upper shaft, measured 6 feet by 6 feet, and appears to connect with the upper shaft approximately 3 feet bgs (Appendix A; Photo 11-13). The upper waste rock pile measured 10 feet by 15 feet by 5 feet deep. The lower waste rock pile measured 50 feet by 15 feet by 5 feet deep (Appendix A; Photo 11-14). The START-2 did not observe an overland drainage route from the waste rock piles to the Pend Oreille River. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.3 BLUE BUCKET MINE

6.3.1 Mine Location

Latitude:	48° 50' 37.68"N
Longitude:	117° 23' 53.52"W
Legal Description:	N½ Section 32, Township 39N, Range 43E
CERCLIS ID:	WAN001002319
County:	Pend Oreille
Mine Owner/Contact:	Shoshone Tree Farms/Riley Creek Lumber Contact: Bob Boeh 69 Riley Creek Park Drive P.O. Box 220 Laclede, Idaho 83841 (208) 263-7574

6.3.2 Historical Information

The Blue Bucket Mine is a former zinc, lead, and silver mine located in the Metaline mining district (Derkey 1990). The Blue Bucket Mine was the name given to an adit used to access the combined ore bodies of the Metaline, Bella May, and West Contact (Derkey 1990). The mine is reported to have produced in 1906, 1907, 1916 to 1918, 1922 to 1926, and 1937 to 1950 (Derkey 1990). Total production was 175,000 tons by 1942, with production at a rate of 200 ton/day (Derkey 1990). The total ore produced between 1937 and 1943 was 56,131 tons (Derkey 1990). Ownership history from the time of patent to the present is unknown.

6.3.3 Mine Description/Features

The Blue Bucket Mine is accessed from an unmarked forest service road. Ore bodies of various sizes tend to lie along bedding zones, probably within the upper 350 feet of the Metaline Formation, and contain sphalerite and galena associated with silicified dolomite and calcite (Derkey 1990). Ore at the Blue Bucket and adjacent mines occurs within the upper 350 feet of the Metaline Formation (Derkey 1990).

6.3.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the Blue Bucket Mine and conducted a visual inspection of the property and surrounding area (Figure 6-1; Appendix C; Team 2, Pages 19 and 20). The mine area consisted of a shaft measuring 15 feet by 15 feet with unknown depth (Appendix A; Photos 12-1 through 12-3). There could be potential flow from the shaft to the unnamed creek (probable point of entry [PPE] 2). Below the unmarked forest service road a culvert (PPE 1) leads to an unnamed creek which flows through the mine shaft area and past a waste rock pile for approximately 80 feet. There could be potential overland flow from the waste rock pile to the unnamed creek (PPE 3). The START-2 estimated the flow of the creek to be 20 gpm. The culvert appeared to be galvanized metal. At the time of the visit, there was minimal (approximately 1 gpm) flow from the culvert. The waste rock pile measured 60 feet long by 50 feet wide by 15 feet deep. The START-2 did not observe any areas of obvious staining at the mine area.

6.3.5 Sampling Locations

Two co-located sediment and surface water samples were collected at the mine (Figure 6-2). Samples BBPP01SW and BBPP01SD were collected downgradient of the waste rock pile in an observed overland drainage area (PPE 3). The sediments at this sample location were sandy and multi-colored.

Samples BBPP02SW and BBPP02SD were collected near the culvert and south of the mine shaft (PPE 1). The sediments at this sample location were gray, dark brown and fine grained.

6.3.6 Analytical Results

6.3.6.1 Surface Water Sample Results

Sample results are summarized in Table 6-1. No analytes were detected above the Ecotox Screening Thresholds or Federal AWQC Protection of Aquatic Organisms benchmarks.

6.3.6.2 Sediment Sample Results

Sample results are summarized in Table 6-2. Cadmium was detected at significant concentrations in BBPP01SD and BBPP02SD at 1.7 mg/kg and 2.8 mg/kg, respectively. Lead was detected at significant concentrations in BBPP01SD and BBPP02SD at 59.9 mg/kg and 72.5 mg/kg, respectively. Zinc was detected at a significant concentration in BBPP02SD at an adjusted concentration of 373 mg/kg.

6.4 BELLA MAY MINE

6.4.1 Mine Location

Latitude:	48° 50' 53.16"N
Longitude:	117° 24' 16.20"W
Legal Description:	SW¼ Section 29, Township 39N, Range 43E
CERCLIS ID:	WAN001002318
County:	Pend Oreille
Mine Owners/Contact:	Bureau of Land Management Contact: Joe Buesing 1103 North Fancher Road Spokane, Washington 99212-1275 (509) 536-1221 Shoshone Tree Farms/Riley Creek Lumber Contact: Bob Boeh 69 Riley Creek Park Drive P.O. Box 220 Laclede, Idaho 83841 (208) 263-7574

6.4.2 Historical Information

The Bella May Mine is a former zinc, lead, silver, and cadmium mine located in the Metaline mining district (Derkey 1990). The Bella May Mine was the name given to an adit used to access the combined ore bodies of the Blue Bucket, West Contact, and Metaline deposits (Derkey 1990). The mine was reported to have produced 208,678 tons of ore between 1937 to 1943 (Derkey 1990). From 1923 to 1924, over 250 tons of practically pure galena made up the shipment put together by the then owners, Oscar DeCamp and Associates (Battien 1998). Further ownership history from the time reported to the present is unknown.

6.4.3 Mine Description/Features

One adit at the mine was 6,400 feet long and there were a reported 12,000 feet of underground workings by 1956 (Battien 1998). At least two ore bodies were found in hydrothermally altered Metaline Formation about 150 feet below the Ledbetter Slate - Metaline Formation contact (Derkey 1990). Ore at the Bella May and adjacent mines occurs near the upper contact of the Metaline Formation, within about 300 feet of the contact with the Ledbetter Slate (Derkey 1990).

6.4.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the Bella May Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 2, Pages 20 and 21). The mine area consisted of an upper adit measuring 6 feet by 6 feet by 30 feet deep; a lower adit measuring 5 feet by 6 feet by 50 feet deep; and a shaft measuring 5 feet by 5 feet by 30 feet deep (Appendix A; Photos 12-7 through 12-9). A waste rock pile measuring 100 feet by 50 feet by 5 feet deep was observed. The waste rock pile is adjacent to the lower adit and extends in a triangular shape to the south for approximately 100 feet (Appendix A; Photo 12-10). The START-2 did not observe any surface water features in the area and any overland drainage routes appear to end at the mine access road. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.5 DIAMOND R. MINE

6.5.1 Mine Location

Latitude:	48° 51' 12.60"N
Longitude:	117° 25' 19.20"W
Legal Description:	Near center, Section 30, Township 39N, Range 43E
CERCLIS ID:	WAN001002320
County:	Pend Oreille
Mine Owner/Contact:	Shoshone Tree Farms/Riley Creek Lumber Contact: Bob Boeh 69 Riley Creek Park Drive P.O. Box 220 Laclede, Idaho 83841 (208) 263-7574

6.5.2 Historical Information

The Diamond R. Mine is a former lead and zinc mine located in the Metaline mining district (Derkey 1990). It is reported that one carload of ore was shipped in 1918 (Battien 1998; Derkey 1990). In 1932 the mine came under the ownership of the Metaline Mining and Leasing Company (Battien 1998). Further ownership history from the time reported to the present is unknown.

6.5.3 Mine Description/Features

Mineralization at the mine occurs as small irregular streaks of galena in brecciated dolomitic limestone (Derkey 1990). Mineralization occurs at the Josephine horizon, 35 to 150 feet below contact of the Metaline Formation with the overlying Ledbetter Slate (Derkey 1990).

6.5.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the Diamond R. Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 2, Page 19). The mine area includes a partially collapsed shaft and two waste rock piles (Appendix A; Photos 11-20 through 11-24). The shaft measures approximately 60 feet by 10 feet wide by 15 feet deep. The upper waste rock pile measures approximately 10 feet by 8 feet by 2 feet deep. The lower waste rock pile is covered with vegetation and measures approximately 40 feet by 30 feet by 10 feet deep. The START-2 team located another mine area approximately 500 feet to the east of the mine. It was unclear at the time of the visit if the two areas were related. The START-2 assumes that the adjacent area is a portion of the Diamond R. Mine. The

adjacent area consisted of three waste rock piles. The upper waste rock pile measures 5 feet by 5 feet by 2 feet deep. The middle waste rock pile measures 50 feet by 20 feet by 10 feet deep. The lower waste rock pile measures 60 feet by 40 feet by 10 feet deep. The START-2 did not observe any surface water features at the mine area. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.6 LEHIGH NO. 1 MINE

6.6.1 Mine Location

Latitude:	48° 51' 2.52"N
Longitude:	117° 24' 14.09"W
Legal Description:	NE¼ NE¼ Section 29, Township 39N, Range 43E
CERCLIS ID:	WAN001002325
County:	Pend Oreille
Mine Owner/Contact:	Shoshone Tree Farms/Riley Creek Lumber Contact: Bob Boeh 69 Riley Creek Park Drive Laclede, Idaho 83841 (208) 263-7574

6.6.2 Historical Information

The Lehigh No. 1 Mine is a former iron and lead mine located in the Metaline mining district (Derkey 1990). It is reported that the mine produced 800 tons of ore prior to 1941 (Derkey 1990). Historical ownership information for the Lehigh No. 1 Mine from the time of patent to the present is unknown.

6.6.3 Mine Description/Features

Mississippi Valley-type deposits are found in lower Paleozoic miogeoclinal rocks. Ore control included oxidation of pyrite bodies. The iron oxide was used in the manufacture of cement requiring a low amount of sulfide and aluminum-bearing clays. (Derkey 1990)

6.6.4 START-2 Mine Visit

On June 26, 2001 the START-2 visited the Lehigh No. 1 Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 2, Page 21). The mine area consisted of two shafts; the horizontal shaft (shaft 1-connects with the Bella May Mine) measured approximately 15 feet

by 15 feet by 100 feet deep and the nearby vertical shaft measured approximately 5 feet by 5 feet by 30 feet deep (Appendix A; Photos 12-11 through 12-15). A waste rock pile located downgradient from both shafts measured approximately 100 feet by 67 feet by 5 feet deep. The START-2 did not observe any surface water features at the mine including overland drainage routes. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.7 WEST CONTACT MINE

6.7.1 Mine Location

Latitude:	48° 51' 7.92"N
Longitude:	117°24' 56.88"W
Legal Description:	E½ Section 30, Township 39N, Range 43E
CERCLIS ID:	WAN001002332
County:	Pend Oreille
Mine Owner/Contact:	Shoshone Tree Farms/Riley Creek Lumber Contact: Bob Boeh 69 Riley Creek Park Drive Laclede, Idaho 83841 (208) 263-7574

6.7.2 Historical Information

The West Contact Mine is a former zinc, lead, and silver mine located in the Metaline mining district (Derkey 1990). The West Contact was the name given to an adit that was used to access the combined ore bodies of the Bella May, Blue Bucket, and Metaline deposits (Derkey 1990). The production of this mine is reported along with that of the Metaline Mine (Derkey 1990). Historical ownership information for the West Contact Mine from the time of patent to the present is unknown.

6.7.3 Mine Description/Features

Ore bodies lie along bedding zones near the upper contact with the Metaline Formation (Derkey 1990). Mineralization consists of sphalerite and galena associated with silicified dolomite and calcite (Derkey 1990). Ore at the West Contact and Bella May and Blue Bucket mines occurs near the contact of the Metaline Formation with the overlying Ledbetter Slate (Derkey 1990).

6.7.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the West Contact Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 2, Page 18). The mine area consisted of a shaft measuring 10 feet by 10 feet with unknown depth (Appendix A; Photos 11-18 and 11-19). The START-2 did not observe any surface water features at the mine including overland drainage routes. The START-2 did not observe any additional sources such as waste rock or tailings at the mine. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.8 LEHIGH NO. 2 MINE

6.8.1 Mine Location

Latitude:	48° 51' 31.68"N
Longitude:	117° 24' 52.20"W
Legal Description:	W½ Section 30, Township 39N, Range 43E
CERCLIS ID:	WAN001002326
County:	Pend Oreille
Mine Owner/Contact:	Shoshone Tree Farms/Riley Creek Lumber Contact: Bob Boeh 69 Riley Creek Park Drive Laclede, Idaho 83841 (208) 263-7574

6.8.2 Historical Information

The Lehigh No. 2 Mine is a former iron mine located in the Metaline mining district (Derkey 1990). It is reported that the mine produced in 1936 (Derkey 1990). Historical ownership information for the Lehigh No. 2 Mine from the time of patent to the present is unknown.

6.8.3 Mine Description/Features

Mississippi Valley-type deposits are found in lower Paleozoic miogeoclinal rocks. Ore control included oxidation of pyrite bodies. The iron oxide was used in the manufacture of cement requiring a low amount of sulfide and aluminum-bearing clays. (Derkey 1990)

6.8.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the Lehigh No. 2 Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 2, Page 23). The mine area consisted of a horizontal shaft that measured approximately 5 feet by 5 feet by 20 feet deep (Appendix A; Photos 13-3 through 13-5). The waste rock pile associated with this mine is mixed with the Lehigh No. 1 waste rock pile and measured approximately 100 feet by 67 feet by 5 feet deep. The START-2 did not observe any surface water features at the mine including overland drainage routes. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.9 ORIOLE MINE

6.9.1 Mine Location

Latitude:	48° 51' 36.72"N
Longitude:	117°24' 46.44"W
Legal Description:	SE corner, Section 19, Township 39N, Range 43E
CERCLIS ID:	WAN001002330
County:	Pend Oreille
Mine Owner/Contact:	United States Forest Service Contact: Nora Rasure 765 South Main Colville, Washington 99114 (509) 684-7000

6.9.2 Historical Information

The Oriole Mine is a former zinc, lead, silver, copper, and gold mine located in the Metaline mining district (Derkey 1990). The mine is reported to have produced in 1911, 1912, 1925, 1926, (total of 2,000 tons by 1942), and in 1953 (Derkey 1990). Smelter returns on a carload of handpicked ore were 42.1 ounces/ton silver, 21.9% zinc, 15.3% lead, and 1.12% copper (Derkey 1990). Historical ownership information for the Oriole Mine from the time of patent to the present is unknown.

6.9.3 Mine Description/Features

The Oriole Mine is accessed by the Oriole Road; a dirt road approximately 2 miles south of the town of Metaline. Ore is localized in a northwest-trending gouge-breccia seam (Derkey 1990). Ore bodies are a series of elongated-down-dip lenses along the fault plane; they are connected by a narrow

quartz stringers (Derkey 1990). Mineralization occurs in the Proterozoic Monk Formation of the Windermere Group (Derkey 1990).

6.9.4 START-2 Mine Visit

On June 27, 2001, the START-2 visited the Oriole Mine and conducted a visual inspection of the property and surrounding area (Figure 6-3; Appendix C; Team 2, Pages 23 and 24). The mine consisted of an upper adit which has been gated approximately 15 feet from the opening (Appendix A; Photos 12-16 through 12-23, 13-2, and 13-10). Five waste rock piles were present. The largest waste rock pile measured 25 feet long by 15 feet wide by 4 feet deep. A spring begins 20 feet from the adit (PPE 1) and flows approximately 75 feet where it reaches the waste rock pile (PPE 2) and continues into a muddy area with no outflow. PPE 3 is a potential overland flow from the muddy area to Linton Creek. The START-2 estimated spring flow at 32 gpm. The northern portion of the mine consisted of a waste rock pile covered with soil. The covered waste rock pile measured 35 feet by 55 feet by 2 feet deep.

6.9.5 Sample Locations

A co-located surface water and sediment sample (ORSP01SW and ORSP01SD) was collected approximately 13 feet downstream from where the spring flows to the surface. Another sediment sample (ORSP02SD) was collected below the covered waste rock pile in the northern portion of the mine. Sample locations are depicted in Figure 6-4.

6.9.6 Analytical Results

6.9.6.1 Surface Water Sample Results

Sample results are summarized in Table 6-3. Zinc was detected above the Ecotox Screening Threshold benchmark at 102 micrograms per liter (μg/L).

6.9.6.2 Sediment Sample Results

Sample results are summarized in Table 6-4. Cadmium was detected at significant concentrations in ORSP01SD and ORSP02SD at 8.5 mg/kg and 27 mg/kg, respectively. Lead was detected at significant concentrations in ORSP01SD and ORSP02SD at 301 mg/kg and 714 mg/kg, respectively. Manganese was detected at significant concentrations in ORSP01SD and ORSP02SD at 4,210 mg/kg and 2,230 mg/kg, respectively. Silver was detected at significant concentrations in

ORSP01SD and ORSP02SD at 2.8 mg/kg and 5.6 mg/kg, respectively. Zinc was detected at significant concentrations in ORSP01SD and ORSP02SD at 784 mg/kg and 5,740 mg/kg, respectively.

6.10 JOSEPHINE MINE

6.10.1 Mine Location

Latitude:	48° 52' 48.00"N
Longitude:	117° 22' 15.96"W
Legal Description:	N½SE¼ Section 16, Township 39N, Range 43E
CERCLIS ID:	WAN001002322
County:	Pend Oreille
Mine Owner/Contact:	Teck Cominco American Inc. Contact: David Godlewski 15918 East Euclid Avenue Spokane, Washington 99216-1816 (509) 892-2584

6.10.2 Historical Information

The Josephine Mine is a former zinc, lead, silver, and cadmium mine located in the Metaline mining district (Derkey 1990). Reported alternative names for the Josephine Mine include Clark Mine and Hortense Mine (Derkey 1990). The mine is reported to have produced 40,000 tons of ore valued at $275,000 prior to 1919, 243,000 tons between 1920 and 1935, and from 1936 through 1955 (Derkey 1990). Production was 187,000 tons in 1948 and 273,520 tons in 1951 (Derkey 1990). Historical ownership information for the Josephine Mine from the time of patent to the present is unknown. Currently, Teck Cominco American Inc. maintains a prospecting lease for the Josephine Mine property through 2005 (Godlewski 2001).

6.10.3 Mine Description/Features

The Josephine Mine is part of the mining properties of Pend Oreille Mines, and information is sometimes combined for these two deposits (Derkey 1990). The portal for the Pend Oreille Mine/Mill is located on the east side of the Pend Oreille River and for the Josephine Mine on the west side of the river (Derkey 1990). Ore occurs as irregular bodies of sphalerite and galena in a zone 35 to 150 feet below the upper contact of the Metaline Formation (Derkey 1990). Ore minerals (sphalerite is generally dominant) are most commonly in brecciated dolomite gangue (Derkey 1990). The ore is disseminated in silicified dolomite, especially in brecciated zones cemented by calcite (Derkey 1990). Known ore bodies are

similar in size to those at the Pend Oreille Mine/Mill and range up to 5,000 feet long, 700 feet wide, and 100 feet thick (Derkey 1990). Ore at the Josephine Mine and adjacent deposits occurs in the carbonaceous and locally siliceous breccia called the Josephine horizon of the Metaline Formation (Derkey 1990). The horizon occurs within about 35 to 200 feet of the top of the Middle Cambrian to Middle Ordovician Metaline Formation beneath the Ledbetter Slate (Derkey 1990).

6.10.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the Josephine Mine and conducted a visual inspection of the property and surrounding area (Figure 6-5; Appendix C; Team 3, Page 28). The mine area consisted of a shaft, a waste rock pile, a small building, and a collapsing wood structure (Appendix A; Photos 7-10 through 8-3). The mine is located directly across the Pend Oreille River from the waste rock at the Pend Oreille Mine/Mill. The shaft is surrounded by an 8 foot barbed-wire-topped chain-link fence. The shaft was filled with water approximately 25 feet from the surface. The shaft also contained wood debris that resembled rail lines. Approximately 2 feet southwest of the collapsing wood structure a spring was observed (PPE 1). The spring was estimated to be flowing at 2 to 3 gpm. The waste rock pile measured 60 feet long by 10 feet high by 2 feet deep. The waste rock pile extended into the Pend Oreille River (PPE 2).

6.10.5 Sample Locations

A sediment sample (JOPP01SD) was collected at the PPE 2 of the waste rock into the Pend Oreille River (Figure 6-6). A surface water sample, JOSP01SW, was collected at the mouth of the spring which originates approximately 2 feet south of the wooden structure and feeds into the Pend Oreille River. A co-located sediment sample was not collected due to lack of sediment.

6.10.6 Analytical Results

6.10.6.1 Surface Water Sample Results

Sample results are summarized in Table 6-5. Lead (21.5 μg/L) and zinc (117 μg/L) were detected at significant concentrations in sample JOSP01SW.

6.10.6.2 Sediment Sample Results

Sample results are summarized in Table 6-6. Cadmium (9.6 mg/kg), lead (17,400 mg/kg), mercury (0.16 mg/kg), silver (2.3 mg/kg), and zinc (2,040 mg/kg) were detected at significant concentrations in JOPP01SD.

6.11 GRANDVIEW MINE/MILL

6.11.1 Mine/Mill Location

Latitude:	48° 52' 22.04"N
Longitude:	117° 21' 26.16"W
Legal Description:	Sections 14, 15, 22, and 30, Township 39N, Range 43E
CERCLIS ID:	WASFN1002165
County:	Pend Oreille
Owner/Contact:	Mr. Arlen Looney Washington Resources P.O. Box 69 Greenacres, WA 99016 (509) 534-0266

The inactive Grandview lead-zinc mine/mill is located in the lower Pend Oreille River Valley approximately 0.75 mile from the east bank of the Pend Oreille River, approximately 2 miles northeast of Metaline Falls, Washington (Figure 6-7).

In October 2000, E & E conducted field sampling activities at the Grandview Mine/Mill. The combined PA/SI activities were conducted under TDD Nos. 00-06-0001 and 01-01-0015 issued under EPA Region 10 START Contract Nos. 68-W6-0008 and 68-S0-01-01, respectively.

The PA/SI involved collection of samples from potential hazardous substance sources on the property and from target areas potentially impacted through contaminant migration. Forty-one samples were collected for the Grandview Mine PA/SI, including background and QA samples (one rinsate). Samples were analyzed for TAL metals, SVOCs, PCBs and the Gamma spectroscopy method was applied.

Analytical results of samples collected during the October 2000 field event can be found in the Grandview Mine PA/SI report prepared by E & E for EPA, dated June 2001. The Grandview Mine PA/SI report also includes facility background information, a discussion of field sampling activities and analytical protocols, analytical results and background sampling, QA/QC criteria, potential sources, migration/exposure pathways and targets.

In summary, samples were collected from three soil source areas including the tailings pile, waste rock piles, and the abandoned container and drum area on the property (Figure 6-8). The soil sources contained significant concentrations of TAL metals. The tailings pile samples contained significant concentrations of cadmium (58.4 mg/kg), copper (91.5 mg/kg), lead (2,260 mg/kg), mercury (1.7 mg/kg JL), selenium (1.1 mg/kg), and zinc (19,100 mg/kg).

The waste rock samples contained significant concentrations of arsenic (44.0 mg/kg), cadmium (23.3 mg/kg), lead (4,930 mg/kg) mercury (1.5 mg/kg) selenium (1.5 mg/kg), and zinc (7,420 mg/kg).

The abandoned container and drum area soil contained significant concentrations of arsenic (64.9 mg/kg), cadmium (99.5 mg/kg), copper (236 mg/kg), lead (14,600 mg/kg), mercury (6.0 mg/kg), selenium (3.0 mg/kg), and zinc (36,200 mg/kg).

Samples were collected from suspected targets along potential groundwater migration, surface water migration, and soil exposure pathways including groundwater wells, Pend Oreille River, an unnamed spring, and a former wastewater drainage ditch (Figures 6-9 and 6-10).

Elevated concentrations were detected in the Pend Oreille Village groundwater samples, including arsenic (23.4 μg/L), manganese (245 μg/L), selenium (5.1 μg/L), and zinc (125 μg/L).

No elevated concentrations were detected in the Pend Oreille River surface water samples. Cadmium (1.4 mg/kg), copper (28.2 mg/kg), lead (827 mg/kg), and zinc (1,090 mg/kg) were detected at elevated concentrations in the Pend Oreille River sediment samples.

Elevated concentrations were detected in the unnamed spring surface water samples, including arsenic (10.4 μg/L), lead (1,340 μg/L), manganese (101 μg/L), selenium (6.7 μg/L), and zinc (547 μg/L). Elevated concentrations were detected in the unnamed spring co-located sediment samples including cadmium (63.9 mg/kg), chromium (25.2 mg/kg), copper (120 mg/kg), lead (11,800 mg/kg) selenium (2.4 mg/kg), thallium (4.9 mg/kg), and zinc (19,800 mg/kg).

Elevated concentrations were detected in the former wastewater drainage ditch surface soil samples including arsenic (31.2 mg/kg), cadmium (41.8 mg/kg), chromium (133 mg/kg), copper (3,730 mg/kg), lead (43,000 mg/kg), mercury (3.9 mg/kg), selenium (6.4 mg/kg), silver (7.4 mg/kg), and zinc (12,100 mg/kg).

Radionuclide data were evaluated with respect to measured background concentrations. For radionuclide data, results normally are considered elevated or significant when the sample concentration exceeds the value of two standard deviations above the mean site-specific background concentration for that radionuclide. However, only one background sample was required to meet the DQOs identified for the Grandview Mine PA/SI. Further, additional background samples are necessary to define the

variability of the background population to accurately determine if radionuclides from the Grandview Mine/Mill are impacting identified targets. To date, there is no conclusive evidence suggesting off-site contamination from radionuclides present at Grandview Mine/Mill. The data collected previously for the Grandview Mine/Mill site can be found in the Grandview Mine PA/SI report prepared by E & E for EPA, dated June 2001.

6.11.2 Sample Locations

During the June 2001 field event, two co-located surface water and sediment samples were collected at the PPEs of Grandview Mine/Mill (GMPP04SW/SD [PPE 1] and GMPP05SW/SD [PPE 2]) in between the Pend Oreille Mine/Mill and the co-located background sample POBK01SW/SD (Figure 6-12).

6.11.3 Analytical Results

6.11.3.1 Surface Water Sample Results

Sample results are summarized in Table 6-7. Lead was detected at a significant concentration in GMPP05SW at 4.1 μg/L. Manganese was detected at a significant concentration in GMPP05SW at 25.5 μg/L. Zinc was detected at a significant concentration in GMPP05SW at 20.6 μg/L.

6.11.3.2 Sediment Sample Results

Sample results are summarized in Table 6-8. Cadmium was detected at a significant concentration in GMPP05SD at 1.6 mg/kg. Lead was detected at a significant concentration in GMPP05SD at 449 mg/kg. Zinc was detected at a significant concentration in GMPP05SD at 864 mg/kg.

6.12 PEND OREILLE MINE/MILL

6.12.1 Mine/Mill Location

Latitude:	48° 52' 54.12"N
Longitude:	117° 21' 36.00"W
Legal Description:	N½ Sections 10,11,14, and 15, Township 39N, Range 43E
CERCLIS ID:	WASFN1002160
County:	Pend Oreille

Owner/Contact: Teck Cominco American Inc.
Contact: David Godlewski
15918 East Euclid Avenue
Spokane, Washington 99216-1816
(509) 892-2584

6.12.2 Historical Information

The Pend Oreille is an active zinc, lead, silver, and cadmium mine/mill located in the Metaline mining district (Derkey 1990). The Pend Oreille Mine/Mill is a collective name for several properties (Derkey 1990). Production in 1915 was 3,111 tons valued at $8.76 per ton from the Clark Property (Derkey 1990). The mine produced 123,751 tons of ore in 1948 and 186,955 tons were produced in 1949 (Derkey 1990). Yield from 186,197 tons of ore in 1950 was 9,580,731 pounds of zinc, 6,336,653 pounds of lead, 18,000 ounces of silver, and 30,000 pounds of cadmium (Derkey 1990). Yield from 273,580 tons of ore in 1951 was 12,950,584 pounds of zinc, 6,045,914 pounds of lead, and 16,041 ounces of silver (Derkey 1990). The Pend Oreille Mine/Mill produced 5,451,328 tons of ore through 1956 (Derkey 1990). Drilling for ore in the Yellowhead horizon began in the late 1960s and the mine produced from both the Josephine and Yellowhead horizons until it closed in the late 1970s (Derkey 1990). The focus for reopening the mine (1990) is mineralization from the Yellowhead horizon, which is rich in zinc and contains more pyrite than Josephine horizon ores (Derkey 1990).

The Pend Oreille Mine/Mill is located about 2 miles north of the town of Metaline Falls and approximately 80 miles north of Spokane in northeastern Washington State. The mine is about 11 miles south of the International Border and about 15 miles west of the Idaho border. The property is located within portions of Sections 10, 11, 14, and 15; Township 39N; Range 43E (Ecology 2000).

Ownership of the Pend Oreille Mine/Mill dates back to 1904, when L.P. Larsen began prospecting in this location. In 1906, Pend Oreille Mines & Metals Company was incorporated and L.P. Larsen became the president (Lasmanis 1995). The Pend Oreille Mine/Mill was owned and operated by Pend Oreille Mines & Metals Company until 1974, when the Bunker Hill Company acquired the property and operations. The Bunker Hill Company operated the mine and mill until September 1977, when the property was acquired by Pintlar Corporation (Pintlar), a wholly-owned subsidiary of Gulf Resources & Chemical Corporation (GRC). In 1988, Resource Finance Corporation (RFC) obtained an option-purchase agreement from Pintlar, de-watered the mine, and commissioned a feasibility study for mining and milling the East Side Yellowhead deposit. In May 1990, RFC purchased the mine and mill along with 13,000 acres of contiguous mineral holdings in the district (Ecology 2000). In 1996, Cominco American, Inc. (Cominco) acquired a portion of this property, including the Pend Oreille Mine/Mill, from

RFC (Ecology 2000). Cominco American Inc. was bought out by Teck Cominco American Inc. (Hallinan 2001).

The Pend Oreille Mine/Mill property is included in the 580 acres of Teck Cominco American Inc.-owned or leased surface lands (including mineral rights) and 980 additional acres of mineral rights in this area (Ecology 2000). The Pend Oreille Mine/Mill is bounded on the west by Pend Oreille River, on the north and northeast corner by Colville National Forest lands, on the east by privately-owned lands, and on the south by State Route 31 and the Grandview Mine/Mill property (USGS 1992a, 1992b).

6.12.3 Mine/Mill Description/Features

Information for several deposits is combined into this single mine record (Derkey 1990). Properties are on the east and west sides of the Pend Oreille River (Derkey 1990). Most production at the Pend Oreille Mine/Mill was from irregularly shaped bodies of sphalerite and galena in a zone called the Josephine horizon, 35 to 200 feet below the contact of the Metaline Formation with the overlying Ledbetter Slate (Derkey 1990). The Yellowhead ores occur about 1,000 feet below the upper contact of the Metaline Formation (Derkey 1990). Ore minerals (sphalerite generally dominant) are most commonly in brecciated dolomite gangue (Derkey 1990). Ore bodies range up to 5,000 feet long, 700 feet wide, and 100 feet thick (Derkey 1990). Ore at the Pend Oreille Mine/Mill and adjacent mines occurs in a carbonaceous and locally siliceous breccia called the Josephine horizon of the Metaline Formation (Derkey 1990). The horizon lies within 35 to 200 feet of the top of the Middle Cambrian to Middle Ordovician Metaline Formation beneath the Ledbetter Slate (Derkey 1990).

The Pend Oreille Mine/Mill was one of the earliest, largest, and most productive mines in the Metaline mining district, accounting for over 50% of the lead and zinc production in the area (Ecology 2000).

Two ore horizons are present at the Pend Oreille Mine/Mill, the Josephine and the Yellowhead. The Josephine Horizon is found in the upper 500 feet of the Metaline Limestone, or about 1,600 feet below the surface. The Yellowhead Horizon is beneath the Josephine Horizon and is generally found from 1,000 to 2,400 feet beneath the top of the Metaline Limestone (Ecology 2000).

The primary method for extracting ore in the Metaline Mining District, including the Pend Oreille Mine/Mill, has been underground mining. Historically, most ore extraction was from the Josephine Horizon, which is exposed at the surface at Pend Oreille River. This horizon has been mostly mined out. (Ecology 2000)

Mining in the area by the Pend Oreille Mines & Metals Company was on a small scale during the early years, beginning on the Josephine claim with near-surface deposits on the west side of Pend Oreille River; mining continued here intermittently from 1904 until 1917 (Dings and Whitebread 1965). In 1917, a table concentration mill was constructed and operated for a few months, but was shut down during World War I. There was little activity for the next 10 years. (Ecology 2000)

In 1927, the old table mill was remodeled to a flotation plant which operated on surface ores at 150 tons per day for approximately six months. In 1928, Pend Oreille Mines & Metals Company began additional deeper development of the area; a program of extensive diamond drilling from 1928 to 1930 disclosed promising ore bodies. With a 300-ton flotation mill completed in anticipation of treating this ore, mining resumed in November 1930 and continued intermittently until 1937. The underground workings were developed, with ore hauled to the surface through a network of track haulage drifts and inclined shafts. In September 1937, a power plant on the Pend Oreille River was completed, the mill was overhauled, and production was increased to approximately 600 tons per day (Lambly 1941; Zeigler 1949; Dings and Whitebread 1965).

Subsequent workings on the Josephine Horizon were conducted eastward and downward, crossing under the river in the 1940s. Approximately 14.4 million tons of ore at 1.2% lead and % zinc were removed from this horizon between 1938 and 1977 (RFC 1993).

Mining of the Yellowhead Horizon on the east side of the river began in 1972 at an elevation about 650 to 900 feet below the Josephine workings. Only 387,000 tons of ore containing 0.5% lead and 4.0% zinc were removed from this horizon prior to closure of the mine in 1977. Since 1977, there have been no mining operations other than a development program (Lasmanis 1995; Godlewski 2000).

Prior to 1967, tailings from the milling operation—the finely ground sand and silt material remaining after the target minerals have been separated during beneficiation—were disposed of directly into Pend Oreille River. Beneficiation includes those activities that serve to separate and concentrate the mineral values from waste material, remove impurities, or prepare the ores for further refinement (EPA 2000b). An estimated 3,000 tons of tailings were discharged to Pend Oreille River each day of milling operations in 1962 (Neale 1962). After 1967, three upland tailings disposal facilities (TDFs) were used to dispose of the tailings. TDF No. 1 (TDF-1), which is located 2,400 feet northeast of the mill and west of the Metaline Falls Golf Course and Gun Club, covers approximately 24 acres. This facility was used from 1967 through 1974. TDF No. 2 (TDF-2), which is located between the golf course and TDF-1, covers approximately 25 acres; this facility was used during 1974 and 1975. Tailings in these two TDFs are comprised of material from the Josephine Horizon workings (Ecology 2000).

TDF No. 3 (TDF-3) is located south of the golf course and covers approximately 20 acres. TDF-3 was operated from 1975 until the mine closed in 1977. The tailings in this facility are approximately 40 feet deep at the deepest point and are comprised primarily of material from the Yellowhead Horizon workings (Ecology 2000). Pend Oreille River is approximately 3,500 feet west of TDF-3.

Historically, waste rock—the waste material consisting of non-mineralized and low-grade mineralized rock removed from, around, or within the orebody during extraction activities—was stored underground during early operations. From 1950 to 1977, waste rock from both the Josephine and Yellowhead horizons, as well as Ledbetter Slate, was removed from the mine by conveyors from the Josephine Horizon to the surface, and stored in the waste rock pile located 150 feet south and west of the mill. Most of the waste rock has a low pyrite content and consists of carbonate material (limestone and dolomite) removed from above and below the ore horizons that were mined. Some of the waste rock brought to the surface was sold and used locally as road material or in construction from at least the mid-1970s until the early 1990s (Ecology 2000). The waste rock was used as a road construction base, subbase, and surface material; for private driveways; as parking lot material at Gardner Cave State Park; and as backfill by the county (Ecology 2000). The total amount of waste rock used for these purposes is unknown. The waste rock pile currently consists of approximately 386,000 cubic yards of waste rock, and covers about 15 acres (Ecology 2000).

Between 1977 and 1986, Bunker Hill Company, Pintlar, and GRC continued exploration in the area and operated pumps to prevent flooding of the mine by underground water. The mine water was discharged into Pend Oreille River. The mine was allowed to flood between 1986 and 1988, at which time development ceased (Ecology 2000).

After purchasing the property in 1990, RFC submitted a proposal to Ecology in 1992 to reopen the mine, and submitted a State Environmental Policy Act (SEPA) checklist for the proposed project in February 1993. Ecology reviewed the SEPA checklist and issued a "Determination of Non-Significance" in April 1993. RFC then submitted several applications to Ecology to obtain permits required to reopen the mine. By 1994, RFC had obtained four permits (stormwater discharge, dam safety, septic system, and air quality) and was close to receiving two others (National Pollutant Discharge Elimination System [NPDES] and waste discharge) when RFC decided to cancel the project. The following permits are maintained: NPDES, Waste Identification, Stormwater General, Ground Water, State Dangerous Waste Conditional Exemption, and Dam Safety (Godlewski 2001).

Hazardous materials used during earlier mining operations and stored on the Pend Oreille Mine/Mill property were removed from the site during RFC's tenure in 1992. These wastes included PCB oil-cooled transformers and capacitors, as well as soils containing PCBs (Ecology 2000). The data reviewed did not specify waste quantities or disposal locations. Oil, lubricants, light fuels, antifreeze, and herbicides are reportedly the only hazardous materials currently stored on site. The materials are stored in a shed located between the administrative office and the machine shop.

Having acquired the property in 1996, Cominco submitted a *Statement of Proposal Pend Oreille Mine, Pend Oreille County, Washington*, to Ecology on January 29, 1998, in order to reopen the mine. Based on the proposal, Ecology determined that an Environmental Impact Statement (EIS) would be required before the mine could be reopened (Ecology 2000). The EIS was finalized on July 12, 2000 (Hallinan 2002).

The Pend Oreille Mine/Mill owner, Teck Cominco American Inc., has finished earthwork for its tailings disposal facility this past year. Teck and Cominco merged in mid year 2001 forming Teck Cominco American Inc. This includes the basin floor, construction of the tailings embankment to form a closed basin and contouring the side slopes to a uniform grade. The work has been completed under permit from Ecology. The liner system for the TDF will be constructed in 2002 or 2003. Two raises, or small shafts, have been constructed to surface for air control of the mine. These are located between the mine and the lower road as per the EIS. The foundation for the concentrate load-out building along the west side of the mill has been constructed. The new powerline from Highway 31 has been installed and electrical service upgraded to specifications. Fencing and gates have been installed to limit access to the TDFs and the mine. The company plans to re-start mining and milling operations in January 2004. Teck Cominco American Inc. is continuing to dewater the mine workings, under their NPDES permit. There is exploration occurring underground in the mine shaft to the ore body. (Hallinan 2001, Godlewski 2001). The onsite well is being used by the mine. It has been permitted for use by the Washington Department of Health as a Group B Water System identification number 08269Y, under Department of Health identification number 01-0804.

6.12.4 START-2 Mine Visit

On June 25 and 26, 2001, the START-2 visited the Pend Oreille Mine/Mill and conducted a visual inspection of the property and the surrounding area (Figure 6-11; Appendix C; Team 2, Pages 15 and 16; Team 3, Page 27; Project Management, Logbook 15, Pages 6 through 19; Boat Team, Pages 4 through 11)

Existing Pend Oreille Mine/Mill facilities on the east side of the river include the mine office building, maintenance shop/blacksmith shop/surface conveyor/portal, coarse and fine ore storage silos, mill, assay office building, and storage facilities (Figure 6-12).

The mine office building is a two-story reinforced concrete frame structure with concrete block walls. The building has 5,500 square feet per floor. The lower floor is used for offices, accounting, and lab facilities; the upper floor is used for storage, a training room, and two offices.

The maintenance shop/blacksmith shop is a 10,500-square-foot, 30-foot-high, reinforced concrete building with a flat roof. The conveyor that carries the ore to the coarse ore storage silo is an elevated, steel-frame, integral truss structure supported on steel bents. The shop contains machinery, tools, welding equipment, electrical equipment, lubricants, and chemicals.

Two coarse ore and three fine ore storage silos are on the property. The capacity of each ore silo is approximately 1,000 tons.

The mill is a four-story concrete block building with steel interior framework. Mill equipment includes three primary head ball mills, two regrind ball mills, flotation cells, lead and zinc thickeners, stock tanks, a water filter, and a concentrate storage area. The assay office building consists of a lower story used for storage, and an upper story containing laboratory facilities.

Other buildings on the mine property include storage sheds; a powder magazine; a make-up house; a car barn/carpenter shop; a core storage shed; a crusher building; an upper, main, and mill substation; and a compressor house.

A waste rock pile from historic mining activities is located just southeast of the ore storage silos and mine office (Appendix A; Photos 1-22 through 2-5). Three TDFs from historic mining activities are located on the mine property. The Metaline Falls Golf Course and Gun Club is also located within the property boundary, just east of TDF-2 (Ecology 2000).

6.12.5 Sample Locations

Samples were collected at sources, including the waste rock pile and three tailings piles, targets discussed in Section 7 of this report, and four PPEs (Figure 6-12).

Three waste rock samples (POWP01SS through POWP03SS) were collected from the waste rock pile located adjacent to the Pend Oreille River on the south end of the property. The samples were collected within the overland surface water drainage routes identified by the START-2. The samples were collected to determine potential contamination associated with this source. The samples appeared to consist of dark gray and brown rocks. No odor or staining was noted during the sample collection.

Three surface soil samples were collected at each tailings pile for a total of 9 surface soil samples. Three surface soil samples (POTP01SS through POTP03SS) were collected at TDF-1, three surface soil samples (POTP04SS through POTP06SS) were collected at TDF-3, and three surface soil samples (POTP07SS through POTP09SS) were collected at TDF-2. Soil from TDF-1 was uniform and appeared to consist of moist, gray clay with waste rock. No soil odor or staining was noted during the sample collection. Soil from TDF-3 was uniform and appeared to consist of dry, white and dark brown sand and tailings. No soil odor or staining was noted during the sample collection. Soil from TDF-2 was uniform and appeared to consist of dry, fine gray and dark brown sand and tailings. No soil odor or staining was noted during the sample collection.

PPE 1 (POPP01SW) was collected at the ventilation shaft which flows approximately 1,260 feet in a northwest direction towards the Pend Oreille River.

PPE 2 (POPP02SW and POPP02SD) was collected from the Pend Oreille River near two seep areas located by TDF-2 and TDF-3. The water in these seeps appears to originate from hill slopes and from TDF-2. This seepage is collected in diversion channels and routed around and to the base of TDF-1, where it meets with natural seepage. This water then flows downslope (Creek 2) and drains into Pend Oreille River (PPE 2). Surface water runoff from TDF-1 and TDF-2 drains into installed diversion ditches which drain into Pend Oreille River. (Ecology 2000)

PPE 3 (POPP03SW and POPP03SD) was collected in the surface water drainage runoff from the waste rock which drains by sheet flow into the confluence of Flume Creek and the Pend Oreille River.

Potential PPE 4 was identified at the confluence of Creek 1 to the Pend Oreille River where tailings and other contaminants potentially drained in historic operations.

6.12.6 Analytical Results

6.12.6.1 Surface Soil Sample Results

Sample results are summarized in Table 6-9. In the waste rock pile, arsenic was detected at significant concentrations in POWP02SS and POWP03SS at 21.8 mg/kg and 35.1 mg/kg, respectively. Cadmium was detected in the waste rock pile at significant concentrations in POWP01SS, POWP02SS, and POWP03SS at 4.0 mg/kg, 34.2 mg/kg, and 44.1 mg/kg, respectively. Lead was detected in the waste rock pile at significant concentrations in POWP01SS, POWP02SS, and POWP03SS at adjusted concentrations of 2,090 mg/kg, 5,625 mg/kg, and 4,188 mg/kg, respectively. Mercury was detected in the waste rock pile at significant concentrations in POWP02SS and POWP03SS at 0.16 mg/kg and 0.19 mg/kg, respectively. Selenium was detected in the waste rock pile at significant concentrations in

POWP01SS and POWP03SS at 3.1 mg/kg and 1.7 mg/kg, respectively. Zinc was detected in the waste rock pile at significant concentrations in POWP01SS, POWP02SS, and POWP03SS at 890 mg/kg, 7,420 mg/kg, and 9,300 mg/kg, respectively.

In TDF-1, arsenic was detected at a significant concentration in POTP01SS at 20.6 mg/kg. Cadmium was detected in TDF-1 at significant concentrations in POTP01SS and POTP03SS at 15.0 mg/kg and 9.2 mg/kg, respectively. Copper was detected in TDF-1 at a significant concentration in POTP01SS at an estimated 176 mg/kg JL. Lead was detected in TDF-1 at significant concentrations in POTP01SS and POTP03SS at 680 mg/kg and 467 mg/kg, respectively. Mercury was detected in TDF-1 at significant concentrations in POTP01SS and POTP03SS at 0.25 mg/kg and 0.16 mg/kg, respectively. Zinc was detected in TDF-1 at significant concentrations in POTP01SS and POTP03SS at adjusted concentrations of 2,753 mg/kg and 1,460 mg/kg, respectively.

In TDF-3, arsenic was detected at significant concentrations in POTP05SS and POTP06SS at 40.0 mg/kg and 20.8 mg/kg, respectively. Cadmium was detected in TDF-3 at significant concentrations in POTP04SS, POTP05SS, and POTP06SS at 8.5 mg/kg, 8.2 mg/kg, and 11.9 mg/kg, respectively. Copper was detected in TDF-3 at significant concentrations in POTP04SS and POTP06SS at estimated concentrations of 90.0 mg/kg JL and 178 mg/kg JL, respectively. Lead was detected in TDF-3 at significant concentrations in POTP04SS, POTP05SS, and POTP06SS at 666 mg/kg, 1,650 mg/kg, and 818 mg/kg, respectively. Mercury was detected in TDF-3 at significant concentrations in POTP04SS, POTP05SS, and POTP06SS at 0.15 mg/kg, 0.10 mg/kg, and 0.18 mg/kg, respectively. Silver was detected in TDF-3 at a significant concentration in POTP05SS at 2.3 mg/kg. Zinc was detected in TDF-3 at significant concentrations in POTP04SS, POTP05SS, and POTP06SS at adjusted concentrations of 1,060 mg/kg, 1,667 mg/kg, and 1,680 mg/kg, respectively.

In TDF-2, arsenic was detected at significant concentrations in POTP07SS, POTP08SS, and POTP09SS at 26.4 mg/kg, 22.4 mg/kg, and 21.1 mg/kg, respectively. Cadmium was detected in TDF-2 at significant concentrations in POTP07SS, POTP08SS, and POTP09SS at 30.4 mg/kg, 20.1 mg/kg, and 10.4 mg/kg, respectively. Copper was detected in TDF-2 at significant concentrations in POTP07SS, POTP08SS, and POTP09SS at estimated concentrations of 242 mg/kg JL, 113 mg/kg JL, and 88.0 mg/kg JL, respectively. Lead was detected in TDF-2 at significant concentrations in POTP07SS, POTP08SS, and POTP09SS at 1,760 mg/kg, 1,000 mg/kg, and 919 mg/kg, respectively. Mercury was detected in TDF-2 at significant concentrations in POTP07SS, POTP08SS, and POTP09SS at 0.58 mg/kg, 0.25 mg/kg, and 0.16 mg/kg, respectively. Zinc was detected in TDF-2 at significant concentrations in

POTP07SS, POTP08SS, and POTP09SS at adjusted concentrations of 4,360 mg/kg, 3,027 mg/kg, and 1,513 mg/kg, respectively.

6.12.6.2 Surface Water Sample Results

Sample results are summarized in Table 6-10. Barium was detected at a significant concentration in POPP03SW at 62.6 μg/L. Lead was detected at significant concentrations in POPP01SW and POPP02SW at 8.7 μg/L and 9.3 μg/L, respectively. Manganese was detected at a significant concentration in POPP02SW at 33.0 μg/L. Zinc was detected at significant concentrations in POPP01SW and POPP02SW at 212 μg/L and 62.5 μg/L, respectively.

6.12.6.3 Sediment Sample Results

Sample results are summarized in Table 6-11. Cadmium was detected at a significant concentration in POPP02SD at 6.1 mg/kg. Lead was detected at a significant concentration in POPP02SD at 346 mg/kg. Zinc was detected at a significant concentration in POPP02SD at 2,370 mg/kg.

6.13 YELLOWHEAD MINE

6.13.1 Mine Location

Latitude:	48° 52' 59.88"N
Longitude:	117° 22' 14.16"W
Legal Description:	NE¼ Section 16, Township 39N, Range 43E
CERCLIS ID:	WAN001002333
County:	Pend Oreille
Mine Owner/Contact:	Teck Cominco American Inc. Contact: David Godlewski 15918 East Euclid Avenue Spokane, Washington 99216-1816 (509) 892-2584

6.13.2 Historical Information

The Yellowhead Mine is a former zinc, lead, and silver mine located in the Metaline mining district (Derkey 1990). The mine is reported to have produced prior to 1956 with a total production of approximately 12,000 tons (Derkey 1990). Historical ownership information for the Yellowhead Mine from the time of patent to the present is unknown.

6.13.3 Mine Description/Features

Unlike mineralization on the Josephine horizon at the adjacent Josephine deposit, mineralization at the Yellowhead mine occurs on the Yellowhead horizon, about 1,000 feet from the upper contact of the Metaline Formation (Derkey 1990). The mineralogy is the same as that at the Josephine; however, the proportions are quite different (Derkey 1990). Pyrite and sphalerite are the dominant minerals, and galena is subordinate in the Yellowhead horizon ores (Derkey 1990).

6.13.4 START-2 Mine Visit

On June 26, 2001, the START-2 visited the Yellowhead Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 3, Page 28). The mine area consisted of one waste rock pile and a collapsed wood structure (Appendix A; Photos 8-4 and 8-5). The waste rock pile measures 33 feet long by 25 feet high by 2 feet deep. An area of approximately 1,000 square feet behind the collapsed wood structure was also covered with waste rock in a scattered formation. Samples were not collected at this location because the origin of the waste rock could not be positively associated with the Yellowhead Mine or the Gold Hill Mine located 0.1 mile west of the Yellowhead mine, which is not a part of this field effort. The overland drainage route flowed approximately 600 feet into the Pend Oreille River from the waste rock area. No residents were observed on the property.

6.14 HOAGE MINE

6.14.1 Mine Location

Latitude:	48° 56' 57.48"N
Longitude:	117° 21' 18.00"W
Legal Description:	center S½ Section 22, Township 40N, Range 43E
CERCLIS ID:	WAN001002321
County:	Pend Oreille
Mine Owner/Contact:	United States Forest Service Contact: Nora Rasure 765 South Main Colville, Washington 99114 (509) 684-7000

6.14.2 Historical Information

The Hoage Mine is a former zinc and lead mine located in the Metaline mining district (Derkey 1990). The reported alternative name for the Hoage Mine is the Dreadnaught-Emily Mine (Derkey 1990). Thirty tons of hand-sorted ore was piled at the mine portal in 1945, and 200 tons of lower grade ore was stockpiled in 1951 (Derkey 1990). About 50 tons of hand-sorted ore was reportedly shipped to the Pend Oreille Smelter (Derkey 1990). Historical ownership information for the Hoage Mine from the time of patent to the present is unknown.

6.14.3 Mine Description/Features

Ore minerals are disseminated in silicified dolomite (Derkey 1990). Mineralized outcrops are exposed in several places along a 1,200-foot strike length (Derkey 1990). Mineralization at the Hoage, unlike that at the nearby Lead King deposit, occurs in gray limestone at a considerable distance stratigraphically below the Josephine horizon (Derkey 1990).

6.14.4 START-2 Mine Visit

On June 28, 2001, the START-2 visited the Hoage Mine and conducted a visual inspection of the property and the surrounding area (Appendix C; Team 3, Page 34). The mine area consisted of one waste rock pile and one shaft (Appendix A; Photos 8-21 and 8-22). The shaft measured 6 feet across by 8 feet wide with unknown depth (Appendix A; Photo 8-22). Water was present in the shaft 15 feet bgs. The waste rock pile measured 30 feet by 30 feet by 1 foot deep. The START-2 did not observe any additional surface water features at the mine including overland drainage routes. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.15 LUCKY STRIKE MINE

6.15.1 Mine Location

Latitude:	48° 55' 49.80"N
Longitude:	117° 19' 51.24"W
Legal Description:	NW¼ NE¼ Section 35, Township 40N, Range 43E
CERCLIS ID:	WAN001002327
County:	Pend Oreille

Mine Owner/Contact: United States Forest Service
Contact: Nora Rasure
765 South Main
Colville, Washington 99114
(509) 684-7000

Bureau of Land Management
Contact: Joe Buesing
1103 North Fancher Road
Spokane, Washington 9921201275
(509) 536-1221

Teck Cominco American Inc.
Contact: David Godlewski
15918 East Euclid Avenue
Spokane, Washington 99216-1815
(509) 892-2584

6.15.2 Historical Information

The Lucky Strike Mine is a former zinc, lead, and iron mine located in the Metaline mining district (Derkey 1990). A reported alternative name for the Lucky Strike Mine is the Buzzell Mine (Derkey 1990). The mine is reported to have produced in 1922 and in 1925 (Derkey 1990). Historical ownership information from the time of patent to the present is unknown.

6.15.3 Mine Description/Features

Mineralization occurs in a breccia zone as much as four feet in width (Derkey 1990). Parts of the zone are nearly solid pyrite (Derkey 1990). Mineralization at the Lucky Strike Mine occurs in the Yellowhead horizon, about 1,000 feet from the contact of the Metaline Formation with the overlying Ledbetter Slate (Derkey 1990). The mineralogy of the Yellowhead horizon ore is the same as that of the Josephine; however, the proportions are quite different, in the Yellowhead pyrite is dominant along with galena and subordinate sphalerite (Derkey 1990). Ore samples indicate sulfide mineralization occurs in the matrix of a dolomite breccia (Derkey 1990).

6.15.4 START-2 Mine Visit

On June 27, 2001, the START-2 visited the Lucky Strike Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 3, Page 30). The mine area consisted of one dry adit and a shaft approximately 80 feet apart from each other (Appendix A; Photos 8-10

through 8-12). The shaft measured 6 feet in width by 8 feet in length by unknown depth. Less than a 1,000 cubic yards of waste rock was present surrounding the adit. The START-2 did not observe any surface water features at the mine including overland drainage routes. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.16 LEAD KING MINE

6.16.1 Mine Location

Latitude:	48° 56' 16.44"N
Longitude:	117° 21' 13.32"W
Legal Description:	Near center, Section 27, Township 40N, Range 43E
CERCLIS ID:	WAN001002324
County:	Pend Oreille
Mine Owner/Contact:	United States Forest Service Contact: Nora Rasure 765 South Main Colville, Washington 99114 (509) 684-7000

6.16.2 Historical Information

The Lead King Mine is a former lead, zinc, and silver mine located in the Metaline mining district (Derkey 1990). A reported alternative name for the Lead King Mine is the D. Aldrich Mine (Derkey 1990). It is reported that small quantities of shipments were made in 1917 to 1918 and in 1925 to 1926 (Derkey 1990). On the Boundary Road north of Metaline Falls, and one mile west of the Pend Oreille River, the Lead King Mine was one of the first locations on the west side of the Pend Oreille River (Battien 1998). The mine had six claims and was up to ten when it became a Pend Oreille holding (Battien 1998). Additional historical ownership information from the time reported to the present is unknown.

6.16.3 Mine Description/Features

Mineralization occurs in quartz and dolomite breccia, is of low grade, and is confined to the upper 100 feet of the Metaline Formation (Derkey 1990). Ore is irregularly distributed galena and sphalerite associated with jasperoid, dolomite, and calcite in breccia zones (Derkey 1990).

Mineralization is from the Josephine horizon, 35 to 150 feet below the contact of the Metaline Formation with the overlying Ledbetter Slate (Derkey 1990). At the Lead King Mine, the country rocks are fine-grained gray limestone and large irregular bodies of gray to black crystalline dolomite (Derkey 1990).

6.16.4 START-2 Mine Visit

On June 28, 2001, the START-2 visited the Lead King Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 3, Page 35). The mine area consisted of two adits with ponded water (Appendix A; Photos 8-23 and 8-24). Although ponded water existed at each adit, neither adit was flowing at the time of the visit. Both of the adits are associated with waste rock piles. The waste rock pile at adit 1 measured 30 feet by 30 feet by 1 foot deep (Appendix A; Photo 9-1). The waste rock pile at adit 2 measured 30 feet by 60 feet by 1 foot deep (Appendix A; Photo 8-25). The START-2 did not observe any overland drainage routes from the adits to a water body. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.17 Z CANYON MINE

6.17.1 Mine Location and Description

The Z Canyon Mine is a former lead, zinc, and gold mine located in the Metaline mining district (Derkey 1990). The mine is located on the east side of the Pend Oreille River (Derkey 1990). The legal description of the property is NW¼ NW¼ Section 11, Township 40N, Range 43E, Pend Oreille County, Washington. The mine is reported to have produced a small amount of ore in 1926 (Derkey 1990). The mineralized zone has been exposed for a length of 800 feet on the surface (Derkey 1990). The mine is in coarse-grained dolomite, dolomite limestone, and strongly sheared limestone that is probably within the upper 200 to 400 feet of the Metaline Formation (Derkey 1990).

6.17.2 START-2 Mine Visit

One June 27, 2001, the START-2 attempted to locate the Z Canyon Mine (Appendix C; Team 3, Page 31). The START-2 followed directions given by a local resident who described where the mine was located. Upon arrival, there were no visible signs of the Z Canyon Mine. It is possible the former mine is now underwater from the creation of the Boundary Dam (Appendix A; Photo 8-13). No samples were collected.

6.18 LEAD QUEEN MINE

6.18.1 Mine Location and Description

The Lead Queen Mine is a former lead and zinc mine located in the Metaline mining district (Derkey 1990). The legal description of the property is SE¼ Section 11, Township 40N, Rnage 43E, Pend Oreille County, Washington. Most of the prospecting at the Lead Queen Mine was in a zone of dolomite within 150 feet of an overlying gray limestone (Derkey 1990). Mineralization occurs in quartz and dolomite breccia, is of low grade, and is confined to the upper 100 feet of the Metaline Formation (Derkey 1990). Ore is irregularly distributed galena and sphalerite associated with jasperoid, dolomite, and calcite in breccia zones (Derkey 1990).

6.18.2 START-2 Mine Visit

One June 27, 2001, the START-2 attempted to locate the Lead Queen Mine (Appendix C; Team 3, Page 31). The START-2 followed directions given by a local resident who described where the mine was located. Upon arrival, there were no visible signs of the Lead Queen Mine, other than a collapsed wood structure (Appendix A; Photo 8-14). The START-2 did not observe any surface water features at the property including overland drainage routes. No residents were observed on the property. No potential targets were observed on the property. No samples were collected.

6.19 LEAD HILL MINE

6.19.1 Mine Location

Latitude:	48° 58' 12.72"N
Longitude:	117° 11' 49.56"W
Legal Description:	Sections 11, 12, 13, 22, 23, 27, and S½ NE¼ Section 14, Township 40N, Range 44E
CERCLIS ID:	WAN001002323
County:	Pend Oreille
Mine Owner/Contact:	United States Forest Service Contact: Nora Rasure 7665 South Main Colville, Washington 99114 (509) 684-7000

6.19.2 Historical Information

The Lead Hill Mine is a former lead, zinc, and silver mine located in the Metaline mining district (Derkey 1990). A reported alternative name for the Lead Hill Mine is the Bunker Hill Mine (Derkey 1990). The mine is reported to have produced one small carload of hand-picked galena that was shipped in 1937 (Derkey 1990). The mine also milled 1,230 tons of ore in 1951 and 9,570 tons in 1952 (Battien 1998; Derkey 1990). By 1945, the Lead Hill Mine came under American Zinc holdings (Battien 1998). Historical ownership information from the time reported to the present is unknown.

6.19.3 Mine Description/Features

The Lead Hill Mine is located on the upper portion of Slate Creek (Derkey 1990). The mine consisted of 50 claims and had development including a compressor, shop buildings, and 100-ton ore bins (Battien 1998). The ore zones at the Lead Hill Mine are horizontal and gently dipping (Derkey 1990). The country rock is chiefly Metaline Formation and minor Ledbetter Slate, indicating the mine is near the Metaline-Ledbetter contact (Derkey 1990). The host dolomite is brecciated (Derkey 1990).

6.19.4 START-2 Mine Visit

On June 28, 2001, the START-2 visited the Lead Hill Mine and conducted a visual inspection of the property and surrounding area (Appendix C; Team 3, Page 33). The mine area consisted of three adits with associated waste rock, one shaft, a concrete slab, and a collapsed wood structure (Appendix A; Photos 8-15 through 8-18). The adits were dry and were located along Forest Service Road 300 with waste rock on the hillside below the road. The waste rock was spread thinly over the entire property. The waste rock was not sampled due to a lack of fine-grained material. Both adits and the shaft have been contained with gates, which were installed by the USFS in 2000. The distance between adit 1 to adit 2 is 300 feet. The distance between adit 2 and adit 3 is 20 feet. The distance from adit 3 to the shaft is 225 feet. Adit 1 has a diameter of 10 feet and adit 2 and adit 3 both have a diameter of 5 feet. The START-2 did not observe any overland drainage routes from the adits to a surface water body. No residents were observed on the property. No potential targets were observed on the property. Therefore, based on EPA TM guidance, no samples were collected.

6.20 KING TUT MINE

6.20.1 Mine Location and Description

The King Tut Mine is a former lead, zinc, and silver mine located in the Metaline mining district (Derkey 1990). The legal description of the property is Sections 2 and 11, Township 40N, Range 44E, Pend Oreille County, Washington. It is reported that crude lead ore was shipped which yielded 83.4% lead and 2.3 ounces/ton of silver (Derkey 1990). The deposit occurs in silicified limestone and has been traced by open cuts for a length of 500 feet and a width of 8 feet (Derkey 1990).

6.20.2 START-2 Mine Visit

One June 28, 2001, the START-2 attempted to locate the King Tut Mine (Appendix C; Team 3, Page 34). The START-2 followed the Forest Service Road where the mine was located on a topographic map. Upon arrival, there were no visible signs of the King Tut Mine (Appendix A; Photo 8-19). No samples were collected.

6.21 RED TOP MINE

6.21.1 Mine Location and Descriptions

The Red Top Mine is a former lead and zinc mine located in the Metaline mining district (Derkey 1990). The legal description of the property is Sections 1 and 2, Township 40N, Range 44E, Pend Oreille County, Washington. The mine is reported to have produced 5 tons of crude lead ore (Derkey 1990). The deposit is in silicified dolomite and has been exposed in open cuts for 1,500 feet along the strike (Derkey 1990).

6.21.2 START-2 Mine Visit

One June 28, 2001, the START-2 attempted to locate the Red Top Mine (Appendix C; Team 3, Page 34). The START-2 followed the Forest Service Road where the mine was located on a topographic map. Upon arrival, there were no visible signs of the Red Top Mine (Appendix A; Photo 8-20). No samples were collected.

Table 6-1

BLUE BUCKET MINE SURFACE WATER SAMPLES ANALYTICAL RESULTS SUMMARY LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	Ecotox Screening Thresholds	Federal AWQC Protection of Aquatic Organisms	01264268	01264270
CLP Inorganic ID			MJ0F13	MJ0F15
CLP Organic ID			NU	NU
E & E Sample ID			NU	NU
Station Location			BBPP01SW	BBPP02SW
Description	Background		Source	
TAL Metals (µg/L)				
Calcium	NU	NU	**84400**	**84800**
Iron	NU	**1000**	54.6 U	**125**
Magnesium	NU	NU	**15600**	**14500**

Source: EPA 1996; Ecology 1997.

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

Key:

AWQC	= Ambient Water Quality Criteria.
BB	= Blue Bucket Mine.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
µg/L	= micrograms per liter.
NU	= Not utilized.
PP	= probable point of entry.
SW	= surface water.
TAL	= target analyte list.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 6-2

BLUE BUCKET MINE SEDIMENT SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264426	01264427	01264428	01264267	01264269
CLP Inorganic ID	MJ0GN5	MJ0GN6	MJ0GN7	MJ0F16	MJ0F14
CLP Organic ID	J0GN5	J0GN6	J0GN7	J0F16	J0F14
E & E Sample ID	01050250	01050251	01050252	01050280	01050279
Station Location	PRBK01SD	PRBK02SD	PRBK03SD	BBPP01SD	BBPP02SD
Depth (in. bgs)	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8
Description	Background			Source	
TAL Metals (mg/kg)					
Aluminum	**6020**	**8350**	**6770**	**3640**	**6760**
Arsenic	**5.2**	**5.3**	**5.3**	3.6 U	9.1 U
Barium	**59.9**	**102**	**72.4**	**59.0**	**114**
Cadmium	0.20 U	0.25 JB (0.25 SQL)	0.26 JB (0.26 SQL)	**1.7**	**2.8**
Calcium	**17500**	**15900**	**20400**	**70500**	**35400**
Chromium	**13.2**	**17.9**	**16.4**	**6.5**	**11.9**
Copper	**17.5 JL (21.4 AC)**	**22.4 JL (27.3 AC)**	**19.3 JL (23.5 AC)**	**8.9 JL**	**23.0 JL**
Iron	**12500**	**17000**	**14200**	**9540**	**12000**
Lead	**7.3**	**10.5**	**8.7**	**59.9**	**72.5**
Magnesium	**9100**	**9180**	**9450**	**32200**	**8730**
Manganese	**243**	**429**	**345**	**341**	**194**
Nickel	**13.3**	**16.8**	**15.0**	**17.3**	**44.9**
Potassium	1260 JB	**1600**	**1260**	392 JB	915 JB
Vandium	**29.5**	**32.5**	**30.8**	11.4 JB	19.7 JB
Zinc	**49.7**	**74.1**	**53.4**	**329 JH (219 AC)**	**560 JH (373 AC)**
Total Organic Carbon (mg/kg)					
TOC	**2570**	**7090**	**4550**	**3530**	**56300**

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

Key:

AC	= Adjusted concentration.
B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
BB	= Blue Bucket Mine.
bgs	= below ground surface.
BK	= Background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
H	= High bias.
ID	= Identification.
in.	= inches.
J	= The analyte was positively identified. The associated numerical value is an estimate.
L	= Low bias.
mg/kg	= milligrams per kilogram.
PP	= probable point of entry.
PR	= Pend Oreille River.
SD	= sediment.
SQL	= sample quantitation limit.
TAL	= target analyte list.
TOC	= Total organic carbon.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 6-3

ORIOLE MINE SURFACE WATER SAMPLES ANALYTICAL RESULTS SUMMARY LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	Ecotox Screening Thresholds	Federal AWQC Protection of Aquatic Organisms	01264271
CLP Inorganic ID			MJ0F17
CLP Organic ID			NU
E & E Sample ID			NU
Station Location			ORSP01SW
Description	Background		Source
TAL Metals (µg/L)			
Calcium	NU	NU	**18900**
Magnesium	NU	NU	**9530**
Zinc	100 [1]	110 [2]	**102**

Source: EPA 1996; Ecology 1997.

[1] Value is Hardness Dependent (100 mg/L as $CaCo_3$).

[2] Value must be calculated based on characteristics of the specific surface water body.

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

Key:
AWQC = Ambient Water Quality Criteria.
CLP = Contract Laboratory Program.
E&E = Ecology and Environment, Inc.
EPA = United States Environmental Protection Agency.
ID = Identification.
µg/L = micrograms per liter.
NU = Not utilized.
OR = Oriole Mine.
SP = Spring.
SW = Surface water.
TAL = target analyte list.

Table 6-4

ORIOLE MINE SEDIMENT SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264426	01264427	01264428	01264075	01264272	01264273
CLP Inorganic ID	MJ0GN5	MJ0GN6	MJ0GN7	MJ0BQ7	MJ0F18	MJ0F19
CLP Organic ID	J0GN5	J0GN6	J0GN7	JX832	J0F18	J0F19
E & E Sample ID	01050250	01050251	01050252	NU	01050274	01050273
Station Location	PRBK01SD	PRBK02SD	PRBK03SD	US004SD	ORSP01SD	ORSP02SD
Depth (in. bgs)	0 - 8	0 - 8	0 - 8	0 - 2	0 - 8	0 - 8
Description	Background				Source	
TAL Metals (mg/kg)						
Aluminum	**6020**	**8350**	**6770**	**7950**	**5190**	**9280**
Arsenic	**5.2**	**5.3**	**5.3**	**2.6**	**4.6**	**13.8**
Barium	**59.9**	**102**	**72.4**	**68.4**	**234**	**123**
Beryllium	0.18 JB (0.18 SQL)	0.27 JB (0.27 SQL)	0.2 JB (0.2 SQL)	0.36 U	0.24 JB	0.38 JB
Cadmium	0.2 U	0.25 JB (0.25 SQL)	0.26 JB (0.26 SQL)	0.38 JBK (0.54 SQL)	**8.5**	**27**
Calcium	**17500**	**15900**	**20400**	**1520 JK**	**65000**	**51900**
Chromium	**13.2**	**17.9**	**16.4**	**14.1**	**14.2**	**14.8**
Cobalt	4.8 JB (4.8 SQL)	7.6 JB (7.6 SQL)	6.8 JB (6.8 SQL)	9.3 JB (9.3 SQL)	9.6 JB	9.8 JB
Copper	**17.5 JL (21.4 AC)**	**22.4 JL (27.3 AC)**	**19.3 JL (23.5 AC)**	**12.7JK (15.5 AC)**	**32.3 JL**	**71.7 JL**
Iron	**12500**	**17000**	**14200**	**13600**	**7680**	**20900**
Lead	**7.3**	**10.5**	**8.7**	**14.8**	**301**	**714**
Magnesium	**9100**	**9180**	**9450**	**3290**	**36400**	**33200**
Manganese	**243**	**429**	**345**	**699**	**4210**	**2230**
Nickel	**13.3**	**16.8**	**15**	**20.3**	**15.7**	**21.1**
Potassium	1260 JB	**1600**	**1260**	556 JB	249 JB	531 JB
Silver	0.56 U	0.83 U	0.64 U	0.60 UJL (1.0 U AC)	**2.8**	**5.6**
Vanadium	**29.5**	**32.5**	**30.8**	10.9 JB (10.9 SQL)	10.5 JB	17.1 JB
Zinc	**49.7**	**74.1**	**53.4**	**54.7**	**784**	**5740**
Total Organic Carbon (mg/kg)						
TOC	**2570**	**7090**	**4550**	**19000**	**19500**	**19200**

Note: Bold type indicates the sample concentration is above the detection limit.
Underline type indicates the sample results is significant as defiend in Section 5.

Key:

AC	= Adjusted concentration.
B	= The reported concentration is between the instrument detection limit and the contract requited detection limit.
bgs	= below ground surface.
BK	= background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
in.	= inches.
J	= The analyte was positively identified. The associated numerical value is an estimate.
L	= Low bias.
mg/kg	= milligrams per kilogram.
NU	= Not utilized.
OR	= Oriole Mine.
PR	= Pend Oreille River.
SD	= sediment.
SP	= spring.
SQL	= Sample quantitation limit.
TAL	= target analyte list.
US	= tributary sediment/soil (upstream/upland sampling location.

Table 6-5

JOSEPHINE MINE SURFACE WATER SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS AND
SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264419	01264356
CLP Inorganic ID	MJ0GM8	MJ0FK9
CLP Organic ID	NU	NU
E & E Sample ID	NU	NU
Station Location	POBK01SW	JOSP01SW
Description	Background	Source
TAL Metals (µg/L)		
Calcium	**18700**	**137000**
Lead	2.8 U	**21.5**
Magnesium	4950 JB	**46400**
Zinc	2.8 JB (20 SQL)	**117**

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

Key:

B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
BK	= background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
ID	= identification.
J	= The analyte was positively identified. The associated numerical value is an estimate.
JO	= Josephine Mine.
µg/L	= micrograms per liter.
NU	= Not utilized.
PO	= Pend Oreille Mine/Mill.
SP	= spring.
SQL	= sample quantitation limit.
SW	= surface water.
TAL	= target analyte list.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 6-6

JOSEPHINE MINE SEDIMENT SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS AND
SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264420	01264423
CLP Inorganic ID	MJ0GM9	MJ0GN2
CLP Organic ID	J0GM9	J0GN2
E & E Sample ID	01050244	01050247
Station Location	POBK01SD	JOPP01SD
Depth (in. bgs)	0 - 8	0 - 8
Description	Background	Source
TAL Metals (mg/kg)		
Aluminum	**11100**	**213**
Arsenic	**16.3**	**6.7**
Barium	**183**	31.6 JB
Cadmium	0.57 JB (0.57 SQL)	**9.6**
Calcium	**21500**	**290000**
Chromium	**17.6**	0.86 U
Copper	**25.9 JL (31.6 AC)**	**6.6 JL**
Iron	**27000**	**807**
Lead	**35.7**	**17400**
Magnesium	**8910**	**10800**
Manganese	**921**	**79.3**
Mercury	0.10 U	**0.16**
Nickel	**20.9**	5.0 JB
Silver	1.4 U	**2.3**
Vanadium	**28.3**	8.6 JB
Zinc	**287**	**2040**
Total Organic Carbon (mg/kg)		
TOC	**13700**	**36100**

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

Key.

AC	= Adjusted concentration.
B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs	= below ground surface.
BK	= background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
in.	= inches.
J	= The analyte was positively identified. The associated numerical value is an estimate.
JO	= Josephine Mine.
L	= Low bias.
mg/kg	= milligrams per kilogram.
PO	= Pend Oreille Mine/Mill.
PP	= probable point of entry.
SD	= sediment.
SQL	= Sample quantitation limit.
TAL	= Target analyte list.
TOC	= Total organic carbon.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 6-7

GRANDVIEW MINE/MILL SURFACE WATER SAMPLES ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264419	01264415	01264417
CLP Inorganic ID	MJ0GM8	MJ0GM4	MJ0GM6
CLP Organic ID	NU	NU	NU
E & E Sample ID	NU	NU	NU
Station Location	POBK01SW	GMPP04SW	GMPP05SW
Description	Background	Source	
TAL Metals (µg/L)			
Aluminum	104 JB	156 JB	**245**
Calcium	**18700**	**18300**	**18800**
Iron	53.7 U	**103**	**273**
Lead	2.8 U	2.8 U	**4.1**
Magnesium	4950 JB	4840 JB	**5020**
Manganese	7.7 JB (15 SQL)	11.1 JB	**25.5**
Zinc	2.8 JB (20 SQL)	5.5 JB	**20.6**

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

Key:

B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
BK	= background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
GM	= Grandview Mine/Mill.
ID	= Identificaiton.
J	= The analyte was positively identified. The associated numerical value is an estimate.
µg/L	= micrograms per liter.
NU	= Not utilized.
PO	= Pend Oreille Mine/Mill.
PP	= probable point of entry.
SQL	= sample quantitation limit.
SW	= surface water.
TAL	= Target analyte list.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 6-8

GRANDVIEW MINE/MILL SEDIMENT SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS AND
SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264420	01264416	01264418
CLP Inorganic ID	MJ0GM9	MJ0GM5	MJ0GM7
CLP Organic ID	J0GM9	J0GM5	JOGM7
E & E Sample ID	01050244	01050242	01050243
Station Location	POBK01SD	GMPP04SD	GMPP05SD
Depth (in. bgs)	0 - 8	0 - 8	0 - 8
Description	Background	Source	
TAL Metals (mg/kg)			
Aluminum	**11100**	**3160**	**8400**
Arsenic	**16.3**	**4.5**	**5.2**
Barium	**183**	**44.6**	**110**
Cadmium	0.57 JB (0.57 SQL)	0.34 U	**1.6**
Calcium	**21500**	**27500 JL**	**14600**
Chromium	**17.6**	**7.1**	**25.5**
Copper	**25.9 JL (31.6 AC)**	**8.1**	**84.0 JL**
Iron	**27000**	**7810**	**16600**
Lead	**35.7**	**43.5**	**449**
Magnesium	**8910**	**15000 JL**	**10400**
Manganese	**921**	**209 JH (169 AC)**	**313**
Nickel	**20.9**	5.9 JB	**12.3**
Potassium	2020 JB	427 JB	**1560**
Vanadium	**28.3**	9.3 JB	**20.1**
Zinc	**287**	**152**	**864**
Total Organic Carbon (mg/kg)			
TOC	**18800**	**8670**	**10200**

Note: Bold type indicates the sample concentration is above the detection limit.
Underline type indicates the sample results is significant as defined in Section 5.

Key:

AC	= adjusted concentration.
B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs	= below ground surface.
BK	= background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
GM	= Grandview Mine/Mill.
H	= high bias.
ID	= Identification.
in.	= inches.
J	= The analyte was positively identified. The associated numerical value is an estimate.
L	= low bias.
mg/kg	= milligrams per kilogram.
PO	= Pend Oreille Mine/Mill.
PP	= probable point of entry.
SD	= sediment.
SQL	= sample quantitation limit.
TAL	= Target analyte list.
TOC	= Total organic carbon.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 6-9

PEND OREILLE MINE/MILL SURFACE SOIL SAMPLES ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264358	01264274	01264252	01264253	01264254	01264255	01264256	01264257	01264258	01264259	01264260	01264353	01264354	01264355
CLP Inorganic ID	MJ0FL1	MJ0F20	MJ0EZ7	MJ0EZ8	MJ0EZ9	MJ0F00	MJ0F01	MJ0F02	MJ0F03	MJ0F04	MJ0F05	MJ0FK6	MJ0FK7	MJ0FK8
CLP Organic ID	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
E & E Sample ID	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
Station Location	BK02SS	BK03SS	POTP01SS	POTP02SS	POTP03SS	POTP04SS	POTP05SS	POTP06SS	POTO07SS	POTP08SS	POTP09SS	POWP01SS	POWP02SS	POWP03SS
Depth (in. bgs)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6
Description	Background		TDF-1/Source			TDF-3/Source			TDF-2/Source			Source		
TAL Metals (mg/kg)														
Aluminum	13500	12900	325	8080	4680	146	312	243	614	293	222	1570	750	848
Arsenic	3.5	6.7	20.6	5.1 U	18.9	19.8	40.0	20.8	26.4	22.4	21.1	18.4	21.8	35.1
Barium	296	374	20.3 JB	71.1	70.4	8.7 JB	7.8 JB	10.0 JB	15.7 JB	10.2 JB	8.9 JB	47.1	20.2 JB	29.5 JB
Cadmium	0.86 JB (0.86 SQL)	1.2 JB (1.2 SQL)	15.0	0.08 U	9.2	8.5	8.2	11.9	30.4	20.1	10.4	4.0	34.2	44.1
Calcium	19100 JL	2460	182000	16900	94100	152000	117000	148000	159000	156000	158000	262000 JL	190000 JL	195000 JL
Chromium	22.6	12.9	10.4	19.2	13.9	3.9	2.7	7.1	14.3	8.0	7.2	3.9	2.0 JB	2.8
Copper	17.0 JL (20.7 AC)	19.7 JL (24.0 AC)	176 JL	27.6 JL	58.3 JL	90.0 JL	40.3 JL	178 JL	242 JL	113 JL	88.0 JL	21.2 JL	9.2 JL	10.8 JL
Iron	18100	16700	32000	15900	37800	62700	171000	60800	61800	61100	56000	4220	12400	8510
Lead	47.2 JK (68 AC)	22.3	680	9.5	467	666	1650	818	1760	1000	919	3010 JK (2090 AC)	8100 JK (5625 AC)	6030 JK (4188 AC)
Magnesium	3870 JK	4360	74300	8460	42300	97400	70800	91800	69200	81800	73300	31000 JK	68500 JK	62400 JK
Manganese	989	4050	228	310	279	220	214	236	217	208	184	105	194	196
Mercury	0.06 U	0.06 U	0.25	0.07 U	0.16	0.15	0.10	0.18	0.58	0.25	0.16	0.05 U	0.16	0.19
Nickel	18.9	19.4	9.6 JB	18.9	15.1	20.0	21.4	16.6	16.1	13.7	13.7	73.9	20.9	33.6
Potassium	2250	644 JB	195 JB	1340 JB	665 JB	74.3 JB	87.7 JB	134 JB	336 JB	156 JB	145 JB	985 JB	303 JB	505 JB
Selenium	0.84 U	0.83 U	0.83 U	0.94 U	0.9 U	0.78 U	0.71 U	0.87 U	0.90 U	0.82 U	0.80 U	3.1	0.70 U	1.7
Silver	0.68 JB (0.68 SQL)	0.92 JB (0.92 SQL)	0.65 JB	0.68 JB	1.1 JB	0.98 JB	2.3	1.3 JB	1.3 JB	1.1 JB	0.92 JB	0.54 JB	0.93 JB	0.73 JB
Vanadium	35.2	17.9	7.2 JB	36.3	24.0	3.7 JB	5.1 JB	9.0 JB	11.0 JB	7.6 JB	7.6 JB	43.8	18.4	36.0
Zinc	201	115	4130 JH (2753 AC)	67.6 JH (45.1 AC)	2190 JH (1460 AC)	1590 JH (1060 AC)	2500 JH (1667 AC)	2520 JH (1680 AC)	6540 JH (4360 AC)	4540 JH (3027 AC)	2270 JH (1513 AC)	890	7420	9300

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

Underline type indicates the sample result is significant as defiend in Section 5.

Key:

AC	= Adjsuted concentration.
B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs	= below ground surface.
BK	= background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
H	= High bias.
ID	= Identification.
in.	= inches.
J	= The analyte was positively identified. The associated numerical value is an estimate.
K	= Unknown bias.
L	= Low bias.
mg/kg	= milligrams per kilogram.
NU	= Not utilized.
PO	= Pend Oreille Mine/Mill.
SQL	= sample quantitation limit.
SS	= surface soil.
TAL	= Target analyte list.
TDF	= Tailings disposal facility.
TP	= tailings pile.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.
WP	= waste rock pile.

Table 6-10

PEND OREILLE MINE/MILL SURFACE WATER SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS AND
SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264419	01264401	01264410	01264412
CLP Inorganic ID	MJ0GM8	MJ0GL0	MJ0GL9	MJ0GM1
CLP Organic ID	NU	NU	NU	NU
E & E Sample ID	NU	NU	NU	NU
Station Location	POBK01SW	POPP01SW	POPP02SW	POPP03SW
Description	Background	Source		
TAL Metals (µg/L)				
Barium	57.3 JB (200 SQL)	71.6 JB	58.5 JB	<u>62.6</u>
Calcium	**18700**	**48500**	**89400**	**20100**
Iron	53.7 U	71.3 U	**409**	**107**
Lead	2.8 U	<u>8.7</u>	<u>9.3</u>	2.8 U
Magnesium	4950 JB	**30200**	**29000**	**5230**
Manganese	7.7 JB (15 SQL)	0.43 JB	<u>33.0</u>	10 JB
Zinc	2.8 JB (20 SQL)	<u>212</u>	<u>62.5</u>	4.4 JB

Note: Bold type indicates the sample concentration is above the detection limit.
Underline type indicates the sample results is significant as defined in Section 5.

Key:

B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
BK	= Background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical value is an estimate.
µg/L	= micrograms per liter.
NU	= Not utilized.
PO	= Pend Oreille Mine/Mill.
PP	= probable point of entry.
SQL	= sample quantitation limit.
SW	= surface water.
TAL	= Target analyte list.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 6-11

PEND OREILLE MINE/MILL SEDIMENT SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMNARY ASSESSMENTS AND
SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264420	01264411	01264413
CLP Inorganic ID	MJ0GM9	MJ0GM0	MJ0GM2
CLP Organic ID	J0GM9	J0GM0	J0GM2
E & E Sample ID	01050244	01050239	01050240
Station Location	POBK01SD	POPP02SD	POPP03SD
Depth (in. bgs)	0 - 8	0 - 8	0 - 8
Description	Background	Source	
TAL Metals (mg/kg)			
Aluminum	**11100**	**3310**	**4250**
Arsenic	**16.3**	**13.1**	**3.2**
Barium	**183**	**250**	**44.7 JB**
Cadmium	**0.57 JB (0.57 SQL)**	**6.1**	**0.27 U**
Calcium	**21500**	**209000 JL**	**8600 JL**
Chromium	**17.6**	**9.2**	**6.0**
Copper	**25.9 JL (31.6 AC)**	**28.4**	**24.4**
Iron	**27000**	**31100**	**9160**
Lead	**35.7**	**346**	**23.6**
Magnesium	**8910**	**42200 JL**	**5930 JL**
Manganese	**921**	**1970 JH (1589 AC)**	**160 JH (129 AC)**
Nickel	**20.9**	**40.4**	**7.8 JB**
Vanadium	**28.3**	**12.2 JB**	**15.4**
Zinc	**287**	**2370**	**160**
Total Organic Carbon (mg/kg)			
TOC	**18800**	**46100**	**541 J**

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

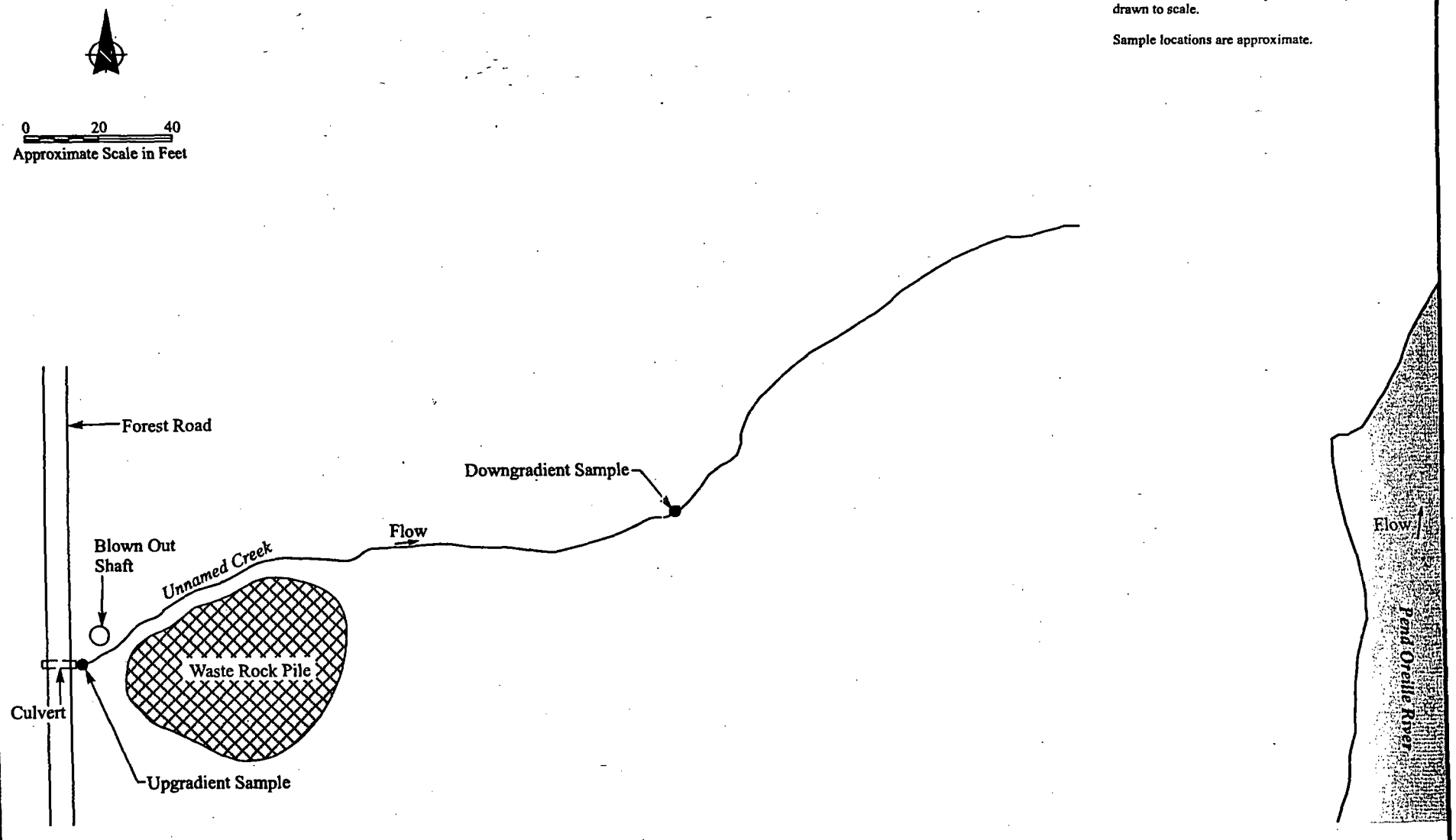
Key:

AC	= adjusted concentration.
B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs	= below ground surface.
BK	= background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
H	= High bias.
ID	= Identification.
in.	= inches.
J	= The analyte was positively identified. The associated numerical value is an estimate.
L	= Low bias.
mg/kg	= milligrams per kilogram.
PO	= Pend Oreille Mine/Mill.
PP	= probable point of entry.
SD	= sediment.
SQL	= sample quantitation limit.
TAL	= Target analyte list.
TOC	= Total organic carbon.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Source: E & E 2001b.

Note: Distance from downgradient sample to Pend Oreille River is approximately 1.5 miles. Pend Oreille River and the unnamed creek beyond this sample are not drawn to scale.

Sample locations are approximate.

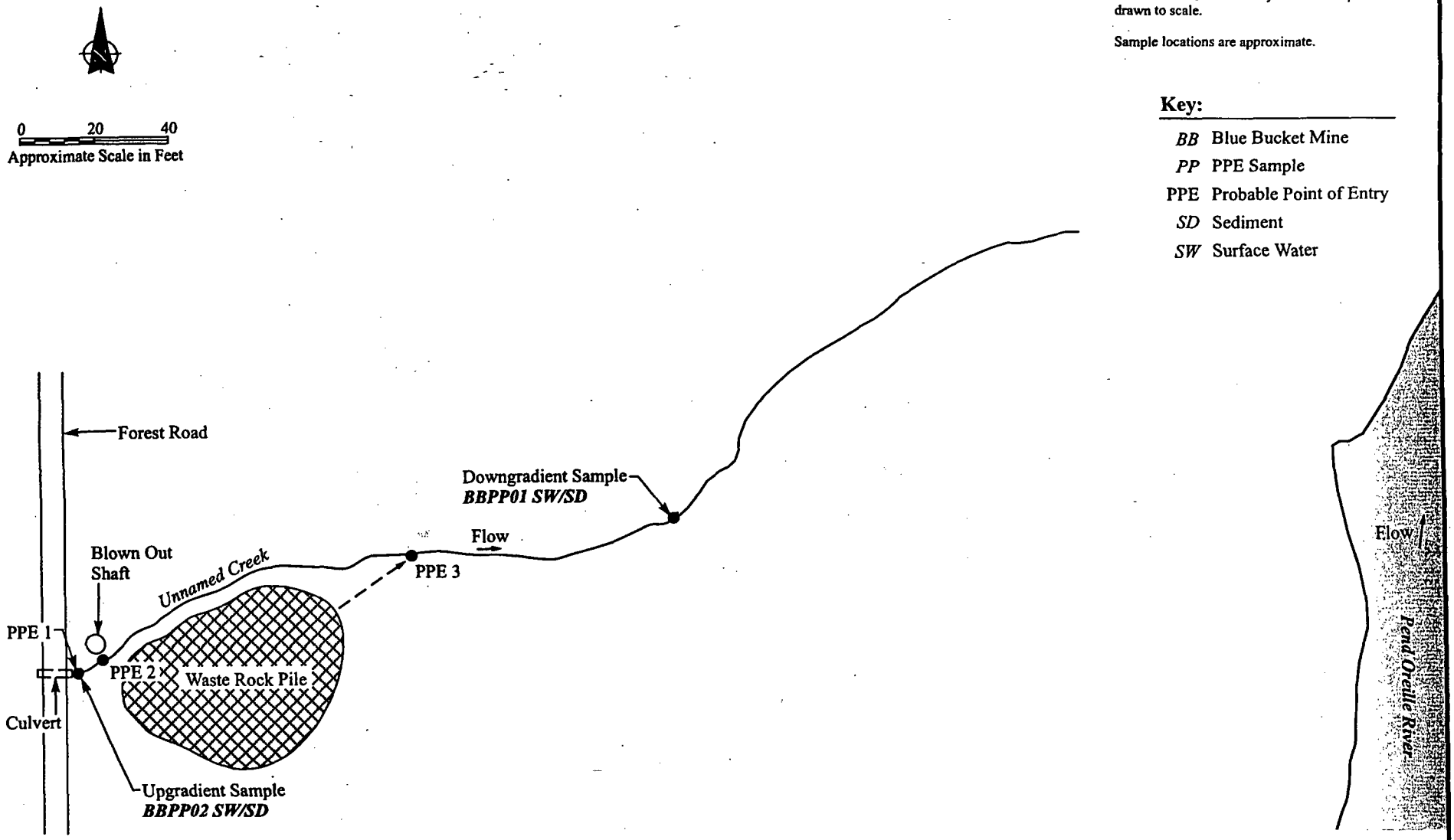


ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington	Figure 6-1 BLUE BUCKET MINE SITE MAP		
		Date: 2-28-02	Drawn by: AES	10:START-2\01080009\S714\fig 6-1

Source: E & E 2001b.

Note: Distance from downgradient sample to Pend Oreille River is approximately 1.5 miles. Pend Oreille River and the unnamed creek beyond this sample are not drawn to scale.

Sample locations are approximate.



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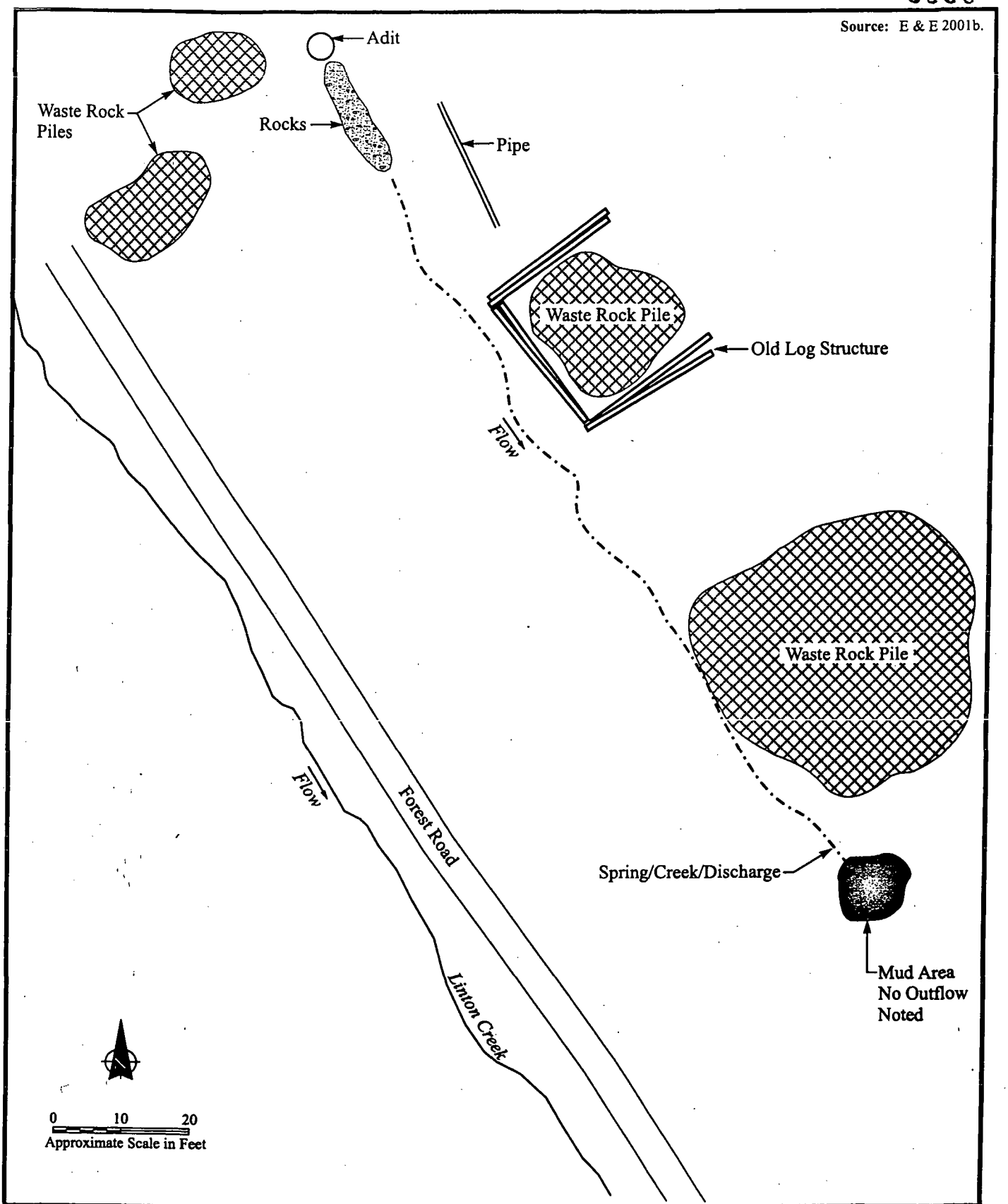
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 6-2
BLUE BUCKET MINE
SAMPLE LOCATION MAP

Date:	Drawn by:	
2-28-02	AES	10:START-2\01080009\S714\fig 6-2

Source: E & E 2001b.



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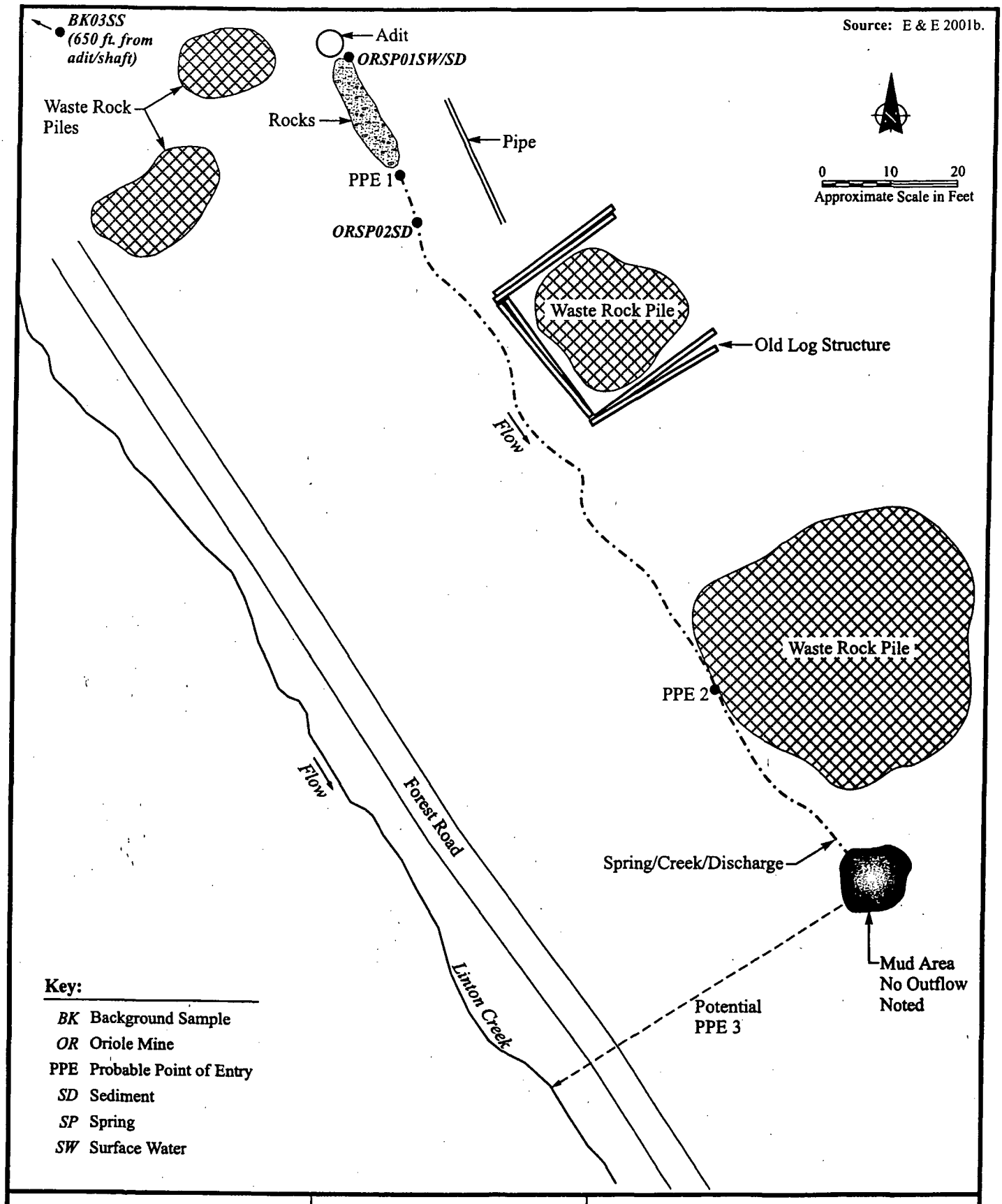
LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 6-3
ORIOLE MINE SITE MAP

Date:	Drawn by:	
2-28-02	AES	10:START-2\01080009\S714\fig 6-3



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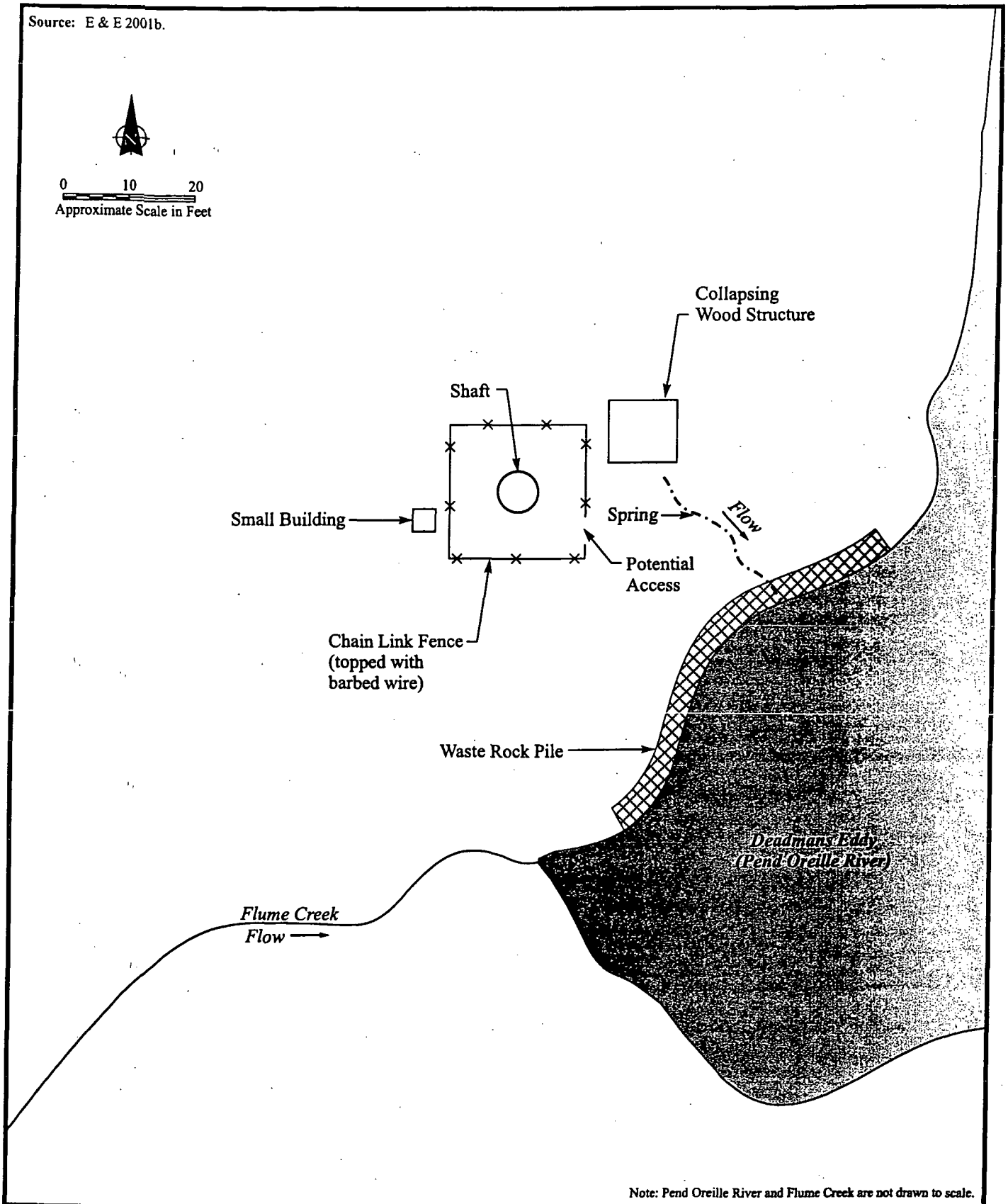
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 6-4
ORIOLE MINE
SAMPLE LOCATION MAP

Date:	Drawn by:	
2-28-02	AES	10:START-2\01080009\S714\fig 6-4

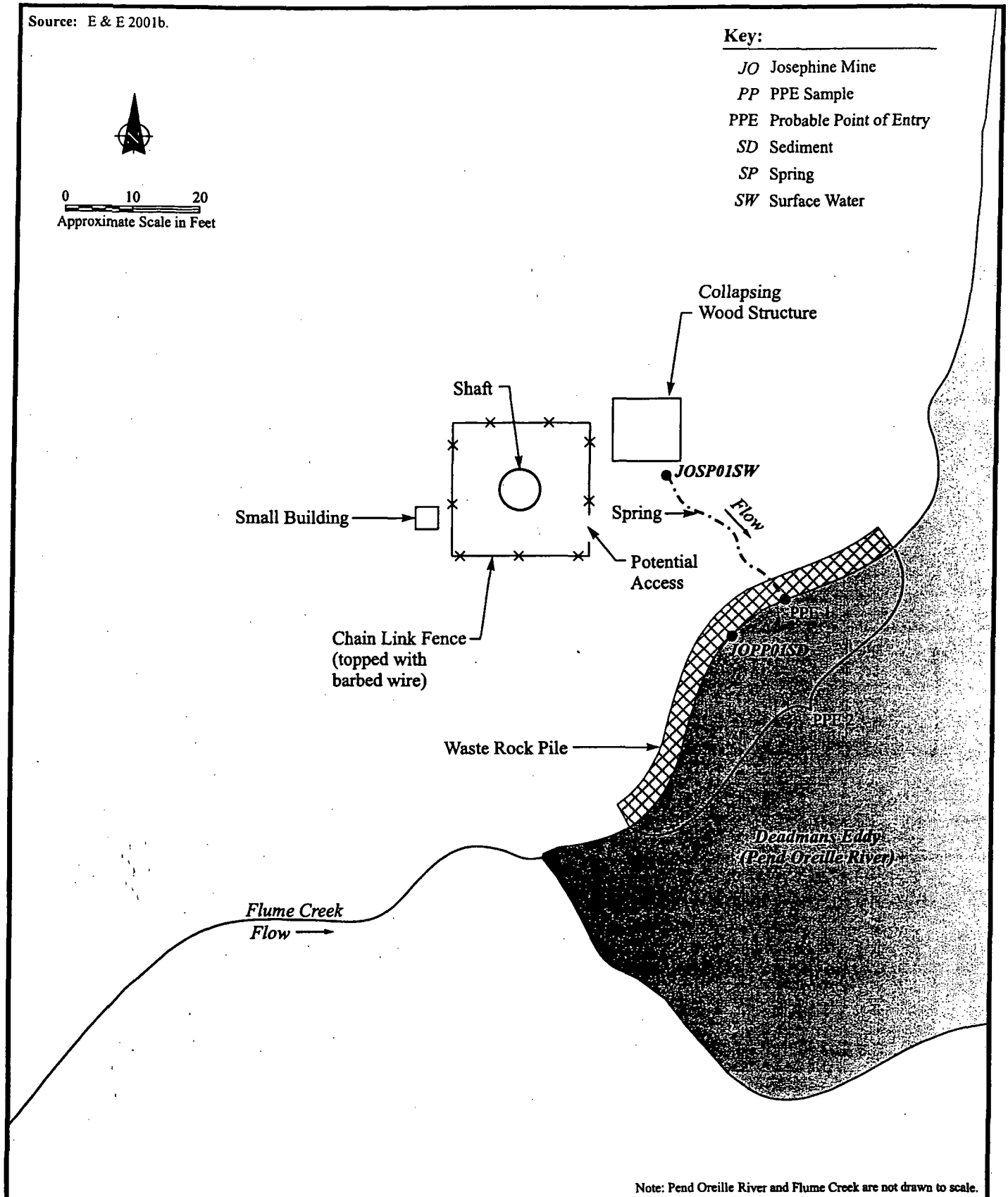
Source: E & E 2001b.



Note: Pend Oreille River and Flume Creek are not drawn to scale.

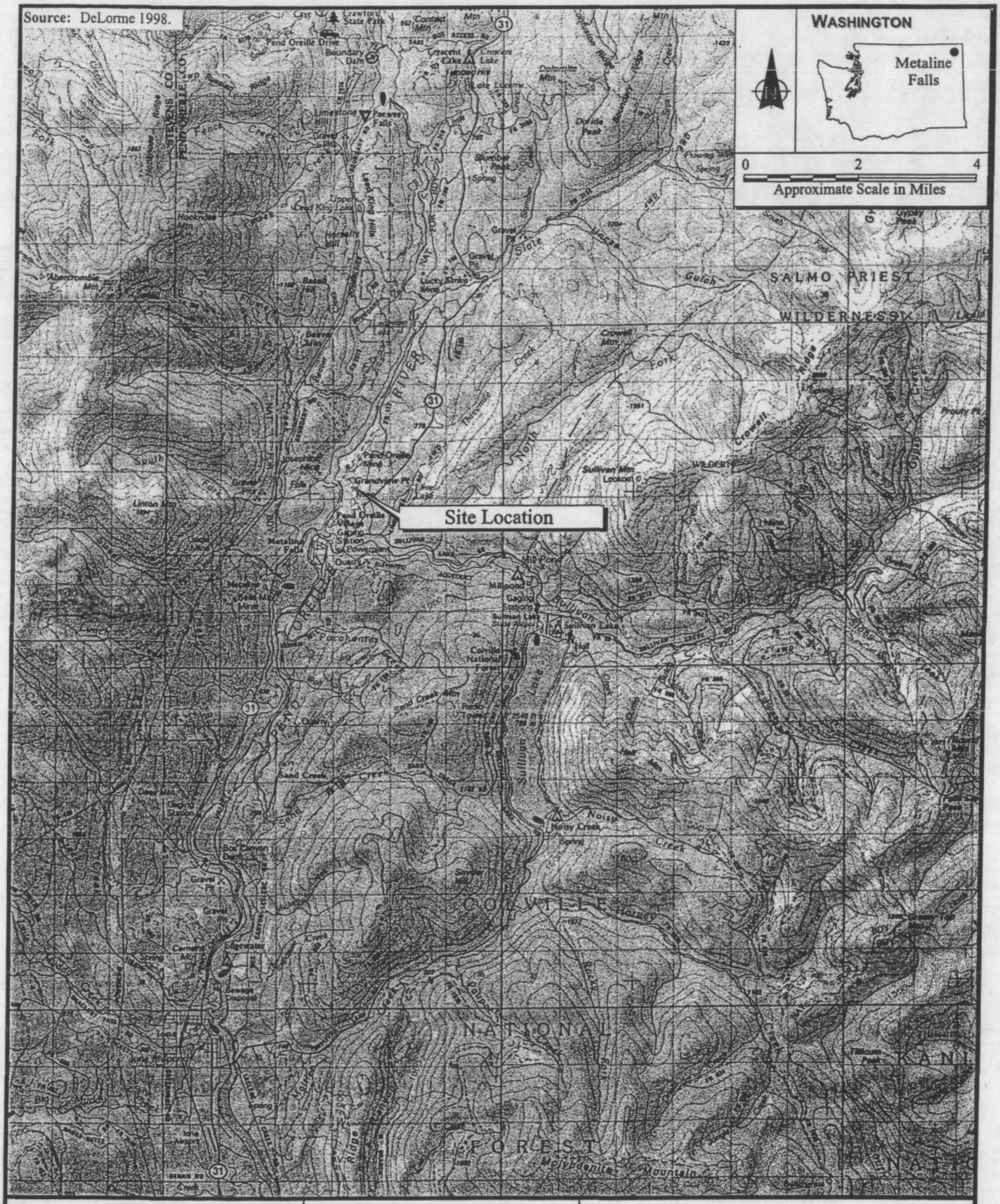
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington	Figure 6-5 JOSEPHINE MINE SITE MAP		
		Date: 2-28-02	Drawn by: AES	10:START-2\0108009\S714\fig 6-5

Source: E & E 2001b.



Note: Pend Oreille River and Flume Creek are not drawn to scale.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington	Figure 6-6 JOSEPHINE MINE SAMPLE LOCATION MAP		
		Date: 2-28-02	Drawn by: AES	10:START-2\0108009\S714\fig 6-6



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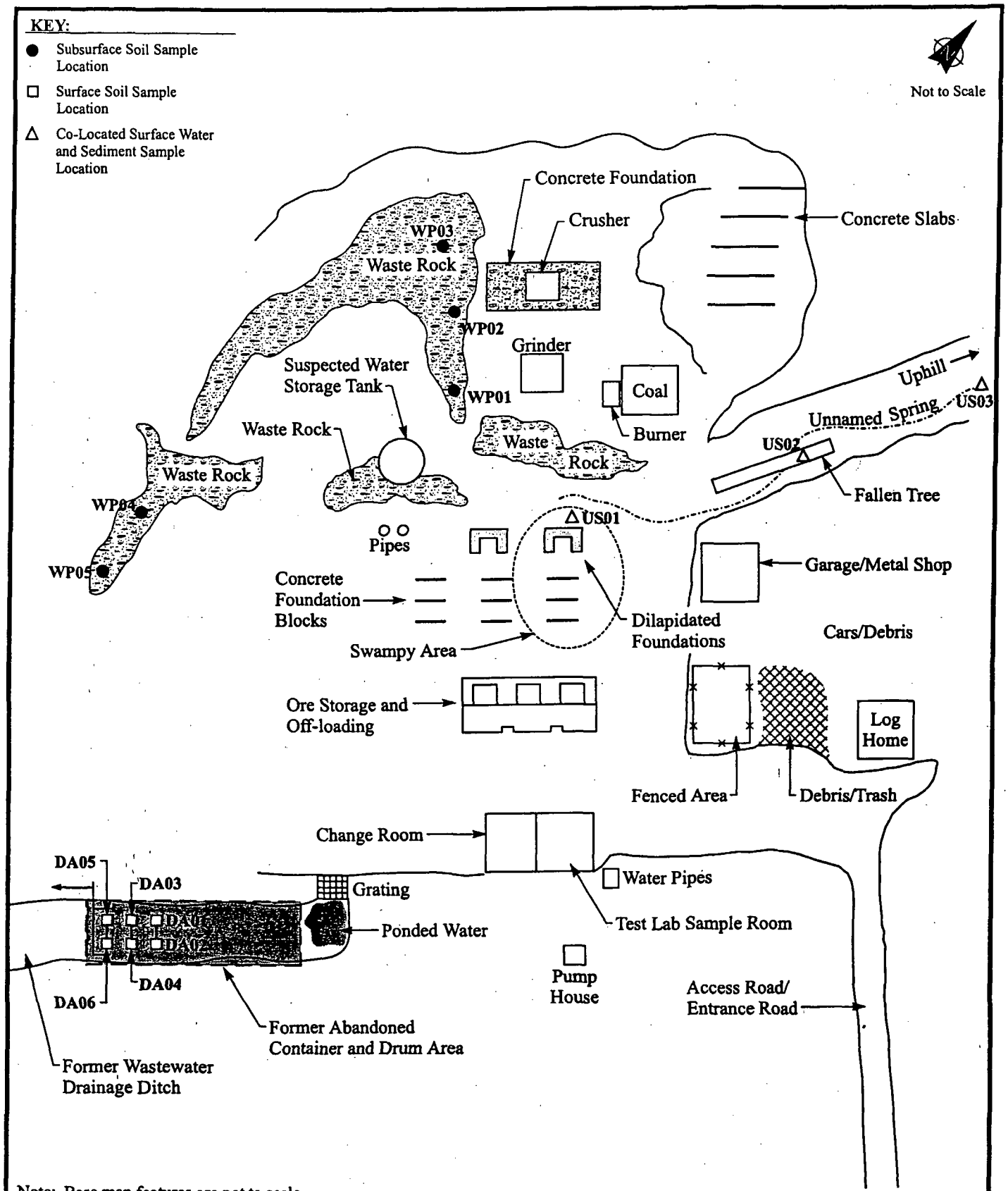
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

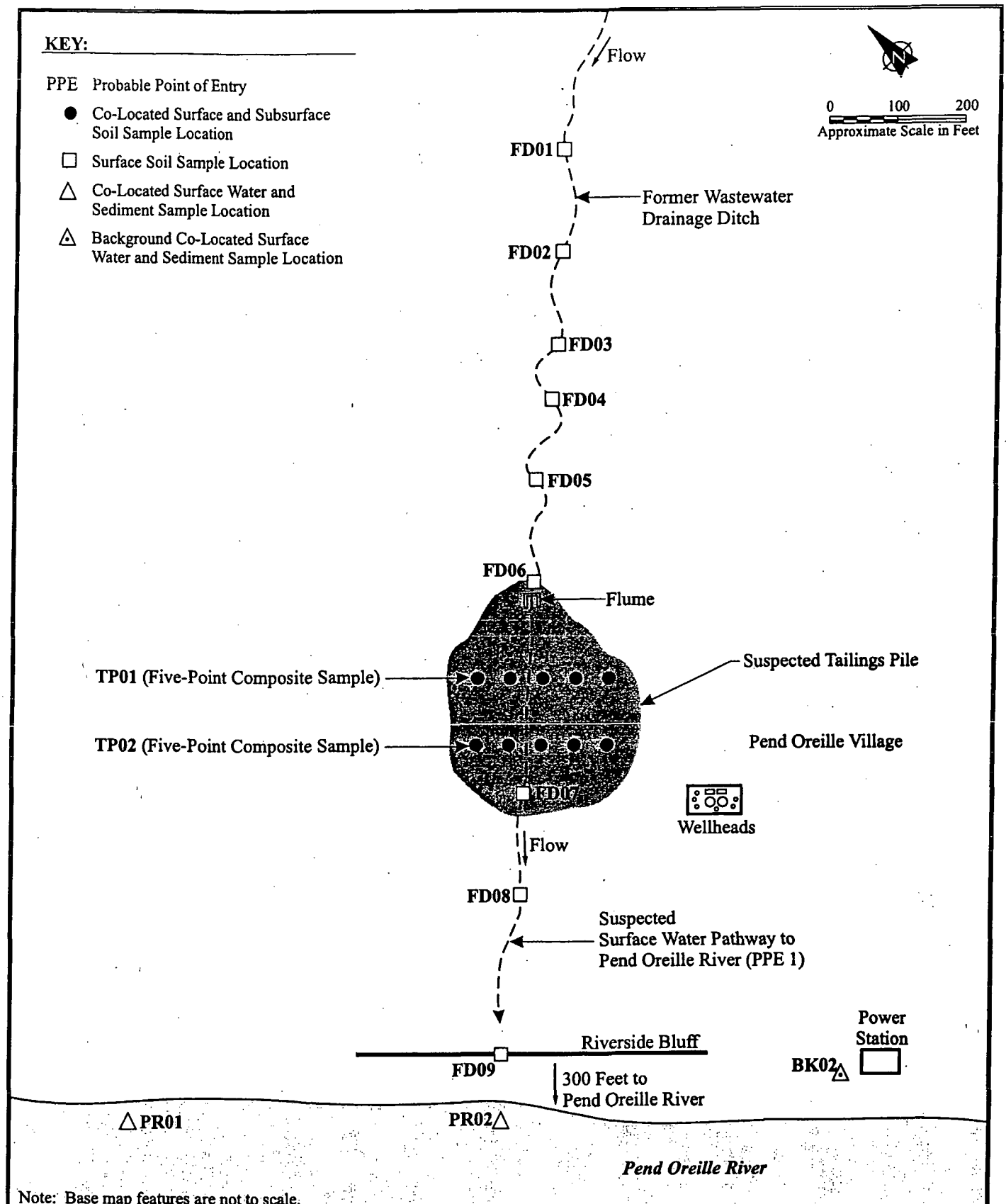
Figure 6-7
GRANDVIEW MINE/MILL
SITE VICINITY MAP

Date:	Drawn by:	
3-1-02	AES	10:START-2\01080009\S714\fig 6-7



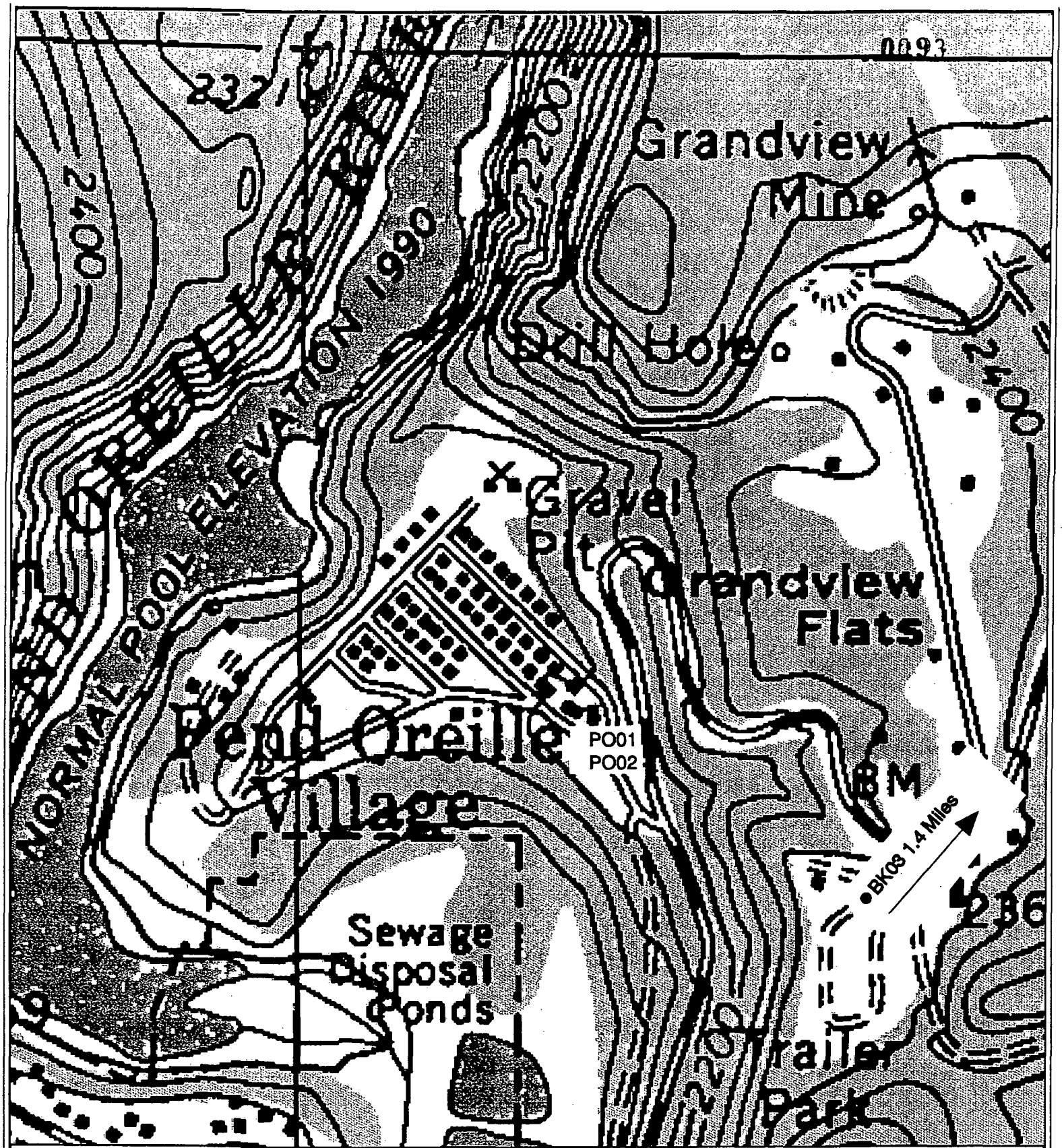
Note: Base map features are not to scale.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington	Figure 6-8 GRANDVIEW MINE/MILL SAMPLE LOCATION MAP LOWER LEVEL-MILL AREA		
		Date: 3-1-02	Drawn by: AES	10:START-2\01080009\S714\fig 6-8



Note: Base map features are not to scale.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington	Figure 6-9 GRANDVIEW MINE/MILL SAMPLE LOCATION MAP PPE TO PEND OREILLE RIVER		
		Date: 3-1-02	Drawn by: AES	10:START-2\01080009\S714\fig 6-9



Legend

● Sample Location

0 200 400 800 800
Feet

Figure 6-10

GRANDVIEW MINE/MILL

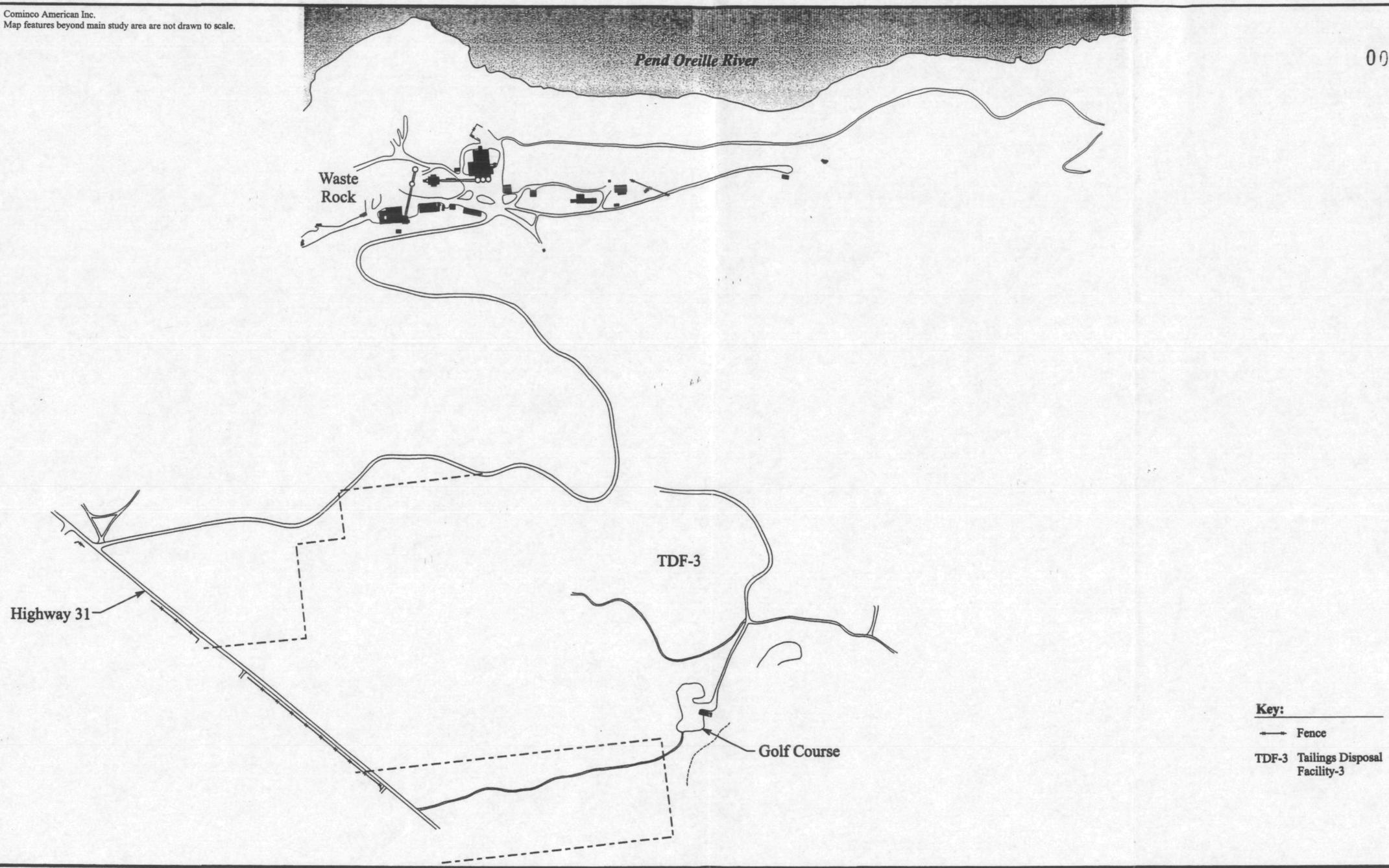
GROUNDWATER SAMPLE LOCATION MAP
October 2000 E & E Sampling Event

N
W E
S

Metaline Falls, Washington
Pend Oreille County

Source: Cominco American Inc.
Note: Map features beyond main study area are not drawn to scale.

0094



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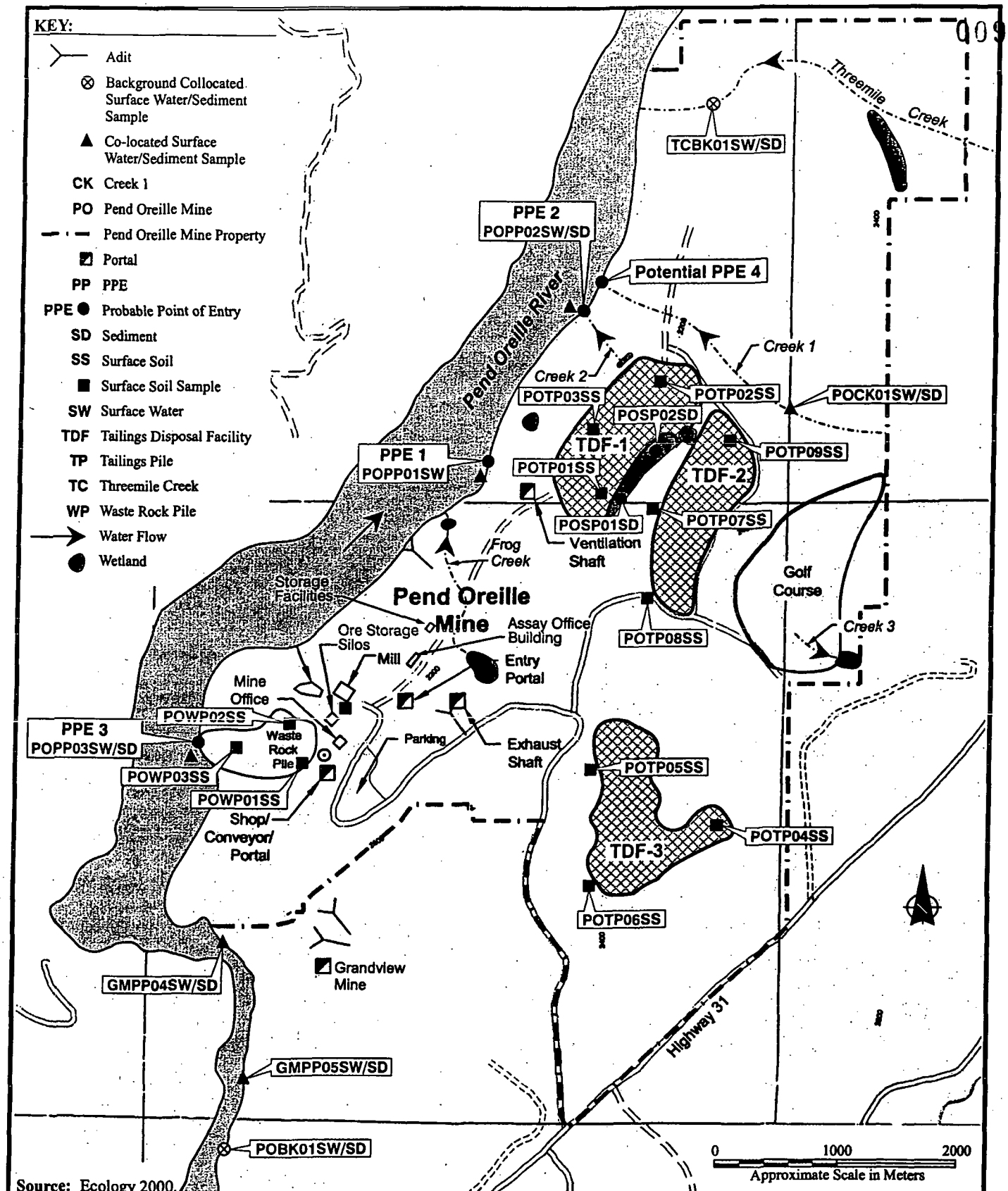
Seattle, Washington

0 500 1000
Approximate Scale in Feet

LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille County, Washington

Figure 6-11
PEND OREILLE MINE/MILL
SITE MAP

Date:	Drawn by:	
3/1/02	AES	10:START-2\01080009\S714\fig 6-11



Source: Ecology 2000.

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille County, Washington	Figure 6-12 PEND OREILLE MINE/MILL SAMPLE LOCATION MAP		
		Date: 3-1-02.	Drawn by: AES	10:START-2\01080009\S714\fig 6-12

7. EPA CLP ANALYTICAL RESULTS, SURFACE WATER MIGRATION/EXPOSURE PATHWAYS, AND TARGETS

The following sections describe the surface water migration pathway for the 5 mines/mills that were sampled; namely Blue Bucket Mine, Oriole Mine, Josephine Mine, Grandview Mine/Mill, and Pend Oreille Mine/Mill; tributaries that were sampled; potential targets within the range of influence of these mines/mills (Figures 7-2 through 7-11); and a discussion of sample results evaluated in accordance with criteria described in Section 5.1.2. Analytical data forms from laboratory analyses are provided in Appendix D.

An evaluation of the groundwater migration, soil exposure and air migration pathways for the Blue Bucket Mine, Oriole Mine, Josephine Mine, and Pend Oreille Mine/Mill was not conducted as part of this investigation. An evaluation of these pathways for the Grandview Mine/Mill site can be found in the Grandview Mine PA/SI report prepared by E & E for EPA, dated June 2001.

A description of the groundwater migration, soil exposure and air migration pathways for the Pend Oreille Mine/Mill with site conditions observed as of May 2000, can be found in the Pend Oreille Mine Preliminary Assessment report prepared by E & E for EPA, dated November 2000.

Refer to Table 7-1 for PPEs of each sampled mine/mill.

7.1 BLUE BUCKET MINE

7.1.1 Surface Water Pathway Description

The potential source area at the Blue Bucket Mine to an unnamed creek includes a waste rock pile measuring approximately 60 feet long by 50 feet wide by 15 feet deep. The distance from the waste rock pile to the unnamed creek is approximately 30 feet. Potential flow from a shaft on the property to the unnamed creek is approximately 5 feet (Figure 6-2, Table 7-1).

The START-2 estimated the flow of the unnamed creek to be 20 gpm. The average annual flow rate recorded for Pend Oreille River near Metaline Falls is 24,580 cubic feet per second (USGS 1992).

The average annual precipitation is 27.38 inches in Metaline Falls, Washington (WRCC 2001). The 2-year, 24-hour rainfall event for the area ranges from 1.8 to 2.4 inches (WRCC 2001).

Soils in the area of Blue Bucket Mine were mapped as Belzar silt loam, high precipitation, 20 to 40 percent slopes. This moderately deep, well drained soil is on the foot slopes and ridgetops of foothills and mountains. It formed in a mantle of volcanic ash and loess over residuum and colluvium derived dominantly from calcareous rock and limestone. Slopes are convex and generally have north and east aspects. Typically, the surface is covered with a mat of organic material about 1 inch thick. The surface layer is brown silt loam about 7 inches thick. The upper 6 inches of the subsoil also is brown silt loam. The lower 7 inches is brown channery loam. The substratum is pale brown very channery loam about 15 inches thick. Fractured limestone is at a depth of about 35 inches. The depth to bedrock ranges from 20 to 40 inches. Included in this unit are small areas of Belzar silt loam that has a slope of less than 20 percent or more than 40 percent, Ahren loam, Aits loam, Boundary silt loam, Hartill silt loam, and Waits loam. Also included are Rock outcrop on ridges and knobs and poorly drained soils in draws and adjacent to seeps and springs. Permeability is moderate in Belzar soil. Available water capacity is low. The effective rooting depth is to 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe. (USDA 1992)

Approximately 23 upgradient acres of land is expected to drain through the source area at the mine (USGS 1992b). The drainage area of sources is approximately 80 acres (USGS 1992b).

Mines/mills adjacent and/or near the Pend Oreille River are assumed to flood at least every two years (USGS 1998a).

No containment such as run off controls exist at the mine.

7.2 ORIOLE MINE

7.2.1 Surface Water Pathway Description

Potential source areas at the Oriole Mine to Linton Creek include waste rock piles described in Section 6. The largest waste rock pile measured approximately 25 feet long by 15 feet wide by 4 feet deep. Flow from a nearby spring reaches the waste rock pile and continues into a muddy area with no flow. The START-2 estimated spring flow at 32 gpm. There is a potential for overland flow from the muddy area to Linton Creek during periods of heavy rainfall or snowmelt, and floods (Figure 6-4, Table 7-1). Linton Creek, a tributary to the Pend Oreille River, is located north of Metaline Falls. It is located on the west side of the Pend Oreille River approximately 1 mile upstream from Metaline Falls and 11 miles upstream from Boundary Dam with an estimated flow of 2 cubic feet per second (cfs; Ecology 2001b).

The average annual flow rate recorded for Pend Oreille River near Metaline Falls is 24,580 cubic feet per second (USGS 1992).

The average annual precipitation is 27.38 inches in Metaline Falls, Washington (WRCC 2001). The 2-year, 24-hour rainfall event for the area ranges from 1.8 to 2.4 inches (WRCC 2001).

Soils in the vicinity of Oriole Mine were mapped as Belzar, high precipitation-Rock outcrop complex, 5 to 40 percent slopes. This map unit is on the toe slopes, foot slopes, and ridgetops of foothills and mountains. Slopes are convex and generally have north and east aspects. This unit is about 65 percent Belzar silt loam, high precipitation, 5 to 40 percent slopes, and 20 percent Rock outcrop. The components of this unit occur as areas so intricately intermingled that mapping them separately is not practical at the scale used by USDA. Included in this unit are small areas of Belzar silt loam that has a slope of less than 5 percent or more than 40 percent, Ahren loam, Aits loam, Boundary silt loam, Hartill silt loam, and Waits loam. Also included are very stony and very shallow soils near the Rock outcrop and poorly drained soils in draws and adjacent to seeps and springs. The Belzar soil is moderately deep and well drained. It formed in a mantle of volcanic ash and loess over residuum and colluvium derived dominantly from calcareous rock and limestone. Typically, the surface is covered with a mat or organic material about 1 inch thick. The surface layer is brown silt loam about 7 inches thick. The upper 6 inches of the subsoil also is brown silt loam. The lower 7 inches is brown channery loam. The substratum is pale brown very channery loam about 15 inches thick. Fractured limestone is at a depth of about 35 inches. The depth to bedrock ranges from 20 to 40 inches. Permeability is moderate in the Belzar soil. Available water capacity is low. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is severe. The Rock outcrop consists mainly of exposed calcareous shale or limestone. (USDA 1992)

Approximately 80 upgradient acres of land is expected to drain through the source area at the mine (USGS 1984). The drainage area of sources is approximately 43 acres (USGS 1984).

Mines/mills adjacent and/or near the Pend Oreille River are assumed to flood at least every two years (USGS 1998a).

No containment such as run off controls exist at the mine.

7.3 JOSEPHINE MINE

7.3.1 Surface Water Pathway Description

The potential source area at the Josephine Mine to the Pend Oreille River is a waste rock pile measuring approximately 60 feet long by 10 feet high by 2 feet deep. The entire length of the waste rock pile extends into the Pend Oreille River (Figure 6-6, Table 7-1).

The average annual flow rate recorded for Pend Oreille River near Metaline Falls is 24,580 cubic feet per second (USGS 1992).

The average annual precipitation is 27.38 inches in Metaline Falls, Washington (WRCC 2001). The 2-year, 24-hour rainfall event for the area ranges from 1.8 to 2.4 inches (WRCC 2001).

Soils in the vicinity of Josephine Mine were mapped as Belzar silt loam, high precipitation, 20 to 40 percent slopes as described previously for Blue Bucket Mine. (USDA 1992)

Approximately 4 upgradient acres of land is expected to drain through the source area at the mine (USGS 1992a). The drainage area of sources is approximately 23 acres (USGS 1992a).

Mines/mills adjacent and/or near the Pend Oreille River are assumed to flood at least every two years (USGS 1998a).

No containment such as run off controls exist at the mine.

7.4 GRANDVIEW MINE/MILL

7.4.1 Surface Water Pathway Description

The site is located approximately 0.75 mile east of Pend Oreille River. Site topography slopes gently toward Pend Oreille River. The two main levels are relatively flat with a slope between them. There is another slope between the lower level and the suspected tailings pile, which slopes gently toward Pend Oreille River. The nearest potential source area at the site to the river is the suspected tailings pile. From this source area, it is approximately 300 feet overland to Pend Oreille River (Figure 6-12, Table 7-1). From this PPE) in Pend Oreille River, it is approximately 8 miles to Boundary Dam.

The average annual flow rate recorded for Pend Oreille River near Metaline Falls is 24,580 cubic feet per second (USGS 1992).

The average annual precipitation is 27.38 inches in Metaline Falls, Washington (WRCC 2001). The 2-year, 24-hour rainfall event for the area ranges from 1.8 to 2.4 inches (WRCC 2001).

Soils in the vicinity of Grandview Mine/Mill were mapped as Belzar, high precipitation-Rock outcrop complex, 40 to 65% slopes; and Dufort silt loam, 0 to 15% slopes. Belzar, high precipitation-Rock outcrop complex, 40 to 65% slopes was mapped on the back slopes and ridgetops of foothills and mountains. Slopes are convex and generally have north and east aspects. This unit is about 65% Belzar silt loam, high precipitation, 40 to 65% slopes, and 20 percent Rock outcrop. The components of this unit occur as areas so intricately intermingled that mapping them separately is not practical at the scale used by USDA. Included in this unit are small areas of Belzar silt loam that has a slope of less than 40% or more than 65%, Ahren loam, Aits loam, Boundary silt loam, Hartill silt loam, and Waits loam. Also included are very stony and very shallow soils near the Rock outcrop and poorly drained soils in draws and adjacent to seeps and springs. The Belzar soil is moderately deep and well drained. It formed in a mantle of volcanic ash and

loess over residuum and colluvium derived dominantly from calcareous rock and limestone. Typically, the surface is covered with a mat of organic material about 1 inch thick. The surface layer is brown silt loam about 7 inches thick. The upper 6 inches of the subsoil also is brown silt loam. The lower 7 inches is brown channery loam. The substratum is pale brown very channery loam about 15 inches thick. Fractured limestone is at a depth of about 35 inches. The depth to bedrock ranges from 20 to 40 inches. Permeablity is moderate in the Belzar soil. Available water capacity is low. The effective rooting depth is 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very severe. The Rock outcrop consists mainly of exposed calcareous shale or limestone. (USDA 1992)

Dufort silt loam, 0 to 15% slopes are very deep, well drained soil on foothills. It formed in a thick mantle of volcanic ash and loess over glacial drift of mixed mineralogy. Slopes are convex. Typically, the surface is covered with a mat of organic material about 1 inch thick. When mixed to a depth of about 5 inches, the surface layer is light yellowish brown silt loam. The upper part of the subsoil also is light yellowish brown silt loam. It is about 13 inches thick. The lower part is pale brown gravelly loam about 12 inches thick. The substratum to a depth of 60 inches or more is pale brown very gravelly sandy loam. Included in this unit are small areas of Dufort silt loam that has a slope of more than 15%, Dufort very stony silt loam, Aits loam, Bonner silt loam, Martella silt loam, Newbell silt loam, and Scrabblers silt loam. Permeability is moderate to a depth of 30 inches in this Dufort soil and moderately rapid below that depth. Available water capacity is moderate. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. (USDA 1992)

Approximately 4 upgradient acres of land are expected to drain through a source area at the site (USGS 1992a). The drainage area of sources is approximately 33 acres (USGS 1992a).

Mines/mills adjacent and/or near the Pend Oreille River are assumed to flood at least every two years (USGS 1998a).

No source area at the site has any flood containment mechanisms.

7.5 Pend Oreille Mine/Mill

7.5.1 Surface Water Pathway Description

The Pend Oreille Mine/Mill site is located approximately 0.75 mile east of Pend Oreille River. Site topography slopes gently toward Pend Oreille River. The two main levels are relatively flat with a slope between them. There is another slope between the lower level and the suspected tailings pile, which slopes gently toward Pend Oreille River. Potential source areas at the site include mine water discharge into the

Pend Oreille River, three TDFs, and one waste rock pile. A description of overland flow from source areas at the site to associated PPEs is provided in Table 7-1. PPE locations are shown in Figure 6-12.

Surface water flows are generated from precipitation in the form of rainfall or snowfall, and where groundwater is exposed at the surface.

Several creeks transect the site. Threemile Creek, which flows year-round and has flow rates of a few hundred gallons per minute or higher depending on the time of year, is located near the northern border of the mine and adjacent to USFS-managed lands. Threemile Creek is primarily confined to a single channel along most of its length within the mine area, and dorms a large forested wetland used by beavers near the northeastern boundary of the mine. (Ecology 2000)

Two creeks are found near the TDF-1. One creek (Creek 1) originates to the east of the mine, near the golf course. Water flows within a well-defined channel along most of its length during most of the year and empties into Pend Oreille River. (Figure 6-12; Ecology 2000)

Two seep areas are located by TDF-2 and TDF-3. The water in these seeps appear to originate from hill slopes and from TDF-2. This seepage is collected in diversion channels and routed around and to the base of TDF-1, where it meets with natural seepage. This water then flows downslope (Creek 2) and drains into Pend Oreille River (PPE 2). Surface water runoff from TDF-1 and TDF-2 drains into installed diversion ditches which drain into Pend Oreille River. (Figure 6-12, Ecology 2000)

A third unnamed creek (Creek 3) originates off the property east of the 9th/18th fairway of the Metaline Falls Golf Course. It flows approximately 160 feet through a wetland on the edge of the fairway, and for an additional 150 feet on the fairway before flowing underground. (Ecology 2000)

Frog Creek originates approximately 900 feet downslope from TDF-3 as a groundwater spring and seep. Frog Creek derives its water from groundwater flowing beneath the kettle basin that holds TDF-3 and from precipitation; it has a perennial flow. Initially, water from the spring flows into several channels, which then join into a single channel approximately 400 feet downstream from the source. This channel flows downhill until it intersects an access road that leads to TDF-1, then flows northerly along this road, and then westerly under the road into a small pond. The flow rate is estimated by Ecology to be 40 gpm. The creek flows from the pond in a northwesterly direction until surface flow termiates approximately 100 feet downslope from the pond. The creek resurfaces approximately 50 feet downslope from the southern mine access road that parallels Pend Oreille River. The water collects into two chanels and eventually flows into Pend Oreille River. (Figure 6-12, Ecology 2000)

Flume and Beaver creeks are important tributaries of Pend Oreille River that drain into the river from the west and are also near the site. Surface water runoff from the staged waste rock may drain by sheet flow into Flume Creek which drains into Pend Oreille River.

Each of the PPEs described in this report are located along the Pend Oreille River. Approximately 8 miles of the 15-mile TDL are on the Pend Oreille River between the PPEs on site and Boundary Dam; 1 mile covers the final section of the Pend Oreille River from Boundary Dam to the Canadian border; and the remaining 6 miles are on the Pend Oreille River in Canada (Figure 7-11).

The average annual flow rate recorded for Pend Oreille River near Metaline Falls is 24,580 cubic feet per second (USGS 1992).

The average annual precipitation is 27.38 inches in Metaline Falls, Washington (WRCC 2001). The 2-year, 24-hour rainfall event for the area ranges from 1.8 to 2.4 inches (WRCC 2001).

Soils in the vicinity of Pend Oreille Mine/Mill were mapped as Dufort silt loam, 0 to 15% slopes; Dufort very stony silt loam, 0 to 40% slopes; Hartill silt loam, 0 to 15% slopes; Hartill silt loam, 40 to 65% slopes; Kaniksu sandy loam, 0 to 15% slopes; Kaniksu sandy loam, 15 to 40% slopes; Sacheen loamy fine sand, 5 to 15% slopes; and Threemile silt loam, 25 to 40% slopes. (USDS 1992)

Dufort silt loam, 0 to 15% slopes are described previously for Grandview Mine/Mill (USDA 1992).

Dufort very stony silt loam, 0 to 40% slopes are very deep, well drained soil on the toe slopes and foot slopes of foothills. It formed in a mantle of volcanic ash and loess over glacial drift or mixed mineralogy. Slopes are convex. Typically, the surface is covered with a mat of organic material about 1 inch thick. The surface layer is light yellowish brown very stony silt loam about 12 inches thick. The subsoil is pale brown gravelly loam about 14 inches thick. The substratum to a depth of 60 inches or more is pale brown very gravelly sandy loam. Included in this unit are small areas of Dufort very stony silt loam that has a slope of more than 40%, Dufort silt loam, Aits stony loam, Bonner gravelly silt loam, Martella silt loam, Newbell stony silt loam, and Scrabblers silt loam. Permeability is moderate to a depth of 26 inches in this Dufort soil and moderately rapid below that depth. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe. (USDA 1992)

Hartill silt loam, 0 to 15% slopes are moderately deep, well drained soil on the toe slopes and ridgetops of foothills and mountains. It formed in a mantle of volcanic ash and loess over residuum and colluvium derived dominantly from phyllite and quartzite. Slopes are convex and generally have north and east aspects at the lower elevations and south and west aspects at the higher elevations. Typically, the surface is covered with a mat of organic material about 1 ½ inches thick. When mixed to a depth of about 8

inches, the surface layer is pale brown silt loam. The upper part of the subsoil also is pale brown silt loam. It is about 4 inches thick. The lower part is light yellowish brown channery loam about 6 inches thick. The upper part of the substratum is light yellowish brown very channery loam about 9 inches thick. The lower part is very pale brown very channery loam about 9 inches thick. Phyllite is at a depth of about 36 inches. The depth to bedrock ranges from 20 to 40 inches. Included in this unit are small areas of Hartill silt loam that has a slope of more than 15%, Aits loam, and Newbell silt loam. Also included are Raisio channery loam on south- and west-facing slopes and Rock outcrop on ridges and knobs. Permeability is moderate in this Hartill soil. Available water capacity is low. The effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. (USDA 1992)

Hartill silt loam, 40 to 65% slopes are moderately deep, well drained soil on the back slopes of foothills and mountains. It formed in a mantle of volcanic ash and loess over residuum and colluvium derived dominantly from phyllite and quartzite. Slopes are convex and generally have north and east aspects at the lower elevations and south and east aspects at the higher elevations. Typically, the surface is covered with a mat of organic material about 1 ½ inches thick. When mixed to a depth of about 8 inches, the surface layer is pale brown silt loam. The upper part of the subsoil also is pale brown silt loam. It is about 4 inches thick. The lower part is light yellowish brown channery loam about 6 inches thick. The upper part of the substratum is light yellowish brown very channery loam about 9 inches thick. The lower part is very pale brown very channery loam about 9 inches thick. Phyllite is at a depth of about 36 inches. The depth to bedrock ranges from 20 to 40 inches. Included in this unit are small areas of Hartill silt loam that has a slope of less than 40% or more than 65%, Aits loam, and Newbell silt loam. Also included are Raisio channery loam on south- and west-facing slopes, Rock outcrop on ridges and knobs, and poorly drained soils in draws and adjacent to seeps and springs. Permeability is moderate in this Hartill soil. Available water capacity is low. The effective rooting depth is 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very severe. (USDA 1992)

Kaniksu sandy loam, 0 to 15% slopes is very deep, well drained soil on terraces. It formed in sandy glacial outwash of mixed mineralogy. The outwash has a mixture of volcanic ash and loess in the upper part. Typically, the surface is covered with a mat of organic material about 1 inch thick. The surface layer is brown sandy loam about 7 inches thick. The subsoil is light yellowish brown sandy loam about 23 inches thick. The substratum to a depth of 60 inches or more is pale brown gravelly loamy sand. Included in this unit are small areas of Kaniksu sandy loam that has a slope of more than 15%, Bonner silt loam, Dalkena fine sandy loam, Sacheen loamy fine sand, and Scotia fine sandy loam. Permeability is moderately rapid to a depth of 30 inches in this Kanisku soil and rapid below that depth. Available water capacity is low. The

effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. (USDA 1992)

Kaniksu sandy loam, 15 to 40% slopes is very deep, well drained soil on terraces. It formed in sandy glacial outwash of mixed mineralogy. Typically, the surface is covered with a mat of organic material about 1 inch thick. The surface layer is brown sandy loam about 7 inches thick. The subsoil is light yellowish brown sandy loam about 23 inches thick. The substratum to a depth of 60 inches or more is pale brown gravelly loamy sand. Included in this unit are small areas of Kaniksu sandy loam that has a slope of less than 15% or more than 40%, Dalkena fine sandy loam, Orwig sandy loam, Sacheen loamy fine sand, and Scotia fine sandy loam. Permeability is moderately rapid to a depth of 30 inches in this Kanisku soil and rapid below that depth. Available water capacity is low. The effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. (USDA 1992)

Sacheen loamy fine sand, 5 to 15% slopes are very deep, somewhat excessively drained soil on terraces and old alluvial fans. It formed in sandy glaciofluvial material of mixed mineralogy. Typically, the surface is covered with a mat of partially decomposed organic material about 1 inch thick. The surface layer is dark brown loamy fine sand about 6 inches thick. The upper 6 inches of the subsoil also is dark brown loamy fine sand. The lower 12 inches is yellowish brown loamy sand. The upper 6 inches of the substratum is light yellowish brown loamy coarse sand. The lower part to a depth of 60 inches or more is light yellowish brown sand. Included in this unit are small areas of Sacheen loamy fine sand that has a slope of less than 5% or more than 15%, Dalkena fine sandy loam, Dufort silt loam, Kaniksu sandy loam, and Scotia fine sandy loam. Also included are Rathdrum very fine sandy loam in depressions and poorly drained soils in draws. Permeability is rapid to a depth of 24 inches in this Sacheen soil and very rapid below that depth. Available water capacity is low. The effective rooting depth is 60 inches ore more. Runoff is slow, and the hazard of water erosion is slight. (USDA 1992)

Threemile silt loam, 25 to 40% slopes are deep, well drained soil on the foot slopes of foothills and mountains. It formed in a mantle of volcanic ash and loess over calcareous glacial till. Slopes are convex. Typically, the surface is covered with a mat of organic material about 1 ½ inches thick. The surface layer is yellowish brown silt loam about 4 inches thick. The upper 6 inches of the subsoil is yellowish brown loam. The lower 5 inches is brown gravelly loam. The upper 17 inches of the substratum is pale brown very gravelly loam. The lower 20 inches is light brownish gray extremely gravelly loam. Limestone is at a depth of about 52 inches. The depth of bedrock ranges from 40 to 60 inches. Included in this unit are small areas of Threemile silt loam that has a slope of less than 25% or more than 40%, Ahren loam, Boundary silt loam, and Newbell silt loam. Also included are Anglen silt loam, Kaniksu sandy loam, and Kiehl gravelly loam on

terrace remnants; Belzar silt loam on the upper parts of the slopes; Rock outcrop on knobs; and poorly drained soils in draws and adjacent to seeps and springs. Permeability is moderate in this Threemile soil. Available water capacity is low. The effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is severe. (USDA 1992)

The Pend Oreille Mine/Mill and surrounding area is underlain by Metaline Limestone, which is overlain by Ledbetter Slate. On the surface above the mine workings, a very large part of the Ledbetter and some of the Metaline is concealed beneath Quaternary lake deposits that range in thickness from a thin veneer to 200 feet or more. This glacial covering is especially extensive east of Pend Oreille River. Most of the carbonate rock is medium-to-dark-gray crystalline dolomite, commonly having a medium- to coarse-grained texture, but some very fine-grained, gray limestone is exposed at many places in both the eastern and western mine workings. Some dolomite is creamy, light gray, or black, and locally the grain size is very fine. (Ecology 2000)

The uppermost 25 feet of the Metaline commonly contains irregular zones of dark-gray to black crystalline limestone, although at other places all rock in this position is dark crystalline dolomite. Black shaley partings and some shale lenses a few inches thick are locally present in these upper rocks. At many places altered rock is in the form of irregularly-shaped masses of dolomite breccia that range widely in size and grade imperceptibly into non-brecciated dolomite. As a very general statement it can be said that the uppermost 150 feet of Metaline Limestone in the Pend Oreille Mine/Mill and surrounding area is crystalline dolomite that overlies gray limestone, although at places gray massive limestone is found 50 feet or less below the slate. (Ecology 2000)

Approximately 13,698 upgradient acres of land are expected to drain through a source area at the site (USGS various dates). The drainage area for the waste rock pile at the site is estimated to be 64 acres (USGS various dates).

Mines/mills adjacent and/or near the Pend Oreille River are assumed to flood at least every two years (USGS 1998a).

7.6 Tributaries

Tributaries to the lower Pend Oreille River that were sampled as part of this field effort include Linton Creek, Sullivan Creek, Flume Creek, Beaver Creek, Slate Creek, Ledbetter Creek, Everett Creek, unnamed tributary, Lime Creek, and Pewee Creek (Figure 7-12). Sample results are summarized in Tables 7-5 and 7-6.

Linton Creek is located on the west side of the Pend Oreille River 1 mile upstream from Metaline Falls and approximately 11 miles upstream from Boundary Dam with an estimated flow of 2 cfs (Ecology 2001b). Sullivan Creek is located on the east side of the Pend Oreille River approximately ½ mile downstream from Metaline Falls and 9 miles upstream from Boundary Dam with an estimated flow less than 10 cfs on the North Fork of Sullivan Creek and an estimated flow between 30 and 170 cfs on Sullivan Creek (Ecology 2001b). Flume Creek is located on the west side of the Pend Oreille River approximately 1 mile downstream from Metaline Falls and 8 miles upstream from Boundary Dam with an estimated flow between 5 and 35 cfs (Ecology 2001b). Beaver Creek is located on the west side of the Pend Oreille River approximately 2 miles downstream from Metaline Falls and 7 miles upstream from Boundary Dam. Slate Creek is located on the east side of the Pend Oreille River approximately 4 miles downstream from Metaline Falls and 5 miles upstream from Boundary Dam. Ledbetter Creek is located on the west side of the Pend Oreille River approximately 5 miles downstream from Metaline Falls and 4 miles upstream from Boundary Dam. Everett Creek is located on the west side of the Pend Oreille River approximately 5 miles downstream from Metaline Falls and 4 miles upstream from Boundary Dam. The unnamed tributary is located on the east side of the Pend Oreille River approximately 7 miles downstream from Metaline Falls and 3 miles upstream from Boundary Dam. Lime Creek is located on the east side of the Pend Oreille River approximately 7 miles downstream from Metaline Falls and 1 mile upstream from Boundary Dam. Pewee Creek is located on the west side of the Pend Oreille River approximately 9 miles downstream from Metaline Falls and 1 mile upstream from Boundary Dam.

7.7 Targets

This section discusses potential target information for the 5 mines that were sampled; namely, Blue Bucket Mine, Oriole Mine, Josephine Mine, Grandview Mine/Mill, and the Pend Oreille Mine/Mill.

The Clark-Fork/Pend Oreille Basin is characterized by highly valued recreational and economic resources and is the central focus of nearly every major urban, industrial and agricultural activity in the region. Vast resources of minerals, timber, fish, wildlife, water, rangeland, and croplands support a variety of human uses, ranging from mining and agriculture to recreational fishing and boating. (EPA 1993)

Surface water intakes are reported to lie within the surface water target distance limit (TDL) for each of the mines/mills sampled. Refer to Table 7-2 for surface water intakes for each mine/mill. The average number of persons per household in Pend Oreille County is 2.51; therefore, the START-2 estimates the following:

- There are 112.95 persons using surface water for drinking water within a 4-mile radius of Blue Bucket Mine;
- There are 112.95 persons using surface water for drinking water within a 4-mile radius of Oriole Mine;
- There are 92.87 persons using surface water for drinking water within a 4-mile radius of Josephine Mine;
- There are 143.07 persons using surface water for drinking water within a 4-mile radius of Grandview Mine/Mill; and
- There are 130.52 persons using surface water for drinking water within a 4-mile radius of Pend Oreille Mine/Mill. (Ecology 2001a)

The START-2 expects that surface water will be used within the TDL for irrigation of commercial food or forage crops or for watering of commercial livestock.

Fishing occurs on Pend Oreille River; however, the river is relatively underutilized with respect to fisheries (BLM 2001). Boundary Dam notes that visitors can fish for rainbow trout as they drift down the river in a raft or boat (BLM 2001). Seattle City Light is promoting tourism with www.cityofseattle.net/light/tours/boundary (Baker 2001). Fishing around Box Canyon Dam has been documented; however, fish catch data are not available. The area contains trout, perch, catfish, but no steelhead or salmon (Owens 2001).

Most of the fishing that occurs on the Pend Oreille River is by local residents, and is concentrated at the mouth of major tributaries such as Flume, Sullivan, and Slate creeks. Some boating occurs on the river adjacent to the mine/mill areas. Rafting, innertubing, swimming, jetskiing, and waterskiing occur predominantly upstream from the 5 mines/mills that were sampled between Box Canyon Dam and Metaline Falls. A privately-conducted jet-boat tour of the Pend Oreille River from Box Canyon to Boundary Dam passes by the 5 mines/mills that were sampled approximately four days each week during late spring, summer, and early fall tourist season. At present, the only boat launches along this stretch of the Pend Oreille River are in Metaline and at the Boundary Dam (Ecology 2000).

One fish species present in the lower Pend Oreille River has been listed as threatened by the federal government; bull trout (*Salvelinus confluentus*), a Federal listed threatened species found in the Columbia River basin distinct population segment, was listed as a threatened species by the United States Fish and Wildlife Service on June 10, 1998. One bird species present in the lower Pend Oreille River has been listed as threatened or endangered by the state or federal government. The American peregrine falcon (*Falco peregrinus anatum*; a State listed endangered species) typically lives along mountain ranges, river valleys,

and coastlines. Peregrine falcons may occasionally fly along Pend Oreille River near the 5 mines/mills that were sampled. (Ecology 2000)

Five mammal species in the vicinity of the 5 mines/mills that were sampled have been listed as threatened or endangered by the state or federal government. Gray wolves (*Canis lupus*; a Federal listed endangered species) have been sighted and their presence confirmed in the Colville National Forest, although these are likely lone dispersing wolves. Camera surveillance has not detected wolves, and no systematic surveys for wolves have been conducted. Grizzly bears (*Ursus arctos*; a Federal listed threatened and State listed endangered species) are present throughout the Colville National Forest, although the number of bears is lower near Lake Sullivan and the 5 mines/mills that were sampled. A grizzly bear den has been found on the Colville National Forest, east of the Pend Oreille Mine/Mill near the Idaho border, and grizzly bears have been radio-located on both sides of the Pend Oreille River. The Pend Oreille Mine/Mill is adjacent to a designated grizzly bear recovery area, which begins east of State Route 31. The North American (Canada) lynx (*Lynx canadensis*; a proposed Federal listed threatened or endangered and State listed threatened species) may travel through the 5 mines/mills areas that were sampled; tracks of lynx were found in the Slate Creek drainage in 1978. The Pacific fisher (*Martes pennanti pacifica*; a Federal listed species of concern and State listed endangered species) is a large, weasel-like animal. There have been unconfirmed sightings in the 5 mine/mill areas that were sampled, and it is believed that the fisher may be present around Sullivan and Slate creeks, as well as Sullivan Lake. The woodland (mountain) caribou (*Rangifer tarandus caribou*; a Federal and State listed endangered species) could potentially enter the 5 mine/mill areas that were sampled, but all woodland caribou that have been previously signted on or near the Pend Oreille Mine/Mill were transplanted animals that had been released nearby and were returning to the release site. There is a woodland caribou recovery area which includes mostly wilderness area east of the Pend Oreille Mine/Mill, within 25 miles south of the International Border, and further east into Idaho. (Ecology 2000)

Recreational activities that occur in the nearby Colville National Forest include hiking, camping, fishing, picnicking, mountain biking, cross-country skiing, snow shoeing, snowmobiling, horseback riding, wildlife viewing, motorized travel, and recreational gold panning and dredging. Hunting is not allowed on lands owned by Teck Cominco American Inc. (Ecology 2000).

The Salmo-Priest Wilderness Area is located approximately 3 miles east of the Pend Oreille Mine/Mill. The Wilderness Area covers 39,940 acres and is within the Colville and the Idaho Panhandle National Forests. Recreational use in this wilderness area is limited compared to other wilderness areas within the state because of its distance from large population centers. Recreational activities that occur

within the wilderness area include hunting, fishing, camping, mountain biking, wildlife viewing, and winter sports (Ecology 2000).

Farms and rural residential development are found to the east and south of the 5 mine/mill areas that were sampled. The main crops raised on agricultural lands along the Pend Oreille River are small grains and hay. Most of the agricultural land in the area originated from 160-acre plots that were homesteaded at the turn of the century. A few privately-owned farms occur in the vicinity of the Pend Oreille Mine/Mill and the other four mines/mills that were sampled. They are operated primarily for growing hay and raising cattle. Such farms are located north of the Pend Oreille Mine/Mill along Threemile Creek, east of State Route 31 opposite the mine entrance, and across the Pend Oreille River north of Flume Creek. These operators also lease USFS-managed lands in close proximity to their base properties for use as summer pasture. The closest relatively high-density residential area is Pend Oreille Village, located along the river approximately 1.5 miles south of the Pend Oreille Mine/Mill. At present, the village has approximately 30 residents. The town of Metaline Falls, population 230, is located approximately 2 miles southwest of the Pend Oreille Mine/Mill. To the east of Metaline Falls is the community of Lehigh Hill, with a population of 45. Metaline is located across the river from Metaline Falls and has a population of 172. USFS-managed lands are located to the north of the 5 mine/mill areas sampled. Boating activities are common on the Pend Oreille River, especially on weekends, from the spring through the fall. (Ecology 2000)

There are no schools or day-care facilities within 200 feet of the 5 mine/mill areas that were sampled.

According to National Wetland Inventory maps:

- 0.47 linear miles of wetland frontage exists along the Pend Oreille River to the International Border for Blue Bucket Mine;
- 0.47 linear miles of wetland frontage exists along the Pend Oreille River to the International Border for Oriole Mine;
- 0.03 linear miles of wetland frontage exists along the Pend Oreille River to the International Border for Josephine Mine;
- 0.430 linear miles of wetland frontage exists along the Pend Oreille River to the International Border for Grandview Mine/Mill;
- 0.03 linear miles of wetland frontage exists along the Pend Oreille River to the International Border for Pend Oreille Mine/Mill. Wetlands were identified by Ecology at five additional locations on site:
- 1.5 acres of wetland area exists along Threemile Creek near the northeastern corner of the site,

  2 acres of artificially-created wetland area exists along the eastern side of TDF-1,

- 0.01 acre of wetland area exists between TDF-2 and TDF-1 at the base of the TDF-2 embankment,
- 0.1 acre of wetland area exists along Creek 3,
- 1.5 acres of wetland area is associated with the upper portions of Frog Creek (Figure 6-12).

Wetlands are located throughout the watershed, interspersed along the Pend Oreille River (USFWS 1987).

7.8 Sample Locations

Four surface water and 20 sediment samples, including three representative background samples were collected from the lower Pend Oreille River and its tributaries and were submitted for EPA CLP analysis by E & E (Figure 7-1). This includes one sediment sample collected at the sand bar at Myers Dam and two surface water samples collected at the Metaline Falls Municipal Water Intake. The data for the aforementioned sediment and two surface water samples are found in Appendices F and G, respectively.

Two surface water samples, which includes a background, were collected on the Pend Oreille Mine/Mill property to determine whether contaminants from the tailings at the Pend Oreille Mine/Mill have impacted the unnamed creek and the lower Pend Oreille River. POCK01SW was collected north of TDF-1 and TDF-2 on the unnamed creek identified as Creek 1. This surface water sample was co-located with sediment sample POCK01SD.

Two sediment samples were collected on the Pend Oreille Mine/Mill at two springs flowing through wetlands located adjacent to TDF-1(POSP01SD and POSP02SD; Figure 6-12). The water from both springs flowed into intervention trenches which feeds into the Pend Oreille River.

Four sediment samples were collected from upstream reaches of the Pend Oreille River to determine whether contaminants from any upgradient mining sources have impacted the lower Pend Oreille River. Samples were collected at the following locations (Figure 7-1):

- The northern most point of the Pend Oreille River below the Boundary Dam (PRRS01SD);
- Upstream of Lime Creek (PRRS02SD);
- Downstream of the Pend Oreille Mine/Mill and upstream of Threemile Creek (PRRS03SD); and
- Upstream of the Pend Oreille Mine/Mill and downstream of Grandview Mine/Mill at the confluence of Flume Creek and the Pend Oreille River (PRRS04SD).

Nine sediment samples were collected from the tributaries of the Pend Oreille River, to document the distance contaminants have migrated and whether targets, such as wetlands, communities, and reservoir/lakes have been impacted. Samples were collected at the following locations (Figure 7-1):

- Upstream of the confluence of Lime Creek with the Pend Oreille River (PRTB01SD);
- Upstream of the confluence of Everett Creek with the Pend Oreille River (PRTB02SD);
- Upstream of the confluence of Ledbetter Creek with the Pend Oreille River (PRTB03SD);
- Downstream of PRTB02SD and upstream of PRTB01SD at an unnamed creek (PRTB04SD);
- Upstream of the confluence of Slate Creek with the Pend Oreille River (PRTB05SD);
- Upstream of the confluence of Pewee Creek with the Pend Oreille River (PRTB06SD);
- Upstream of the confluence of Beaver Creek with the Pend Oreille River (PRTB07SD);
- Upstream of the confluence of Sullivan Creek with the Pend Oreille River (PRTB08SD); and
- Upstream of the confluence of Linton Creek with the Pend Oreille River (PRTB09SD).

Two surface water and sediment samples were collected by Weston upstream of the confluence of Flume Creek with the Pend Oreille River (UW002SW, UW003SW, US002SD, and US003SD, respectively; Figure 7-1).

7.9 Sample Results

Pend Oreille Mine/Mill. Sample results are summarized in Table 7-3 and 7-4. Zinc was detected at an elevated concentration in POCK01SW at an estimated low 63.2 μg/L JL. Cadmium was detected at an elevated concentration in POCK01SD at 3.5 mg/kg. Lead was detected at an elevated concentration in POCK01SD at 180 mg/kg. Nickel was detected at an elevated concentration in POCK01SD at 44.8 mg/kg. Vanadium was detected at an elevated concentration in POCK01SD at 26.8 mg/kg. Zinc was detected at an elevated concentration in POCK01SD at an adjusted concentration of 217 mg/kg AC.

Arsenic was detected at elevated concentrations in POSP01SD and POSP02SD at 17.2 mg/kg and 11.8 mg/kg, respectively. Cadmium was detected at elevated concentrations in POSP01SD and POSP02SD at 9.8 mg/kg and 14.6 mg/kg, respectively. Copper was detected at an elevated concentration in POSP02SD at an estimated low concentrations of 165 mg/kg JL. Lead was detected at elevated concentrations in POSP01SD and POSP02SD at 351 mg/kg and 1,960 mg/kg, respectively. Mercury was detected at an elevated concentration in POSP02SD at 0.39 mg/kg. Vanadium was detected at an elevated concentration in POSP02SD at 20.8 mg/kg. Zinc was detected at elevated concentrations in POSP01SD and POSP02SD at 3,320 mg/kg and 2,610 mg/kg, respectively.

Pend Oreille River. Sample results are summarized in Table 7-5. No analytes were detected at an elevated concentration in the sediment samples collected in the Pend Oreille River.

Flume Creek. Sample results are summarized in Tables 7-5 and 7-6. No analytes were detected at an elevated concentration in the sediment and surface water samples collected on Flume Creek.

Linton Creek. Sample results are summarized in Table 7-5. No analytes were detected at an elevated concentration in the sediment sample collected in Linton Creek.

Sullivan Creek. Sample results are summarized in Table 7-5. No analytes were detected at an elevated concentration in the sediment sample collected in Sullivan Creek.

Beaver Creek. Sample results are summarized in Table 7-5. No analytes were detected at an elevated concentration in the sediment sample collected in Beaver Creek.

Slate Creek. Sample results are summarized in Table 7-5. No analytes were detected at an elevated concentration in the sediment samples collected in Slate Creek.

Ledbetter Creek. Sample results are summarized in Table 7-5. "4,4'-DDT" was detected at an elevated concentration in PRTB03SD at 10 mg/kg.

Everett Creek. Sample results are summarized in Table 7-5. Cadmium was detected at an elevated concentration in PRTB02SD at 6.1 mg/kg. Chromium was detected at an elevated concentration in PRTB02SD at 86.2 mg/kg.

Unnamed Tributary. Sample results are summarized in Table 7-5. No analytes were detected at an elevated concentration in the sediment sample collected in the unnamed tributary.

Lime Creek. Sample results are summarized in Table 7-5. Chromium was detected at an elevated concentration in PRTB01SD at 57.7 mg/kg. Selenium was detected at an elevated concentration in PRTB01SD at an estimated low 4.9 mg/kg JL.

Pewee Creek. Sample results are summarized in Table 7-5. No analytes were detected at an elevated concentration in the sediment sample collected in Pewee Creek.

Myers Dam. Refer to Appendix E. One sediment sample was collected from the sand bar (MDSB01SD).

Metaline Falls Domestic Drinking Water Intake. Refer to Appendix F. Two surface water samples were collected from the Metaline Falls domestic drinking water intake (MF01SW and MF02SW). MF01SW was collected at the confluence of the intake to Linton Creek. MF02SW was collected at the origin of the spring.

Table 7-1

MINE AND MILL PPE LOCATIONS
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

MINE	PPE	LOCATION
Blue Bucket (Figure 6-2)	PPE1	Galvanized metal culvert under forest service road entering unnamed creek.
	PPE2	Potential flow from shaft to unnamed creek approximately 5 feet.
	PPE 3	Waste rock pile to unnamed creek approximately 30 feet.
Oriole (Figure 6-4)	PPE 1	20 feet southeast of shaft a spring originates and flows approximately 75 feet before coming into contact with the waste rock pile. The spring then flows adjacent to the waste rock pile. At the base of the waste rock pile is PPE1.
	PPE2	Located approximately 160 feet southeast of PPE1, where the waste rock pile comes into contact with the spring.
	PPE3	Potential overland pathway to Linton Creek.
Josephine Mine (Figure 6-6)	PPE1	Approximately 2 feet southeast of the collapsing wood structure a spring originates and flows approximately 40 feet and joins the Pend Oreille River.
	PPE2	PPE2 is 60 feet long and is the entire length of the waste rock pile which enters the Pend Oreille River.
Grandview Mine/Mill (Figure 6-12)	GMPP04	PPE1 is the overland flow from the mine workings on the upper level to the Pend Oreille River.
	GMPP05	PPE2 is the overland flow west from the tailings pile approximately 300 feet to the Pend Oreille River.
Pend Oreille Mine/Mill (Figure 6-12)	PPE1	The ventilation shaft at the mine is flowing approximately 1,260 feet in a northwest direction towards the Pend Oreille River.
	PPE2	PPE2 is the overland flow in a northwestern direction from TDF-1 through Creek 2 approximately 1,585 feet to the Pend Oreille River
	PPE3	PPE3 is approximately 882 feet long and is the entire length of the waste rock pile that is contacting the Pend Oreille River.
	Potential PPE4	Potential PPE4 is the overland flow in a northern direction from TDF-2 (for approximately 1,260 feet) through Creek 1for approximately 3,906 feet to the Pend Oreille River.

Table 7-2

SURFACE WATER INTAKE WITHIN A 4-MILE RADIUS
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

Mine	1/4 Mile	1/2 Mile	1 Mile	2 Mile	3 Mile	4 Mile	Total
Blue Bucket Mine	0	3	0	18	14	10	45
Oriole Mine	0	0	5	6	16	18	45
Josephine Mine	1	1	0	19	8	8	37
Grandview Mine/Mill	0	0	4	20	8	25	57
Pend Oreille Mine/Mill	0	0	3	16	10	23	52

Source: Ecology 2001a

Table 7-3

PEND OREILLE MINE/MILL SURFACE WATER SAMPLES
LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS AND
SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264265	01264266
CLP Inorganic ID	MJ0F10	MJ0F11
CLP Organic ID	NU	NU
E & E Sample ID	NU	NU
Station Location	TCBK01SW	POCK01SW
Description	Background	Release
TAL Metals (µg/L)		
Calcium	**68300**	**130000**
Magnesium	**11900**	**31200**
Zinc	2.5 UJK (3.2 U AC)	**<u>63.2 JL</u>**

Note: Bold type indicates the sample concentration is above the detection limit.
Underline type indicates the sample results is elevated as defined in Section 5.

Key:

AC	= adjusted concentration.
BK	= Background.
CK	= Creek 1.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical value is an estimate.
K	= Unknown bias.
L	= Low bias.
µg/L	= micrograms per liter.
NU	= Not utilized.
PO	= Pend Oreille Mine/Mill.
SW	= surface water.
TAL	= Target analyte list.
TC	= Threemile Creek.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 7-4

PEND ORELLE MINE/MILL SEDIMENT SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264264	01264263	01264351	01264352
CLP Inorganic ID	MJ0F09	MJ0F08	MJ0FK4	MJ0FK5
CLP Organic ID	J0F09	J0F08	J0FK4	J0FK5
E & E Sample ID	01050278	01050277	01050260	01050261
Station Location	TCBK01SD	POCK01SD	POSP01SD	POSP02SD
Depth (in. bgs)	0 - 8	0 - 8	0-8	0-8
Description	Background	Release		
TAL Metals (mg/kg)				
Aluminum	**2960**	**2100**	**476**	**1430**
Arsenic	4.7 U	7.6 U	**17.2**	**11.8**
Cadmium	1.4 JB (1.4 SQL)	**3.5**	**9.8**	**14.6**
Calcium	**202000**	**115000**	**142000**	**175000**
Chromium	**5.7**	**9.2**	**3.0**	**12.5**
Copper	**9.2 JL (11 AC)**	**22.5 JL**	**23 JL**	**165 JL**
Iron	**8120**	**6130**	**56800**	**17000**
Lead	**6.8**	**180**	**351**	**1960**
Magnesium	**7090**	**35500**	**63400**	**57800**
Manganese	**211**	**455**	**202**	**254**
Mercury	0.07 U	0.11 JB	0.09 JB	**0.39**
Nickel	**13.8**	**44.8**	10.3 JB	9.0 JB
Vanadium	11.9 JB (11.9 SQL)	**26.8**	9.0 JB	**20.8**
Zinc	**65.2 JH**	**326 JH (217 AC)**	**3320**	**2610**
Total Organic Carbon (mg/kg)				
TOC	**18800**	**36100**	**62000**	**36100**

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

Key:

AC	= adjusted concentration.
B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs	= below ground surface.
BK	= background.
CK	= creek.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
H	= High bias.
ID	= Identification.
in.	= inches.
J	= The analyte was positively identified. The associated numerical value is an estimate.
L	= Low bias.
mg/kg	= milligrams per kilogram.
PO	= Pend Oreille Mine/Mill.
SD	= sediment.
SQL	= sample quantitation limit.
TAL	= Target analyte list.
TC	= Threemile Creek.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.

Table 7-5

PEND OREILLE RIVER AND TRIBUTARY SEDIMENT SAMPLES ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01264420	01264402	01264404	01264409	01264414	01264403	01264405	01264406	01264407	01264408	01264421	01264422	01264424	01264070	01264073	01264425
CLP Inorganic ID	MJ0GM9	MJ0GL1	MJ0GL3	MJ0GL8	MJ0GM3	MJ0GL2	MJ0GL4	MJ0GL5	MJ0GL6	MJ0GL7	MJ0GN0	MJ0GN1	MJ0GN3	MJ0BQ3	MJ0BQ5	MJ0GN4
CLP Organic ID	J0GM9	J0GL1	J0GL3	J0GL8	J0GM3	J0GL2	J0GL4	J0GL5	J0GL6	J0GL7	J0GN0	J0GN1	J0GN3	JX829	JX831	JOGN4
E & E Sample ID	01050244	01050231	01050233	01050238	01050241	01050232	01050234	01050235	01050236	01050237	01050245	01050246	01050248	NU	NU	01050249
Station Location	POBK01SD	PRRS01SD	PRRS02SD	PRRS03SD	PRRS04SD	PRTB01SD	PRTB02SD	PRTB03SD	PRTB04SD	PRTB05SD	PRTB06SD	PRTB07SD	PRTB08SD	US002SD	US003SD	PRTB09SD
Depth (in. bgs)	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 2	0 - 4	0 - 8
Location	Pend Oreille River					Lime Creek	Everett Creek	Ledbetter Creek	Unnamed Tributary	Slate Creek	Peewee Creek	Beaver Creek	Sulllivan Creek	Flume Creek	Flume Creek	Linton Creek
Description	Background	Release														
TAL Metals (mg/kg)																
Aluminum	11100	10700	8410	6950	7660	2470	3850	6610	2220	3530	5720	2620	8950	5120	9960	5930
Arsenic	16.3	5.8	4.9	5.0	3.0 JB	2.4 U	5.6	16.2	3.3 U	8.3	2.8 JB	2.3 JB	4.8	1.5 JB	0.47 U	6.0
Barium	183	123	85.6	44.5 JB	89.7	105 JB	91.0	99.7 JB	109 JB	48.1 JB	57.8 JB	44.2 JB	33.2 JB	34.2 JB	19.2 JB	49.7 JB
Cadmium	0.57 JB (0.57 SQL)	0.51 JB	0.09 U	0.11 U	0.88 JB	1.3 JB	6.1	1.0 JB	1.8 JB	0.40 JB	0.19 JB	0.98 JB	0.94 JB	0.35 JBK	0.05 UJK (0.04 U AC)	0.80 JB
Calcium	21500	24400 JL	2350 JL	3400 JL	12100 JL	206000 JL	59800 JL	14700 JL	342000 JL	49100 JL	1390 JB	3610	42400	1160 JBK	915 JBK	30500
Chromium	17.6	23.9	19.7	17.1	17.1	57.7	86.2	13.8	8.2	7.0	10.1	6.2	18.3	7.9	16.4	14.4
Copper	25.9 JL (31.6 AC)	32.1	23.5	21.8	19.7	20.3	17.7	16.3	15.8 JB	12.0	8.1 JB	4.3 JB	17.5 JL	6.1 JBK	8.7 JK (7.1 AC)	16.0 JL
Iron	27000	21700	14400	14200	14500	3240	9400	16200	4170	14200	15900	6700	25900	14300	24500	13600
Lead	35.7	28.1	9.4	8.3	38.5	7.1	38.7	23.2	12.7	13.6	7.6	4.6	19.0	6.4	5.0	86.8
Magnesium	8910	11200 JL	4660 JL	4450 JL	7540 JL	3060 JL	12100 JL	7580 JL	5680 JL	27100 JL	2410	1200 JB	8510	2230	4490	18700
Manganese	921	429 JH (346 AC)	217 JH (175 AC)	209 JH (169 AC)	188 JH (152 AC)	93.7 JH (75.6 AC)	246 JH (198 AC)	517 JH (417 AC)	217 JH (175 AC)	209 JH (167 AC)	198	107	437	178	235	427
Nickel	20.9	19.2	15.6	14.1	14.5	8.0 JB	35.2	22.7	5.6 JB	20.7	17.4	12.5	26.3	19.9	20	14.2
Potassium	2020 JB	1730	1340	978 JB	1180 JB	333 JB	938 JB	1170 JB	533 JB	990 JB	760 JB	405 JB	403 JB	335 JB	233 JB	985 JB
Selenium	1.5 U	0.87 UJK (0.37 U AC)	0.88 UJK (0.37 U AC)	0.90 UJK (0.38 U AC)	1.1 UJK (0.46 U AC)	4.9 JL	1.2 UJK (0.50 U AC)	1.7 UJK (0.71 U AC)	2.4 UJK (1.0 U AC)	0.84 UJK (0.36 U AC)	1.1 U	1.4 U	0.86 U	0.76 JB	0.44 U	0.85 U
Vanadium	28.3	41.6	32.8	31.5	21.4	6.4 JB	42.9	33.0	8.6 JB	9.0 JB	15.6 JB	17.4	12.2 JB	14.0	6.2 JB	25.4
Zinc	287	130	54	43.8	205	58.2	342	163	49.3	107	60.9	59.8	263	60.0	49	261
Pesticides (mg/kg)																
"4,4'-DDT"	6.6 U	4.3 U	4.2 U	4.5 U	5.7 U	10 U	5.5 U	10	11 U	4.6 U	5 U	5.2 U	4.5 U	4.2 U	3.8 U	4.3 U
Total Organic Carbon (mg/kg)																
TOC	13700	7610	595 J	581 J	45600	74800 J	28900	48200	77300	14100	5490	38100	599 J	1000 U	1310	4270

Note: Bold type indicates the sample concentration is above the detection limit.
Underline type indicates the sample results is elevated as defined in Section 5.

Key:

AC	= Adjusted concentration.
B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
bgs	= below ground surface.
BK	= Background.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
H	= High bias.
ID	= Identification.
in	= inches.
J	= The analyte was positively identified. The associated numerical value is an estimate.
K	= Unknown bias.
L	= Low bias.
mg/kg	= milligrams per kilogram.
NU	= Not utilized.
PO	= Pend Oreille Mine/Mill.
PR	= Pend Oreille River.
RS	= river sediment.
SD	= sediment.
SQL	= Sample quantitation limit.
TAL	= Target analyte list.
TB	= tributary.
TOC	= Total Organic Carbon.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.
US	= Tributary sediment/soil (upstream/upland sampling location).

Table 7-6

FLUME CREEK SURFACE WATER SAMPLES
ANALYTICAL RESULTS SUMMARY
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	Ecotox Screening Thresholds	Federal AWQC Protection of Aquatic Organisms	01264067	01264074
CLP Inorganic ID			MJ0BQ0	MJ0BQ6
CLP Organic ID			NU	NU
E & E Sample ID			NU	NU
Station Location			UW002SW	UW003SW
Description	Background		Release	
TAL Metals (µg/L)				
Calcium	NU	NU	48.6 U	**12500**

Source: EPA 1996; Ecology 1997.

[1] Value is Hardness Dependent (100 mg/L as $CaCo_3$).

[2] Value must be calculated based on characteristics of the specific surface water body.

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

Key:

AWQC	= Ambient Water Quality Criteria.
CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
µg/L	= micrograms per liter.
NU	= Not utilized.
TAL	= target analyte list.
U	= The analyte was not detected. The associated numerical value is the contract required dection limit.
UW	= Upland surface water.

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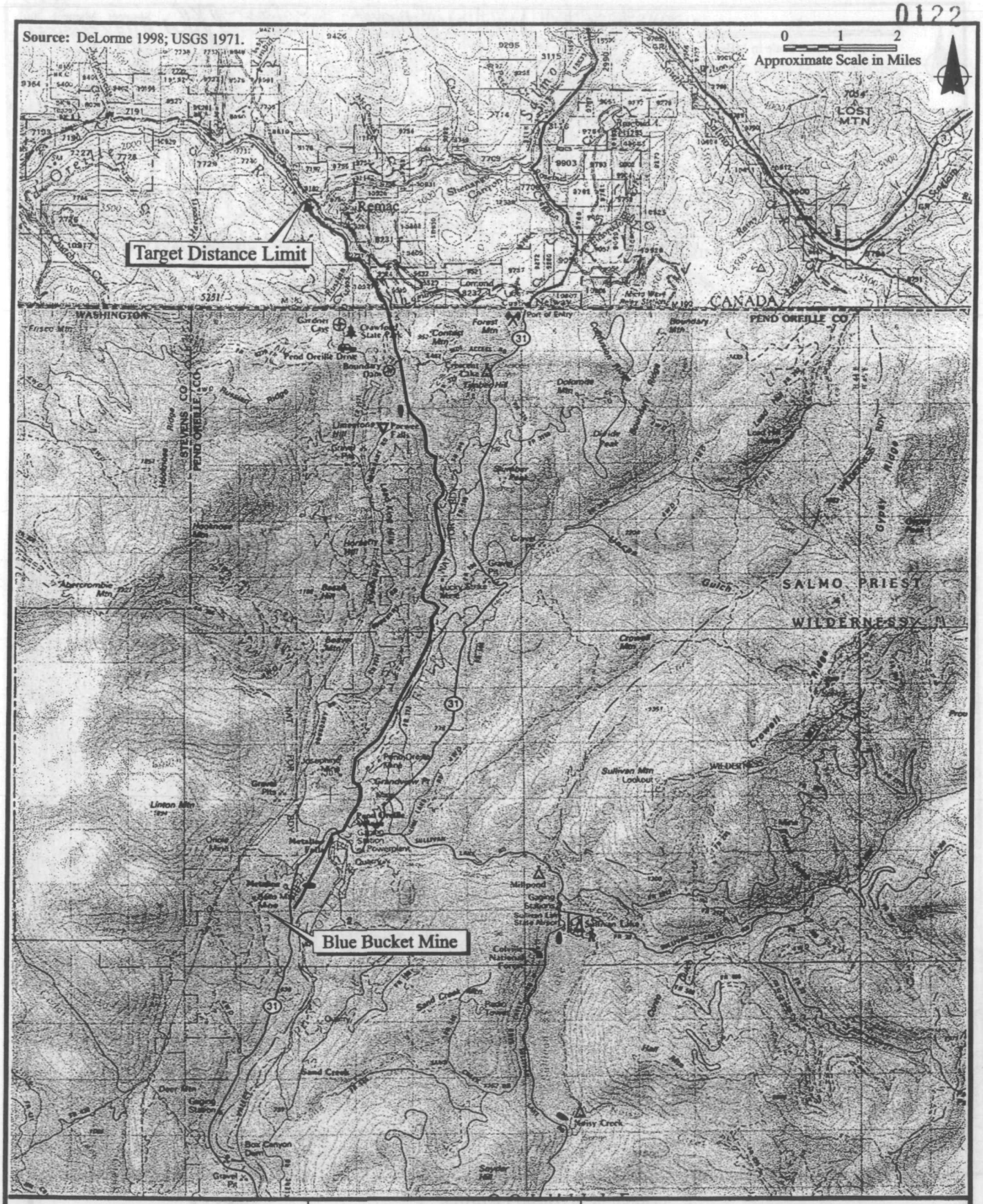
File #: 1.6.1-6

Site Name: Upper Columbia (UCRSF)

Pend Oreille Mini /Mill, River, and Tributaries Sample Location Map Pend Oreille County Washington

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington	Figure 7-2 BLUE BUCKET MINE 4-MILE MAP		
		Date: 2-28-02	Drawn by: AES	10:START-2\01080009\S714\fig 7-2



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LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 7-3
BLUE BUCKET MINE
15-MILE MAP

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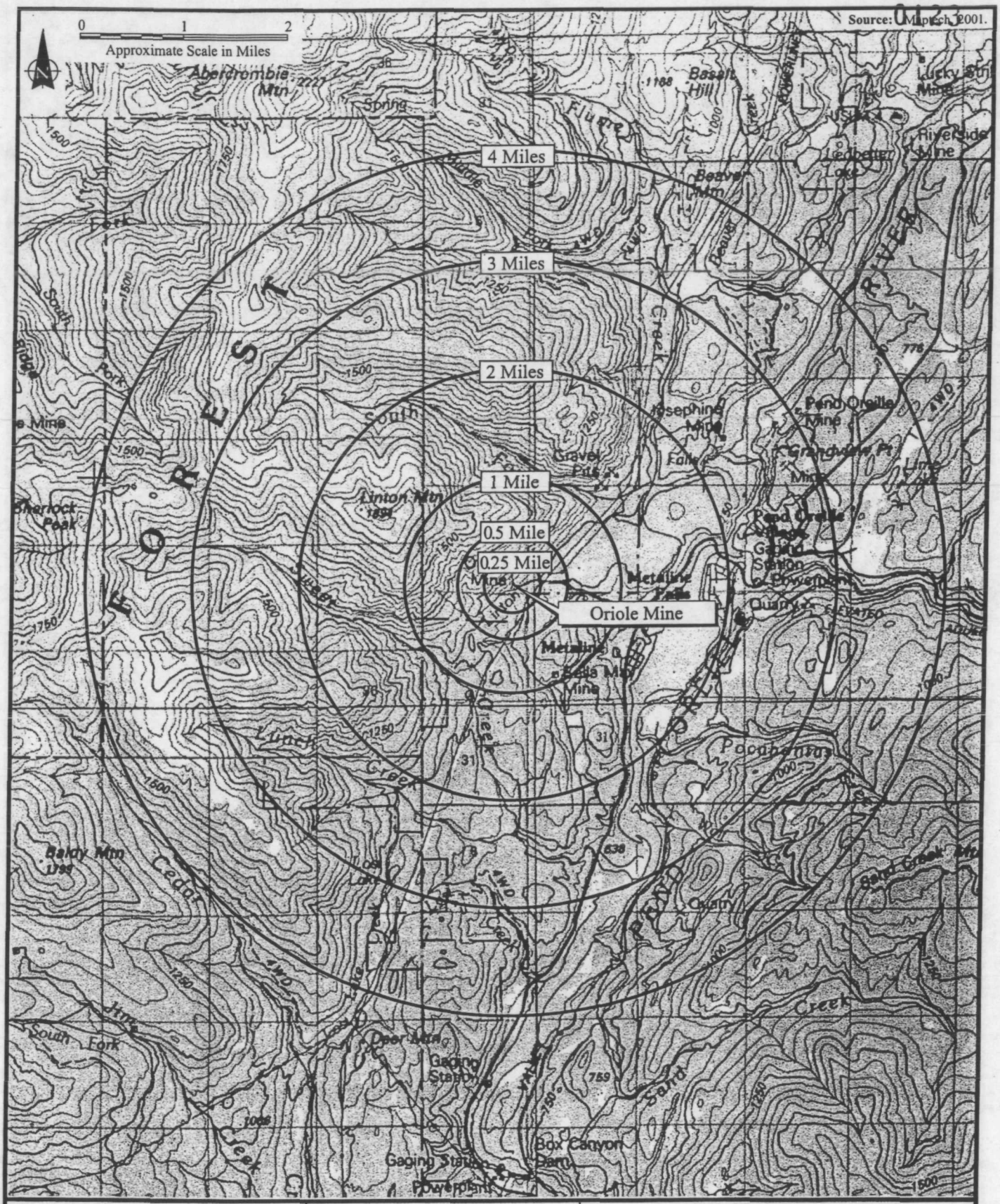

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LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 7-4
ORIOLE MINE
4-MILE MAP

Date:	Drawn by:	
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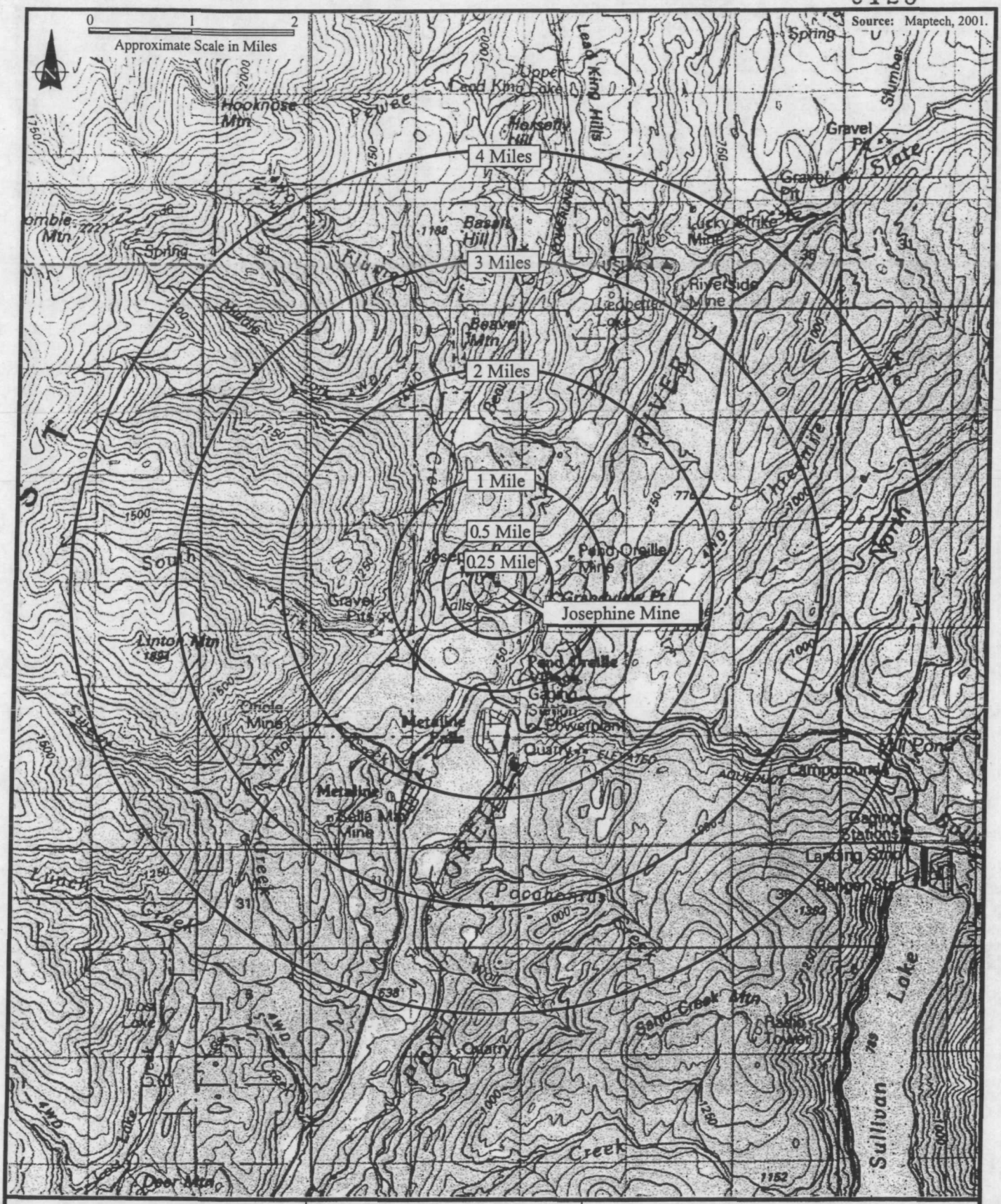
ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington		Figure 7-5 ORIOLE MINE 15-MILE MAP
	Date: 2-28-02	Drawn by: AES	10:START-2\01080009\S714\fig 7-5



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LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 7-6
JOSEPHINE MINE
4-MILE MAP

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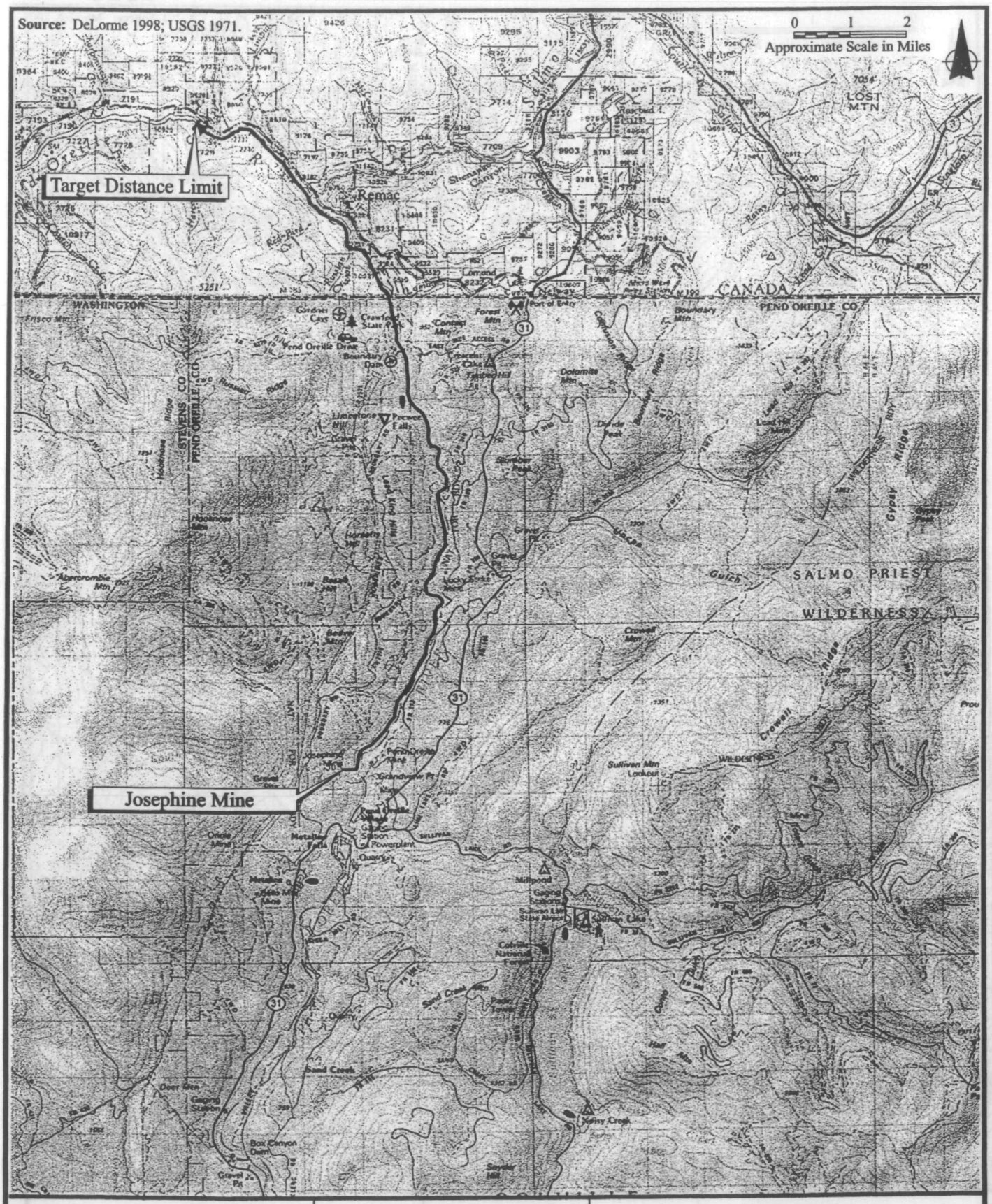

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LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 7-7
JOSEPHINE MINE
15-MILE MAP

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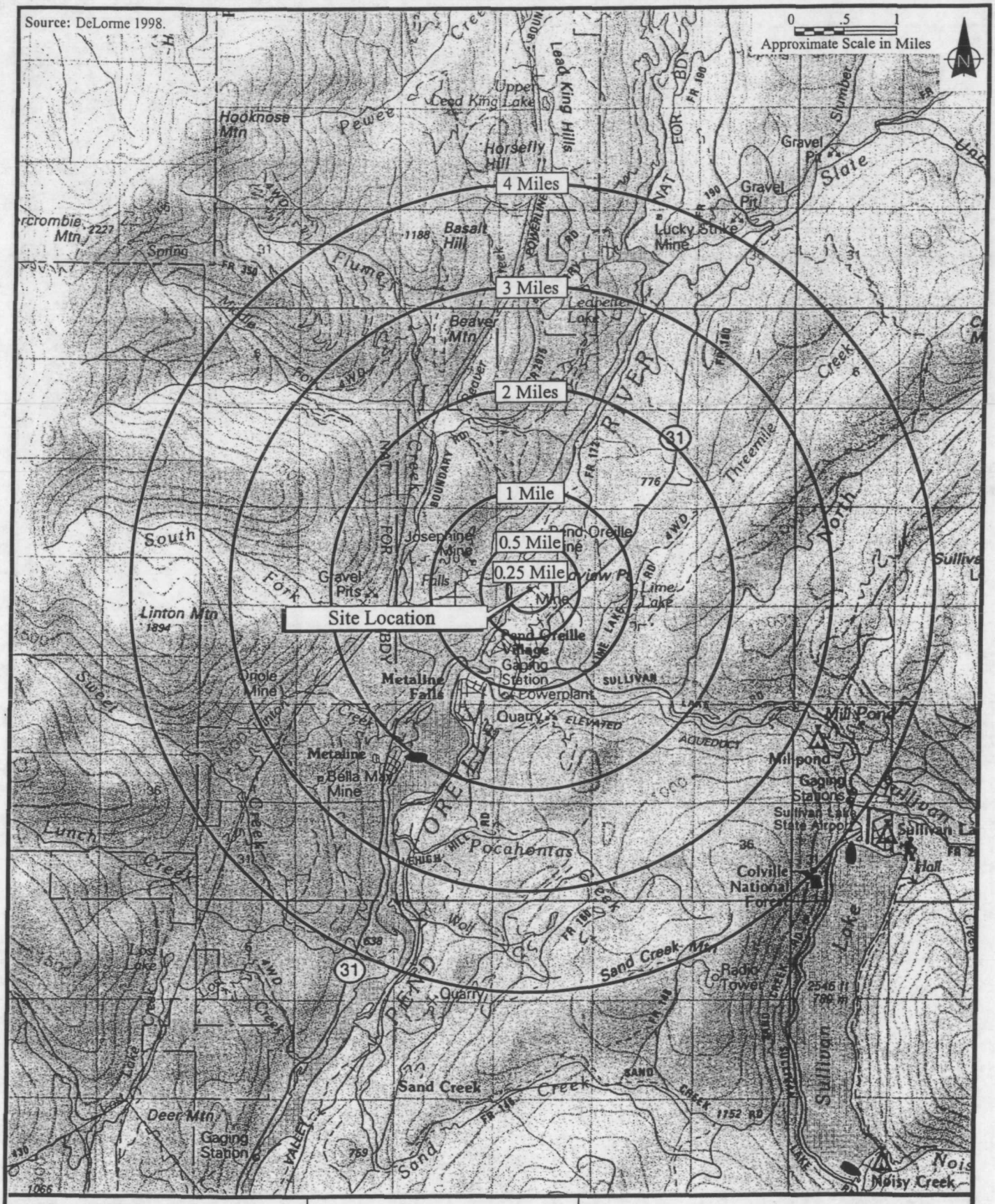

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LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 7-8
GRANDVIEW MINE/MILL
4-MILE MAP

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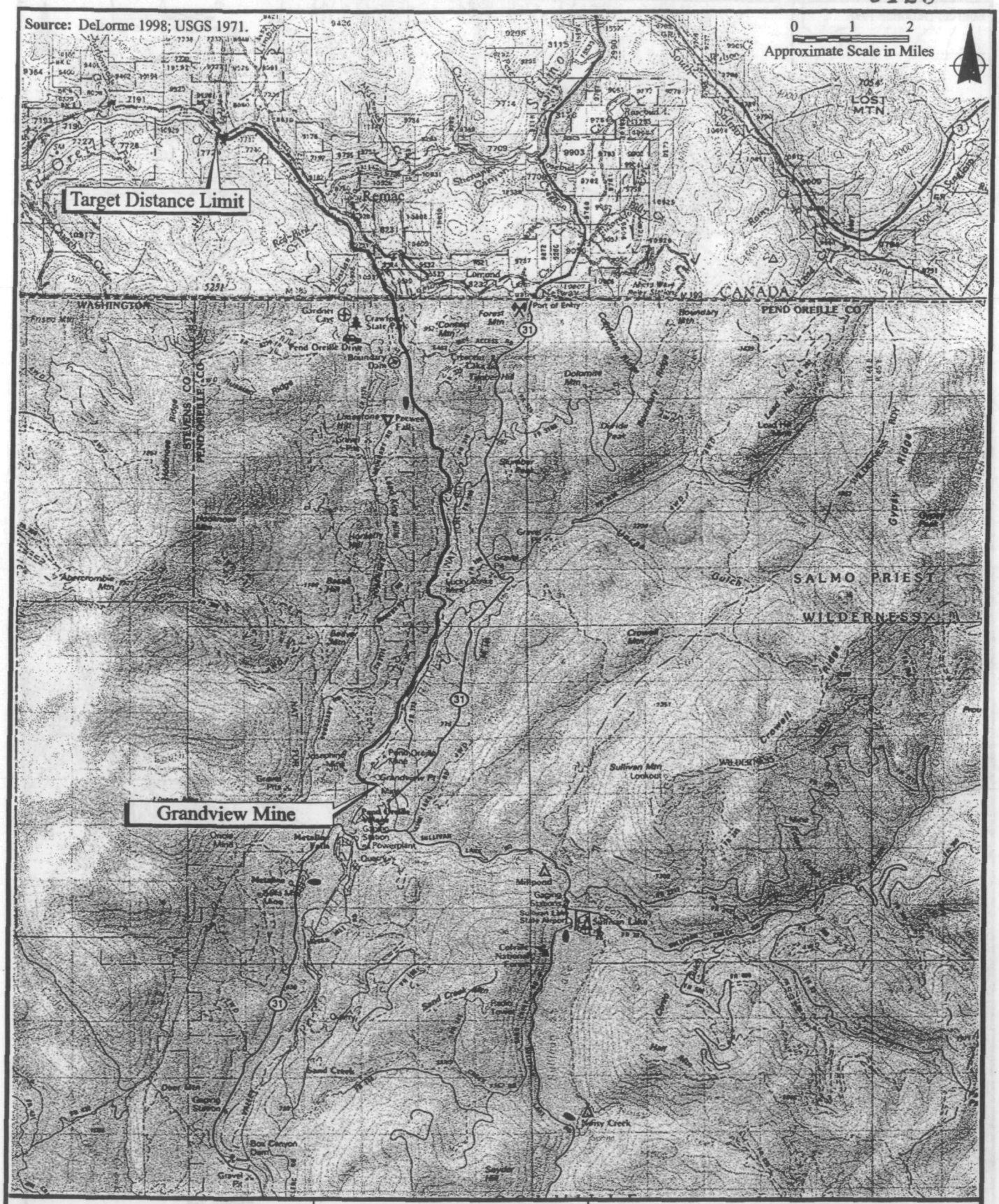

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington	Figure 7-9 GRANDVIEW MINE/MILL 15-MILE MAP
	Date: 3-1-02	Drawn by: AES	10:START-2\01080009\S714\fig 7-9

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LOWER PEND OREILLE RIVER
MINES AND MILLS
PRELIMINARY ASSESSMENTS
AND SITE INSPECTIONS
Pend Oreille, Washington

Figure 7-10
PEND OREILLE MINE/MILL
4-MILE MAP

Date:	Drawn by:	
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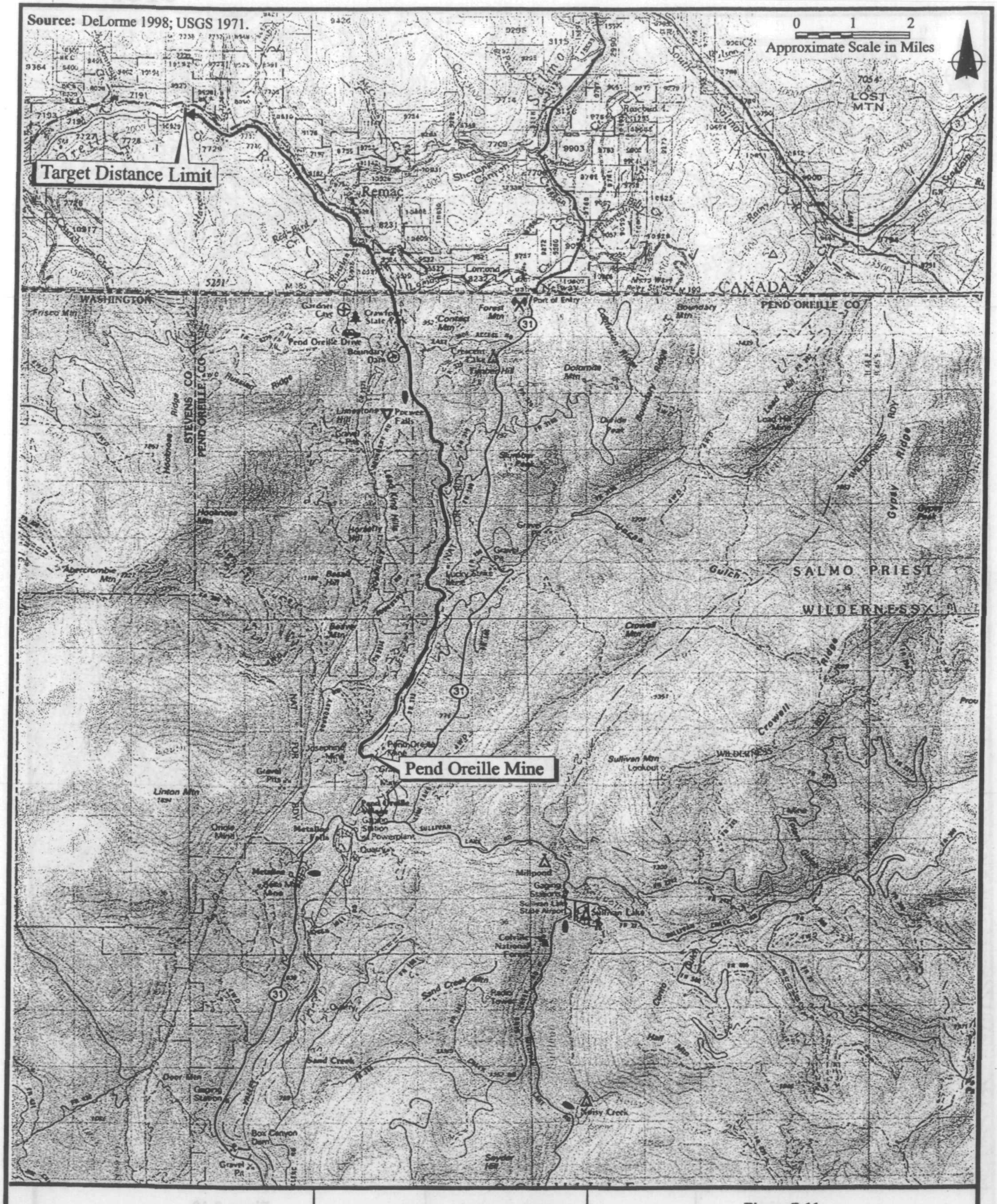

ecology and environment, inc. International Specialists in the Environment Seattle, Washington	LOWER PEND OREILLE RIVER MINES AND MILLS PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS Pend Oreille, Washington	Figure 7-11 PEND OREILLE MINE/MILL 15-MILE MAP		
		Date: 3-1-02	Drawn by: AES	10:START-2\01080009\S714\fig 7-11

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Pend Oreille Mini /Mill, River, and Tributaries Project Area Tributaries Pend Oreille County Washington Figure 7- 12

8. SUMMARY AND CONCLUSIONS

In June 2001, the START-2 visited 21 mines/mills located near the lower reaches of the Pend Oreille River in Pend Oreille County, Washington. The purpose of the visits was to identify potential contaminant source areas that may be impacting or have the potential to impact possible receptors/targets by migration of contaminants via the surface water overland flow pathway. Of the 21 properties visited, sampling was conducted at 5 mines/mills.

The Clark-Fork/Pend Oreille River system flows from Montana as the Clark Fork River into Lake Pend Oreille in Idaho. The Pend Oreille River, originating as the outflow from Lake Pend Oreille, enters Washington flowing north through the northeast corner of the state into Canada, where it drains to the Columbia River just above the International Border (Figure 7-1; Ecology 1991). The Clark-Fork/Pend Oreille Basin covers approximately 26,000 square miles in Montana, Idaho, and Washington (USGS 2000).

The PA and SI activities involved the collection of samples from potential hazardous substance source areas and from target areas potentially impacted through contaminant migration. A total of 64 samples submitted for EPA CLP methods of analysis were collected, including background samples but excluding QA samples. Samples were collected from potential hazardous substance source areas and from potential target areas (Table 3-1). The media sampled included: surface soil, tailings, waste rock, sediment, and surface water. Section 8.1 summarizes the findings and conclusions for each mine/mill sampled. For the purposes of this investigation, significant/elevated concentrations are defined using Table 2-3 of the EPA HRS model criteria for observed release. Refer to Section 5.1 for further discussion of the HRS model criteria.

For those mines visited but not sampled due to no contaminant source observed or no surface water overland flow migration pathway identified, no further action under CERCLA is recommended. A list of those mines is presented in Table 8-1.

8.1 FINDINGS AND CONCLUSIONS

8.1.1 BLUE BUCKET MINE

Two co-located sediment and surface water samples were collected at the Blue Bucket Mine (Figure 6-2). Sample results are summarized in Tables 6-1 and 6-2. The PPE sediment samples contained

significant concentrations of TAL metals including cadmium (2.8 mg/kg), lead (72.5 mg/kg), and zinc (373 mg/kg AC).

Migration of contaminants from the waste rock pile to the nearby unnamed creek may occur via overland flow of runoff water with suspended sediments.

Analytical results of samples collected indicate that hazardous substances are migrating to targets that include the unnamed creek, the Pend Oreille River, and habitat used by threatened and endangered species.

Based on the findings of this investigation, further action under CERCLA or other authorities is recommended.

8.1.2 ORIOLE MINE

One surface water and two sediment samples were collected at the Oriole Mine (Figure 6-4). Sample results are summarized in Tables 6-3 and 6-4. The PPE sediment samples contained significant concentrations of TAL metals including cadmium (27 mg/kg), lead (714 mg/kg), manganese (4,120 mg/kg), silver (5.6 mg/kg), and zinc (5,740 mg/kg).

Migration of contaminants from the waste rock piles to Linton Creek may occur via overland flow of runoff water with suspended sediments.

Analytical results of samples collected indicate that hazardous substances are migrating to targets that include Linton Creek, the Pend Oreille River, and habitat used by threatened and endangered species.]

Based on the findings of this investigation, further action under CERCLA or other authorities is recommended.

8.1.3 JOSEPHINE MINE

One sediment sample was collected at the ppe of the waste rock pile into the Pend Oreille River. One surface water sample was collected at the mouth of a spring originating from a collapsed wooden structure on the property. The spring feeds into the Pend Oreille River (Figure 6-6). Sample results are summarized in Tables 6-5 and 6-6.

The PPE sediment sample contained significant concentrations of TAL metals including cadmium (9.6 mg/kg), lead (17,400), mercury (0.16 mg/kg), silver (2.3 mg/kg), and zinc (2,040 mg/kg). The spring surface water sample contained significant concentrations of TAL metals including lead (21.5 μg/L) and zinc (117 μg/L).

Migration of contaminants from the waste rock pile to the Pend Oreille River is occuring via direct overland flow. The START-2 observed that the waste rock pile extends into the Pend Oreille River. Migration of contaminants via an onsite spring that feeds into the Pend Oreille River may occur.

Analytical results of samples collected indicate that hazardous substances are migrating to targets that include Flume Creek, the Pend Oreille River, and habitat used by threatened and endangered species.

Based on the findings of this investigation, further action under CERCLA or other authorities is recommended.

8.1.4 GRANDVIEW MINE/MILL

In October 2000, EPA conducted sampling at the Grandview Mine/Mill. The field event included the collection of samples from three on-site soil source areas including waste rock piles, a suspected tailings pile, and an abandoned container area (Figures 6-8 and 6-9). Samples collected from the waste rock piles contained significant concentrations of arsenic (44.0 mg/kg), cadmium (23.3 mg/kg), lead (4,930 mg/kg), mercury (1.5 mg/kg), selenium (1.5 mg/kg) and zinc (7,420 mg/kg).

Samples collected from the suspected tailings pile contained significant concentrations of cadmium (58.4 mg/kg), copper (91.5 mg/kg), lead (2,260 mg/kg), mercury (1.7 mg/kg; JL), selenium (1,1 mg/kg), and zinc (19,100 mg/kg).

The abandoned container and drum area contained significant concentrations of arsenic (64.9 mg/kg), cadmium (99.5 mg/kg), copper (236 mg/kg), lead (14,600 mg/kg), mercury (6.0 mg/kg), selenium (3.0 mg/kg), and zinc (36,200 mg/kg).

In June 2001, EPA collected PPE surface water and sediment samples. The PPE surface water and sediment samples contained significant concentrations of TAL metals including cadmium (1.6 mg/kg), lead (449 mg/kg), manganese (25.5 μg/L), and zinc (864 mg/kg).

The October 2000 field event included the collection of samples from potential targets along the groundwater migration, surface water migration, and soil exposure pathways including groundwater wells, an unnamed spring, a former waste water drainage ditch, and the Pend Oreille River.

Elevated levels of TAL metals were detected in the Pend Oreille Village groundwater samples, the unnamed spring co-located surface water and sediment samples, the Pend Oreille River sediment samples, and the former wastewater drainage ditch surface soil samples.

Results of the October 2000 and June 2001 sampling events indicate that the Grandview Mine is a source of hazardous substance contamination, including TAL metals. Analytical results of samples collected indicate that hazardous substances are migrating to targets that include groundwater drinking water

wells, the unnamed spring, the former wastewater drainage ditch, the Pend Oreille River and habitat used by threatened and endangered species.

Further action under CERCLA or other authorities is recommended at this site.

8.1.5 PEND OREILLE MINE/MILL

Samples were collected from potential contaminant source areas at the Pend Oreille Mine/Mill including three TDFs and one waste rock pile. Three PPE co-located sediment and surface water samples were also collected. Sample locations are shown in Figure 6-12 and analytical results are summarized in Tables 6-9, 6-10, and 6-11.

Soil samples collected from source areas contained significant concentrations of TAL metals including arsenic (40.0 mg/kg), cadmium (44.1 mg/kg), copper (242 mg/kg JL), lead (5,625 mg/kg AC), mercury (0.58 mg/kg), selenium (3.1 mg/kg), silver (2.3 mg/kg), and zinc (9,300 mg/kg).

The PPE samples contained significant concentrations of TAL metals including barium (62.6 ug/L), cadmium (6.1 mg/kg), lead (346 mg/kg), manganese (33.0 mg/kg) and zinc (2,370 mg/kg).

Analytical results of samples collected indicate that hazardous substances are migrating to targets that include wetlands, the Pend Oreille River and habitat used by threatened and endangered species

Further action under CERCLA or other authorities is recommended at this site.

Table 8-1

CERCLA RECOMMENDATIONS AT MINES NOT SAMPLED
LOWER PEND OREILLE RIVER MINES AND MILLS
PRELIMINARY ASSESSMENTS AND SITE INSPECTIONS
PEND OREILLE COUNTY, WASHINGTON

EPA CERCLIS ID Number	Mine	CERCLA Activity Type	Recommendation
WAN001002331	Sterling	Preliminary Assessment	No further action under CERCLA
WAN001002328	Metaline	Preliminary Assessment	No further action under CERCLA
WAN001002318	Bella May	Preliminary Assessment	No further action under CERCLA
WAN001002320	Diamond R.	Preliminary Assessment	No further action under CERCLA
WAN001002325	Lehigh No.1	Preliminary Assessment	No further action under CERCLA
WAN001002332	West Contact	Preliminary Assessment	No further action under CERCLA
WAN001002326	Lehigh No.2	Preliminary Assessment	No further action under CERCLA
WAN001002321	Hoage	Preliminary Assessment	No further action under CERCLA
WAN001002327	Lucky Strike	Preliminary Assessment	No further action under CERCLA
WAN001002324	Lead King	Preliminary Assessment	No further action under CERCLA
to be provided	Z Canyon	Preliminary Assessment	No further action under CERCLA
to be provided	Lead Queen	Preliminary Assessment	No further action under CERCLA
WAN001002323	Lead Hill	Preliminary Assessment	No further action under CERCLA
to be provided	King Tut	Preliminary Assessment	No further action under CERCLA
to be provided	Red Top	Preliminary Assessment	No further action under CERCLA

9. REFERENCES

Baker, Lori, November 20, 2001, Recreation Specialist, Bureau of Land Management, Spokane, Washington, telephone conversation regarding fishing at Boundary Dam with Renee Nordeen, Ecology and Environment Inc., Seattle Washington.

Barlee, N.L., 1932, *Gold Creeks and Ghost Towns of Northeastern Washington,* Hancock House Publishers, Blaine, Washington.

Battien, Pauline, 1998 fifth printing, *The Gold Seekers...a 200 Year History of Mining in Washington, Idaho, Montana, and Lower British Columbia*, Eastern Washington University Libraries, Statesman-Examiner, Inc., Colville, Washington.

Cawston, Colleen, August 2, 1999, Chair, Colville Business Council, The Confederated Tribes of the Colville Reservation, Nespelem, Washington, correspondence to Chuck Clark, Regional Administrator, U.S. Environmental Protection Agency, Seattle, Washington.

Derky, Robert E.;Joseph, Nancy L.; Lasmanis, Raymond; November 1990, *Metal Mines of Washington, Preliminary Report,* Washington Division of Geology and Earth Resources, Open File Report 90-18, Washington State Department of Natural Resources.

Dings, M.G., and D.H. Whitebread, 1965, *Geology and Ore Deposits of the Metaline Lead-Zinc District, Pend Oreille County, Washington*, United States Geological Survey Professional Paper No. 489, Denver, Colorado.

Ecology and Environment, Inc., (E & E), 2001a, *Sampling Quality Assurance Plan, Upper Columbia River ESI.*

———, 2001b, Field Logbooks for the Pend Oreille River ESI site.

Economic History, November 2001, Pend Oreille County, http://www.wa.gov/pub/employment_security/lmea/labrmrkt/eco/pendeco.htm

Godlewski, David, April 2001, environmental manager, Cominco American, Inc., Spokane, Washington, telephone conversation regarding finalization of EIS, workers on the property, and valid permits with Leatta Dahlhoff, Ecology and Environment, Inc., Seattle, Washington.

———,June 2000, environmental manager, Cominco American, Inc., Spokane, Washington, telephone conversation regarding amounts and measurements of sources on site with Leatta Dahlhoff, Ecology and Environment, Inc., Seattle, Washington.

Hallinan, Patrick, January 22, 2002, Washington State Department of Ecology (Ecology), Spokane, Washington, email regarding update on finalization of Environmental Impact Statement for the Pend Oreille Mine/Mill to Leatta Dahlhoff, Ecology and Environment, Inc., Seattle, Washington.

———, December 13, 2001, Washington State Department of Ecology (Ecology), Spokane, Washington, email regarding update on Pend Oreille Mine/Mill activities to Leatta Dahlhoff, Ecology and Environment, Inc., Seattle, Washington.

Lambly, Charles, April 1941, Methods and Costs of Mining Zinc-Lead Ores at the Pend Oreille Mines and Metals Co., *Northwest Mining News*, Vol. 7, No. 8, pp. 4-11.

Lasmanis, R., 1995, *History of the Metaline Mining District and the Pend Oreille Mine, Pend Oreille County, Washington,* Washington Geology, Vol. 23, No. 1, pp. 24-29.

Neale, Alfred, July 1962, acting director, Washington State Pollution Control Commission, Olympia, Washington, letter to Marshall Huntting regarding the daily load of tailings discharged to the Pend Oreille River during milling operations, Division of Mines and Geology, Olympia, Washington.

Owens, Mary, November 20, 2001, Pend Oreille County Public Utility District, Pend Oreille County, Washington, telephone conversation regarding fishing at Box Canyon Dam with Renee Nordeen, Ecology and Environment, Inc., Seattle, Washington.

Passmore, Gary, August 2, 2000, Director, Office of Environmental Trust, The Confederated Tribes of the Colville Reservation, Nespelem, Washington, correspondence to Monica Tonel, U.S. Environmental Protection Agency, Seattle, Washington.

Pend Oreille County, October 2001, Profile, http://pendoreille.org/Pages/County%20Profile.html.

Resource Finance Corporation (RFC), 1993, *Feasibility Study Pend Oreille Project, Metaline Falls, Washington.*

Roy F Weston, Inc. (Weston), 2001, *Upper Columbia River/Lake Roosevelt Expanded Site Inspection Sampling and Quality Assurance Plan*, TDD: 01-02-0001-A, EPA Contract: 68-S0-01-02. Prepared for the EPA May 2001.

United States Bureau of Land Management (BLM), November 20, 2001, Recreation.Gov search for Bounday Dam, http://www.recreation.gov/detail.cfm?ID=1771.

United States Department of Agriculture (USDA), *1992, Soil Survey of Pend Oreille County Area, Washington.*

United States Department of Commerce, Bureau of the Census (USBC), 2000 US Census Data, General Housing Characteristics, Pend Oreille County, Metaline, Metaline Falls, http://www.census.gov.

United States Environmental Protection Agency (EPA), November 9, 2001, Clark Fork-Pend Oreille Watershed, http://www.epa.gov/ecoplaces/part2/region0/site3.html.

———,2000a, *Contract Laboratory Program Statement of Work for Inorganic Analyses.*

———, August 2000b, *EPA Abandoned Mine Site Characterization and Cleanup Handbook*, EPA 910-B-00-001, Regions 8, 9, and 10.

———,1999a, *Contract Laboratory Program Statement of Work for Organic Analyses.*

———, April 1999b, *National Recommended Water Quality Criteria-Correction Benchmarks.*

———, *1996, Using Qualified Data to Document an Observed Release and Observed Contamination.*

———, February 1994a, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, OSWER 9240.1-05-01, PB 94-963502, EPA 540/R-94/013.

———, September 1994, *Guidance for the Data Quality Objectives Process,* EPA QA/G-4, Office of Research and Development, Washington, D.C., EPA /600/R-96/055.

———, *February 1993, Clark Fork-Pend Oreille Basin Water Quality Study, EPA 910/R-93-006.*

United States Fish and Wildlife Service (USFWS), 1987, *National Wetlands Inventory Maps, Abercrombie Mountain, Aladdin Mountain, Boundary Dam, Deep Lake, Gypsy Peak, Ione, Metaline, Metaline Falls, Monumental Mountain, Pass Creek, and Scotchman Lake Quadrangles; 1:24,000 scale.*

United States Geologic Survey (USGS), 2000, *Concentrations of Selected Trace Elements in Fish Tissue and Streambed Sediment in the Clark Fork-Pend Oreille and Spokane River Basins, Washington, Idaho, and Montana, 1998,* Water-Resources Investigations Report 00-4159, Boise, Idaho.

———, 1998a, *Magnitude and Frequency of Floods in Washington*, Water-Resources Investigations Report 97-4277, Tacoma, Washington.

———, 1998b, *Determination of Upstream Boundary Points on Northeastern Washington Streams and Rivers Under the Requirements of the Shoreline Management Act of 1971,* Water-Resources Investigations Report 98-4160, Tacoma, Washington.

———,1992a, *1:24,000 Scale Topographic Map, Boundary Dam, Washington.*

———,1992b, *1:24,000 Scale Topographic Map, Metaline, Washington.*

———,1992c, *1:24,000 Scale Topographic Map, Metaline Falls, Washington.*

———,1992d, *1:24,000 Scale Topographic Map, Gypsy Peak, Washington.*

———,1984, *1:100,000 Scale Topopgraphic Map, Colville, Washington.*

———, 1967, *1:24,000 Scale Topographic Map, Pass Creek, Washington, Revised 1986.*

———, 1964, *Drainage-Area Data for Eastern Washington, Open File Release.*

Washington Department of Ecology (Ecology), December 2001a, Water Rights Application Tracking Certificates, Pend Oreille County, Washington.

———, January 2001b, Request for Public Record of streamflow rates of tributaries on the Pend Oreille River, Pend Oreille County, Washington.

———,February 2000, *Draft Environmental Impact Statement: Pend Oreille Mine Project, Pend Oreille County, Washington.*

———,July 1992, *Draft Pend Oreille River Management Plan, Water Body No. WA-62-1020, Segment No. 23-62-05.*

———,*November 1991, Pend Oreille River Primary Productivity and Water Quality of Selected Tributaries, Water Body No. WA-62-1020, Segment No. 23-62-05, Report 91-e08.*

Western Regional Climate Center (WRCC), November 2001, Precipitation Records for Metaline Falls, Washington, http:\\www.wrcc.dri.edu.climsum.html.

Zeigler, W.L., June 1949, Pend Oreille, New Development, *Mining World*, Vol. 11, No. 7, pp. 14-17.

draft

APPENDIX A

PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No. 6279466
Lens Type: 35-70 mm zoom

TDD No. 01-08-0009
Pend Oreille River ESI

Photo No.	Date	Time	By	Direction	Description
1-1	6/26/01	0845	LD	N	View of empty copper sulfate storage tanks that used to be surrounded by berms at Pend Oreille Mine. The tanks are scheduled to be removed off site.
1-2	6/26/01	0846	LD	NW	View of staged soil at Pend Oreille Mine where plastic tanks resided when PA was conducted in May 1999. The soil is scheduled to be shipped to Arlington.
1-3	6/26/01	0850	LD	NE	Panoramic view of tailings pile No. 3 at Pend Oreille Mine.
1-4	6/26/01	0851	LD	E	Panoramic view of tailings pile No. 3 at Pend Oreille Mine.
1-5	6/26/01	0852	LD	E	Panoramic view of tailings pile No. 3 at Pend Oreille Mine.
1-6	6/26/01	0853	LD	S	Panoramic view of tailings pile No. 3 at Pend Oreille Mine.
1-7	6/26/01	0914	LD	S	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-8	6/26/01	0915	LD	SW	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-9	6/26/01	0916	LD	W	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-10	6/26/01	0917	LD	W	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-11	6/26/01	0918	LD	NW	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-12	6/26/01	0919	LD	N	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-13	6/26/01	0920	LD	N	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-14	6/26/01	0921	LD	NE	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-15	6/26/01	0922	LD	E	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-16	6/26/01	0923	LD	SE	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-17	6/26/01	0924	LD	E	Panoramic view of tailings pile No. 1 from gravel road through center of pile/pond at Pend Oreille Mine.
1-18	6/26/01	0934	LD	NE	View of intercept trench at Pend Oreille Mine which connects to another trench which then discharges into Pend Oreille River.
1-19	6/26/01	1016	LD	S	View of guard office/entry gate construction at Pend Oreille Mine.
1-20	6/26/01	1020	LD	S	View of upper level tailings pond No. 1 with vegetation at Pend Oreille Mine.
1-21	6/26/01	1021	LD	N	View of lower level tailings pond No. 1 with vegetation at Pend Oreille Mine.
1-22	6/26/01	1030	LD	E	Panoramic view of waste rock pile at Pend Oreille Mine.

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TDD No. 01-08-0009
Pend Oreille River ESI

Photo No.	Date	Time	By	Direction	Description
1-23	6/26/01	1031	LD	SE	Panoramic view of waste rock pile at Pend Oreille Mine.
1-24	6/26/01	1032	LD	SE	Panoramic view of waste rock pile at Pend Oreille Mine.
1-25	6/26/01	1033	LD	S	Panoramic view of waste rock pile at Pend Oreille Mine.
2-1	6/26/01	1034	LD	SW	Panoramic view of waste rock pile at Pend Oreille Mine.
2-2	6/26/01	1035	LD	SW	Panoramic view of waste rock pile at Pend Oreille Mine.
2-3	6/26/01	1036	LD	NW	Panoramic view of waste rock pile at Pend Oreille Mine.
2-4	6/26/01	1037	LD	N	Panoramic view of waste rock pile at Pend Oreille Mine.
2-5	6/26/01	1038	LD	NE	Panoramic view of waste rock pile at Pend Oreille Mine.
2-6	6/26/01	1039	LD	NW	View of field team collecting sample POWP02SS at lower level of waste rock pile at Pend Oreille Mine.
2-7	6/26/01	1040	LD	S	View of lower level of waste rock pile at Pend Oreille Mine.
2-8	6/26/01	1041	LD	W	View of surface water drainage routes from the upper level of the waste rock pile to the lower level at Pend Oreille Mine.
2-9	6/26/01	1042	LD	W	View of field team heading down to lower level of the Pend Oreille Mine waste rock pile, which abuts Pend Oreille River.
2-10	6/26/01	1045	LD	NE	View of waste rock pile base at Pend Oreille Mine.
2-11	6/26/01	1046	LD	SW	View of surface water drainage from base of waste rock pile at Pend Oreille Mine to Pend Oreille River.
2-12	6/26/01	1052	LD	E	View of waste rock pile at Pend Oreille Mine and edge of bank and pool of water on Pend Oreille River.
2-13	6/26/01	1053	LD	E	View of surface water runoff drainage route from Pend Oreille Mine into Pend Oreille River.
2-14	6/28/01	1153	MT	E	View of domestic water supply after confluence of Linton Creek and Metaline domestic drinking water supply.
2-15	6/28/01	1155	LD	SW	Close-up view of sample collected at confluence.
2-16	6/28/01	1200	MT	N	Sample location upgradient from Metaline domestic drinking water supply and confluence with Linton Creek.
2-17	6/28/01	1205	LD	SW	Close-up view of upgradient Metaline water supply spring/intake sample.
2-18	6/28/01	1206	LD	SW	Close-up view of upgradient Metaline water supply spring/intake sample.
3-1	6/25/01	0845	LD	down	View of adit water discharge at Pend Oreille Mine.
3-2	6/25/01	1100	CG	NE	Sample location PRRS01SD along Pend Oreille River.
3-3	6/25/01	1100	CG	NE	Sample PRRS01SD collected along Pend Oreille River.
3-4	6/25/01	1140	CG	SW	View of Pewee Creek (tributary to Pend Oreille River).
3-5	6/25/01	1205	CG	SE	Sample location PRTB01SD at Lime Creek.

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TDD No. 01-08-0009
Pend Oreille River ESI

Photo No.	Date	Time	By	Direction	Description
3-6	6/25/01	1205	CG	SE	Sample PRTB01SD.
3-7	6/25/01	1210	CG	SE	View of Lime Creek (tributary to Pend Oreille River) from Pend Oreille River.
3-8	6/25/01	1230	CG	N	Sample location PRRS02SD.
3-9	6/25/01	1230	CG	N	Sample PRRS02SD.
3-10	6/25/01	1345	CG	NW	Sample location PRTB02SD.
3-11	6/25/01	1345	CG	NW	Sample PRTB02SD.
3-12	6/25/01	1355	CG	NW	View of Everett Creek (tributary to Pend Oreille River) from Pend Oreille River.
3-13	6/25/01	1415	CG	W	Sample location PRTR03SD.
3-14	6/25/01	1415	CG	W	Sample PRTR03SD.
3-15	6/25/01	1425	CG	SW	View of Ledbetter Creek (tributary to Pend Orielle River) from Pend Oreille River.
3-16	6/26/01	1010	CG	NW	Sample location PRTB04SD.
3-17	6/26/01	1010	CG	SE	Sample PRTB04SD.
3-18	6/26/01	1020	CG	NW	View of unnamed tributary to Pend Oreille River (from Pend Oreille River).
3-19	6/26/01	1035	CG	NE	View of Slate Creek (tributary to Pend Oreille River) from Pend Oreille River.
3-20	6/26/01	1036	CG	NE	View of Slate Creek (tributary to Pend Oreille River) from Pend Oreille River.
3-21	6/26/01	1045	CG	NE	Sample location PRTB05SD on Slate Creek.
3-22	6/26/01	1047	CG	NW	Sample PRTB05SD on Slate Creek.
3-23	6/26/01	1140	CG	SW	Sample location PRRS03SD.
3-24	6/26/01	1140	CG	NW	Sample PRRS03SD.
3-25	6/26/01	1335	CG	N	Sample POPP02SW and its location.
3-26	6/26/01	1340	CG	NE	Sample POPP02SD and its location.
4-1	6/26/01	1350	CG	E	Sample location of POPP02 from Pend Oreille River.
4-2	6/26/01	1350	CG	E	Sample location of POPP02 from Pend Oreille River.
4-3	6/26/01	1400	CG	E	View of sample location POPP01 from Pend Oreille River. Note pipe originating underground from Pend Oreille Mine.
4-4	6/26/01	1400	CG	E	View of sample location POPP01 from Pend Oreille River. Note that no sediment was obtainable.
4-5	6/26/01	1405	CG	SE	View of waste rock pile at Pend Oreille Mine from Pend Oreille River.

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Lens Type: 35-70 mm zoom

TDD No. 01-08-0009
Pend Oreille River ESI

Photo No.	Date	Time	By	Direction	Description
4-6	6/26/01	1420	CG	S	View of sample POPP03SW from shore.
4-7	6/26/01	1425	CG	S	View of sample POPP03SD from shore.
4-8	6/26/01	1435	CG	SE	View of POPP03 sample location.
4-9	6/26/01	1530	CG	SE	View of waste rock pile at Pend Oreille Mine (from across Pend Oreille River near Josephine Mine).
4-10	6/26/01	1545	CG	E	Another view of the discharge from Pend Oreille Mine.
4-11	6/27/01	1110	CG	W	View of Flume Creek at its farthest accessible upstream point.
4-12	6/27/01	1115	CG	W	View of confluence of Flume Creek and Pend Oreille River.
4-13	6/27/01	1145	CG	SE	PRRS04SD sample location.
4-14	6/27/01	1146	CG	SE	Sample PRRS04SD.
4-15	6/27/01	1205	CG	SW	Sample POPP04SW from Pend Oreille River.
4-16	6/27/01	1210	CG	SW	View of co-located sample location POPP04.
4-17	6/27/01	1210	CG	SW	Sample POPP04SD.
4-18	6/27/01	1230	CG	N	POPP05SW sample location.
4-19	6/27/01	1230	CG	N	Sample POPP05SW.
4-20	6/27/01	1235	CG	N	Sample POPP05SD.
4-21	6/27/01	1255	CG	SW	POBK01SW sample location.
4-22	6/27/01	1256	CG	E	Sample POBK01SW.
4-23	6/27/01	1300	CG	N	Sample POBK01SD.
4-24	6/27/01	1715	CG	NW	PRTB06SD sample location.
4-25	6/27/01	1715	CG	W	Sample PRTB06SD.
5-1	6/27/01	1800	CG	NW	PRTB07SD sample location at Beaver Creek.
5-2	6/27/01	1805	CG	NW	Sample PRTB07SD.
5-3	6/28/01	0935	CG	N	JOPP01SD sample location at Josephine Mine.
5-4	6/28/01	0935	CG	N	Sample JOPP01SD.
5-5	6/28/01	0950	CG	W	View of Flume Creek.
5-6	6/28/01	1233	CG	E	PRTB08SD sample location at Sullivan Creek.
5-7	6/28/01	1235	CG	E	Sample PRTB08SD.
5-8	6/28/01	1245	CG	E	View of PRTB08SD sample location from boat.
5-9	6/28/01	1310	CG	W	PRTB09SD sample location on Linton Creek.
5-10	6/28/01	1312	CG	W	Sample PRTB09SD on Linton Creek.
5-11	6/28/01	1355	CG	SE	Sample PRBK01SD.

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Photo No.	Date	Time	By	Direction	Description
5-12	6/28/01	1405	CG	SE	Sample PRBK02SD.
5-13	6/28/01	1415	CG	SE	Sample PRBK03SD.
5-14	6/28/01	1420	CG	NW	View of hillside upstream from background sample locations PRBK01SD through PRBK03SD.
5-15	6/28/01	1421	CG	SW	View of hillside upstream from background sample locations PRBK01SD through PRBK03SD.
5-16	6/28/01	1440	CG	NW	View of hillside upstream from background sample locations PRBK01SD through PRBK03SD.
No Roll 6					
7-1	6/26/01	0919	RN	down	View of Pend Oreille Mine sample POSP01SD.
7-2	6/26/01	0938	RN	down	View of Pend Oreille Mine sample POSP02SD.
7-3	6/26/01	1020	RN	SE	View of Pend Oreille Mine sample location POSP01SS.
7-4	6/26/01	1025	RN	down	View of Pend Oreille Mine sample POWP01SS.
7-5	6/26/01	1035	RN	N	View of Pend Oreille Mine sample location POWP02SS.
7-6	6/26/01	1037	RN	down	View of Pend Oreille Mine sample POWP02SS.
7-7	6/26/01	1040	RN	NE	View of Pend Oreille Mine drainage route into lower level of waste rock pile.
7-8	6/26/01	1045	RN	E	View of Pend Oreille Mine drainage route in background. Sample location POWP03SS.
7-9	6/26/01	1047	RN	down	View of Pend Oreille Mine sample POWP03SS.
7-10	6/26/01	1510	RN	S	View of Josephine Mine in background. Sample JOSP01SW. Note fence.
7-11	6/26/01	1520	RN	NW	View of collapsed wooden structure at Josephine Mine.
8-1	6/26/01	1520	RN	NW	View of Josephine Mine shaft.
8-2	6/26/01	1525	RN	down	View of Josephine Mine sample JOPP01SD which was not sent in for analysis as the sample was recollected by the boat team.
8-3	6/26/01	1535	TK	W	View of Josephine Mine. Sample JOPP01SD was collected to the right of the wood piling and waste rock and was resampled by the boat team.
8-4	6/26/01	1410	RN	E	View of possible adit at Yellowhead Mine.
8-5	6/26/01	1410	RN	E	View of Yellowhead Mine waste rock pile and collapsed building.
8-6	6/27/01	1040	AJ	down	View of background sample BK02SS behind the Circle Motel.
8-7	6/27/01	1045	AJ	SW	View of background sample location BK02SS. Note blue roof of the Circle Motel.

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Photo No.	Date	Time	By	Direction	Description
8-8	6/27/01	1150	TK	NE	View of closed Forest Service road to King Tut Mine, Red Top Mine, and Lead Hill Mine.
8-9	6/27/01	1151	TK	NE	View of closed Forest Service Road 3155 (Slate Creek Road).
8-10	6/27/01	1327	TK	E	View of Lucky Strike Mine adit.
8-11	6/27/01	1330	TK	E	View of Lucky Strike Mine shaft.
8-12	6/27/01	1330	TK	down	Downward view of Lucky Strike Mine shaft.
8-13	6/27/01	1545	TK	NW	View of Z Canyon Mine. Note end of road and the Boundary Dam.
8-14	6/27/01	1645	TK	NW	View of collapsed house at Lead Queen Mine.
8-15	6/28/01	0910	TK	NW	View of Lead Hill Mine adit No. 1.
8-16	6/28/01	0915	TK	NW	View of Lead Hill Mine adit No. 2.
8-17	6/28/01	0916	TK	NW	View of Lead Hill Mine adit No. 3.
8-18	6/28/01	0918	TK	SW	View of Lead Hill Mine shaft.
8-19	6/28/01	1000	TK	NW	View of King Tut Mine on Forest Service Road 203.
8-20	6/28/01	1030	DW	SW	View of Red Top Mine on trail.
8-21	6/28/01	1225	TK	NE	View of Hoage Mine waste rock pile.
8-22	6/28/01	1230	TK	down	View of Hoage Mine shaft.
8-23	6/28/01	1257	TK	NE	View of Lead King Mine adit No. 1.
8-24	6/28/01	1300	TK	NE	View of Lead King Mine adit No. 2.
8-25	6/28/01	1302	TK	NE	View of Lead King Mine waste rock pile No. 2.
9-1	6/28/01	1305	DW	E	View of Lead King Mine waste rock pile No. 1.
9-2	6/28/01	1457	TK	S	View of Flume Creek (tributary to Pend Orielle River) sample location PRTB10SD.
9-3	6/28/01	1500	TK	down	View of Flume Creek (tributary to Pend Orielle River) sample PRTB10SD.
9-4	6/28/01	1530	TK	N	View of Washington Mine at the bottom of Washington Hill.
10-1	6/25/01	0935	LD	SE	View of sample location POSP01SD on tailings pile No. 1 at Pend Oreille Mine.
10-2	6/25/01	0938	LD	down	Close-up view of sample POSP01SD at Pend Oreille Mine.
10-3	6/25/01	0950	LD	S	View of sample location POTP01SS on tailings pile No. 1 at Pend Oreille Mine.
10-4	6/25/01	0955	LD	down	Close-up view of sample POTP01SS on tailings pile No. 1 at Pend Oreille Mine.
10-5	6/25/01	1007	LD	S	View of sample location POSP02SD at tailings pile No. 1 at Pend Oreille Mine.

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Lens Type: 35-70 mm zoom **Pend Oreille River ESI**

Photo No.	Date	Time	By	Direction	Description
10-6	6/25/01	1015	LD	down	Close-up view of sample POSP02SD at tailings pile No. 1 at Pend Oreille Mine.
10-7	6/25/01	1025	LD	E	View of sample location POTP02SS at tailings pile No. 1 at Pend Oreille Mine.
10-8	6/25/01	1027	LD	E	Close-up view of sample POTP02SS at tailings pile No. 1 at Pend Oreille Mine.
10-9	6/25/01	1045	LD	S	View of sample location POTP03SS at tailings pile No. 1 at Pend Oreille Mine.
10-10	6/25/01	1047	LD	S	Close-up view of sample POTP03SS at tailings pile No. 1 at Pend Oreille Mine.
10-11	6/25/01	1125	LD	N	View of sample location POTP04SS at tailings pile No. 3 at Pend Oreille Mine.
10-12	6/25/01	1126	LD	N	Close-up view of sample POTP04SS at tailings pile No. 3 at Pend Oreille Mine.
10-13	6/25/01	1145	LD	SW	View of sample POTP05SS at sample location PTP05SS at tailings pile No. 3 at Pend Oreille Mine.
10-14	6/25/01	1146	LD	SW	Close-up view of sample POTP05SS at tailings pile No. 3.
11-1	6/25/01	1200	LD	W	View of sample location POTP06SS at tailings pile No. 3 at Pend Oreille Mine.
11-2	6/25/01	1201	LD	W	Close-up view of sample POTP06SS at tailings pile No. 3 at Pend Oreille Mine.
11-3	6/25/01	1405	MW	down	View of sample POTP07SS at Pend Oreille Mine.
11-4	6/25/01	1406	MW	W	Sample location POTP07SS at Pend Oreille Mine.
11-5	6/25/01	1412	MW	down	Close-up view of sample POTP08SS at Pend Oreille Mine.
11-6	6/25/01	1413	MW	W	Sample location POTP08SS at Pend Oreille Mine.
11-7	6/25/01	1422	MW	down	Close-up view of sample POTP09SS at Pend Oreille Mine.
11-8	6/25/01	1423	MW	E	Sample location POTP09SS at Pend Oreille Mine.
11-9	6/25/01	1555	MW	down	View of sample POBG01SD at Pend Oreille Mine.
11-10	6/25/01	1600	AJ	N	View of sample POCR01SW and creek at Pend Oreille Mine.
11-11	6/25/01	1628	MW	W	View of POCR01SD sampling at Pend Oreille Mine.
11-12	6/25/01	1638	DG	W	View of sample POCR01SD at Pend Oreille Mine.
11-13	6/26/01	0920	MW	down	View of Metaline Mine lower shaft.
11-14	6/26/01	0920	MW	W	View of Metaline Mine lower waste rock pile.
11-15	6/26/01	0920	MW	down	View of Metaline Mine upper shaft.
11-16	6/26/01	0940	AJ	W	View of Sterling Mine upper shaft.
11-17	6/26/01	0940	AJ	W	View of Sterling Mine lower area.

PHOTOGRAPH IDENTIFICATION SHEET

Camera Serial No. 6279466 | TDD No. 01-08-0009
Lens Type: 35-70 mm zoom | Pend Oreille River ESI

Photo No.	Date	Time	By	Direction	Description
11-18	6/26/01	1030	MW	W	View of West Contact Mine area.
11-19	6/26/01	1030	MW	down	View of West Contact Mine shaft.
11-20	6/26/01	1103	MW	W	View of Diamond R Mine shaft.
11-21	6/26/01	1106	MW	W	View of Diamond R Mine waste rock pile.
11-22	6/26/01	1130	MW	W	View of Diamond R Mine shaft No. 2.
11-23	6/26/01	1130	MW	W	View of Diamond R Mine shaft No. 2.
11-24	6/26/01	1130	MW	W	View of Diamond R Mine waste rock pile.
12-1	6/26/01	1200	MW	W	View of Blue Bucket Mine shaft area.
12-2	6/26/01	1200	MW	N	View of Blue Bucket Mine shaft area.
12-3	6/26/01	1200	MW	W	View of Blue Bucket Mine creek and shaft area.
12-4	6/26/01	1300	MW	down	View of Blue Bucket Mine sample BBPP01SD.
12-5	6/26/01	1305	MW	down	View of Blue Bucket Mine sample BBPP02SD.
12-6	6/26/01	1315	MW	W	View of sample location BBPP02SD at Blue Bucket Mine.
12-7	6/26/01	1330	MW	S	View of Bella May Mine lower shaft.
12-8	6/26/01	1340	MW	S	View of Bella May Mine upper shaft.
12-9	6/26/01	1340	MW	S	View of third Bella May Mine shaft.
12-10	6/26/01	1344	MW	N	View of waste rock pile at Bella May Mine.
12-11	6/26/01	1400	MW	down	View of Lehigh Mine 1 shaft 1 (vertical).
12-12	6/26/01	1400	MW	E	View of Lehigh Mine 1 shaft 2 (horizontal).
12-13	6/26/01	1400	MW	down	View of Lehigh Mine 1 shaft 3 (vertical).
12-14	6/26/01	1410	MW	N	View of Lehigh Mine 1 waste rock area with owner in picture.
12-15	6/26/01	1415	MW	N	View of Lehigh Mine 1 waste rock area. Note lack of rock in the middle of the pile.
12-16	6/26/01	1540	MW	NW	View of Oriole Mine former shaft.
12-17	6/26/01	1540	MW	NW	View of Oriole Mine waste rock pile and shaft.
12-18	6/26/01	1540	MW	N	View of Oriole Mine lower waste rock pile.
12-19	6/26/01	1550	MW	NW	View of Oriole Mine area.
12-20	6/26/01	1555	MW	NW	View of Oriole Mine timber structure at lower level.
12-21	6/26/01	1555	MW	N	View of Oriole Mine waste rock pile.
12-22	6/27/01	1230	RN	NW	View of Oriole Mine shaft. Note gate across shaft entrance.
12-23	6/27/01	1230	RN	NW	View of Oriole Mine shaft with fallen rock above pipe.
12-24	6/27/01	1235	RN	N	View of Oriole Mine sample location ORSP01SW.

PHOTOGRAPH IDENTIFICATION SHEET

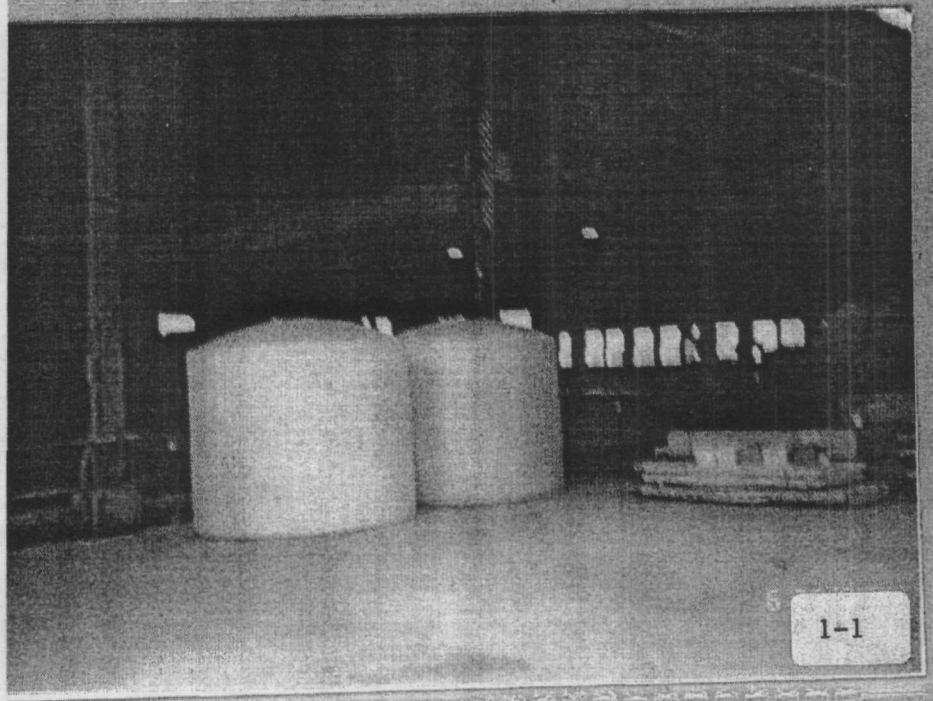
Camera Serial No. 6279466
Lens Type: 35-70 mm zoom

TDD No. 01-08-0009
Pend Oreille River ESI

Photo No.	Date	Time	By	Direction	Description
13-1	6/27/01	1240	RN	N	View of Oriole Mine sample location ORSP01SD.
13-2	6/27/01	1242	RN	W	View of Oriole Mine adit (at right), small waste rock pile and wood on upper level, and overflowing debris (at left).
13-3	6/27/01	1310	RN	NW	View of Lehigh Mine 2 adit.
13-4	6/27/01	1310	RN	NW	Close-up view of Lehigh Mine 2 adit. Note gate.
13-5	6/27/01	1312	RN	NW	View of waste rock pile at Lehigh Mine 2.
13-6	6/27/01	1330	RN	E	Collection of sample BK03SS.
13-7	6/27/01	1332	RN	down	Close-up view of sample BK03SS.
13-8	6/27/01	1405	RN	NW	View of Oriole Mine sample location ORSP02SD. Note drainage route in background.
13-9	6/27/01	1405	RN	down	Close-up view of sample ORSP02SD at Oriole Mine.
13-10	6/27/01	1410	RN	NW	View of collapsed wooden structure covered with dirt at Oriole Mine.

Key:

AJ = Alan Johnson.
CG = Charles Gregory.
DG = Dave Godlewski.
DW = Daniel Weiss.
E = East.
ESI = Expanded site inspection.
LD = Leatta Dahlhoff.
MT = Monica Tonel.
MW = Mark Woodke.
N = North.
NE = Northeast.
No. = Number.
NW = Northwest.
PA = Preliminary asessment.
RN = Renee Nordeen.
S = South.
SE = Southeast.
SW = Southwest.
TK = Tara Karamas.
W = West.



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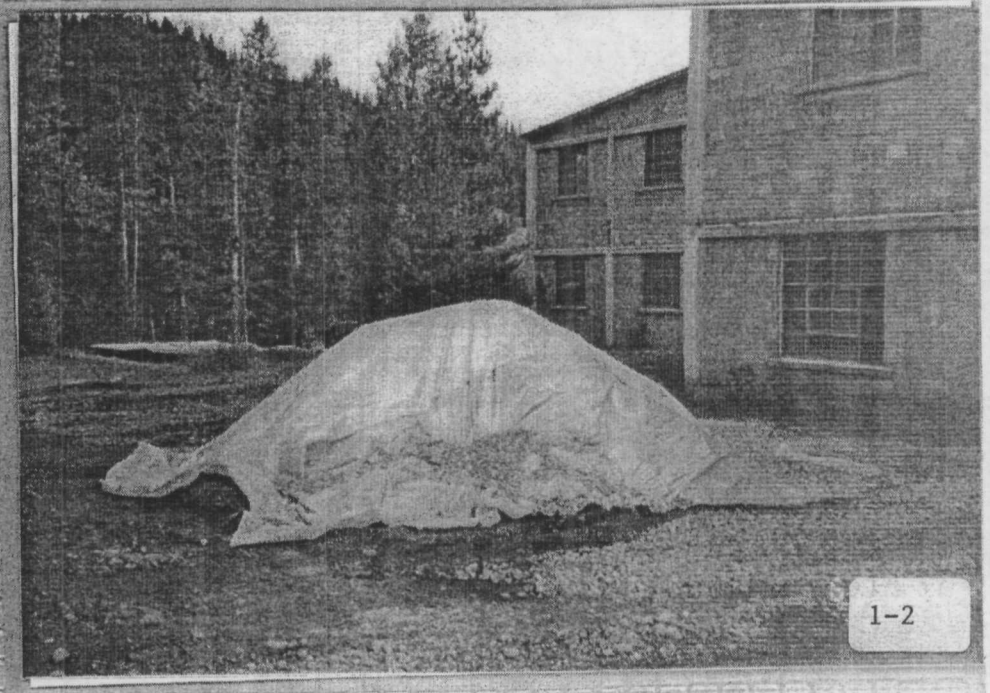

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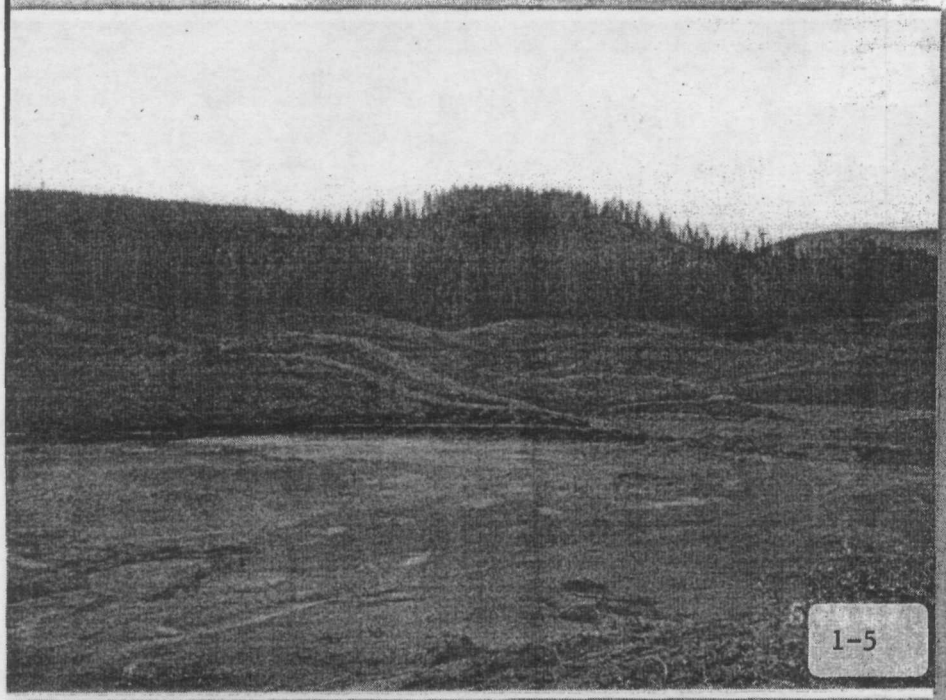

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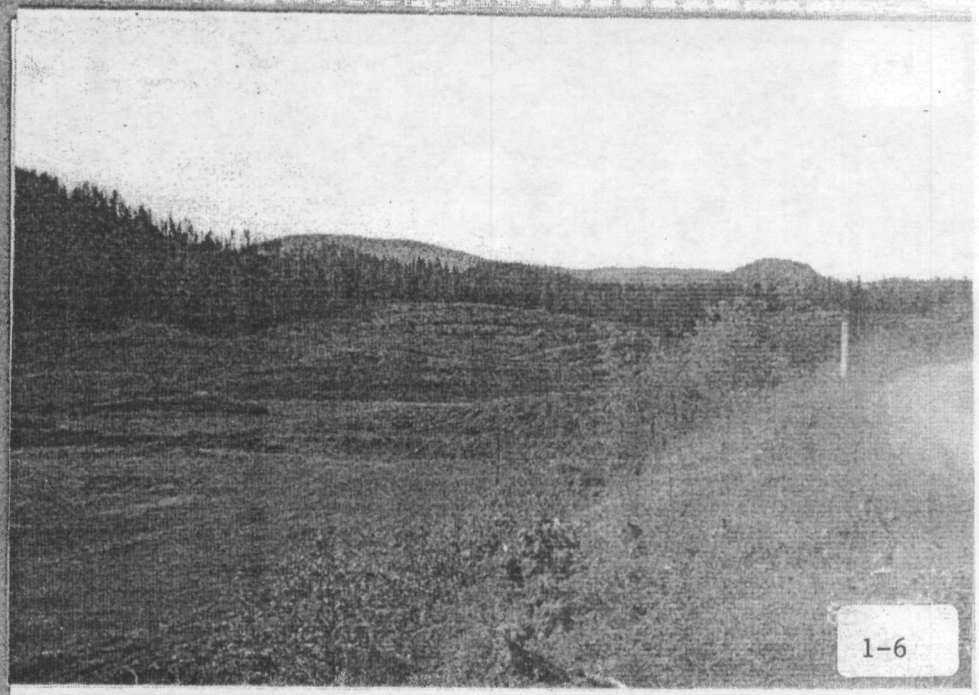

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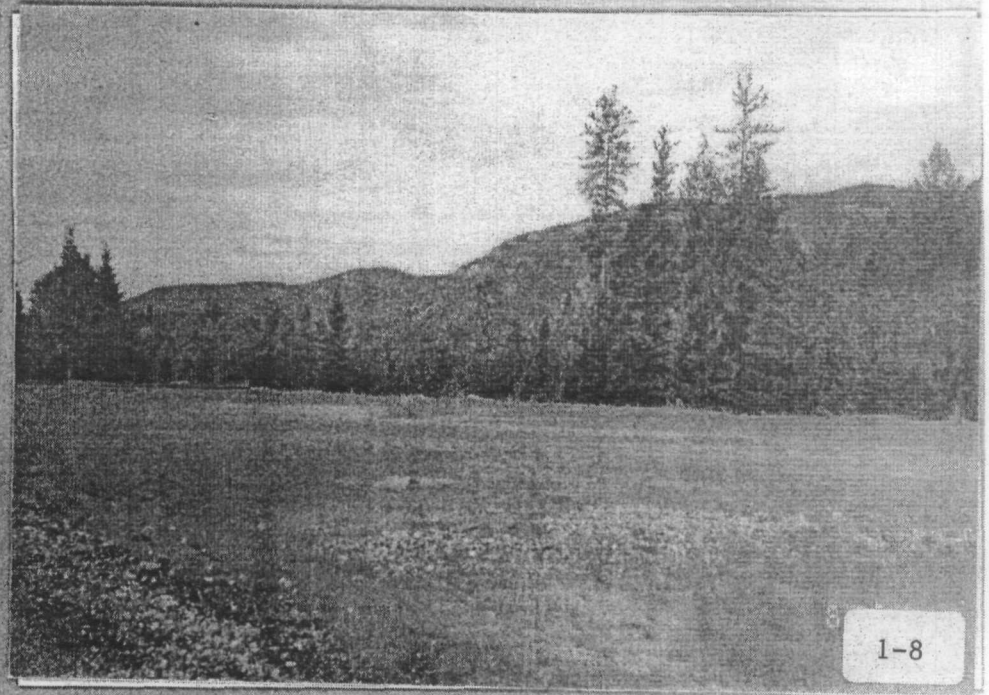

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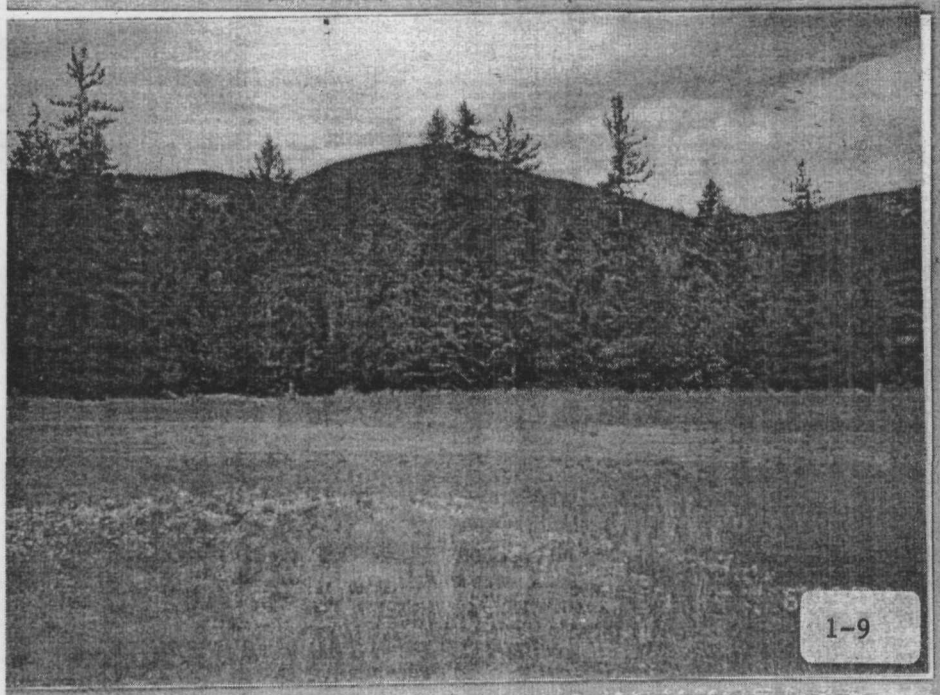

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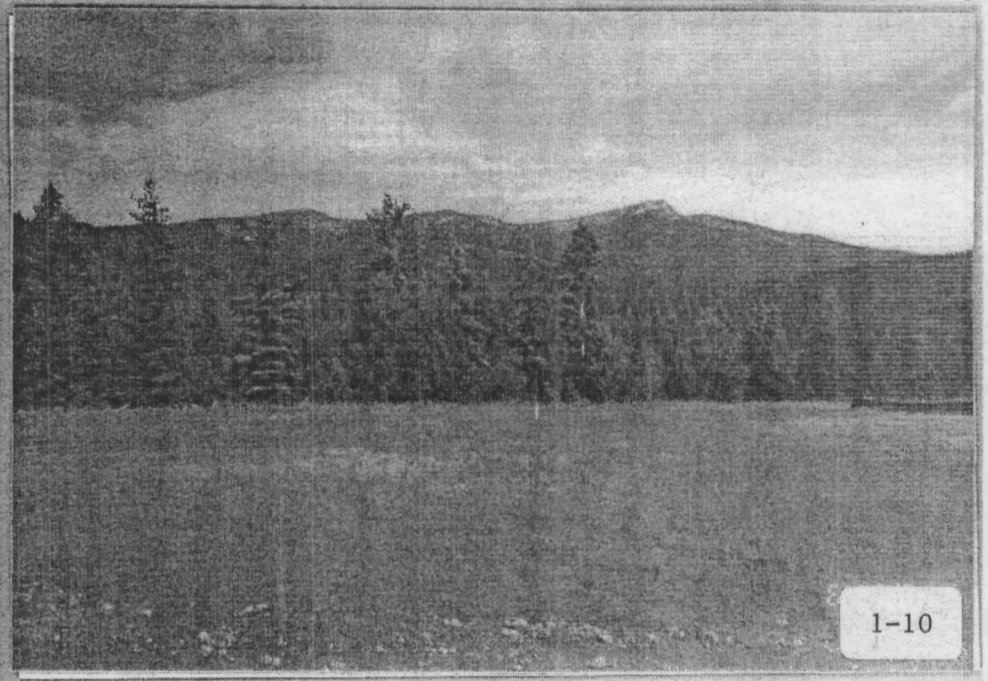

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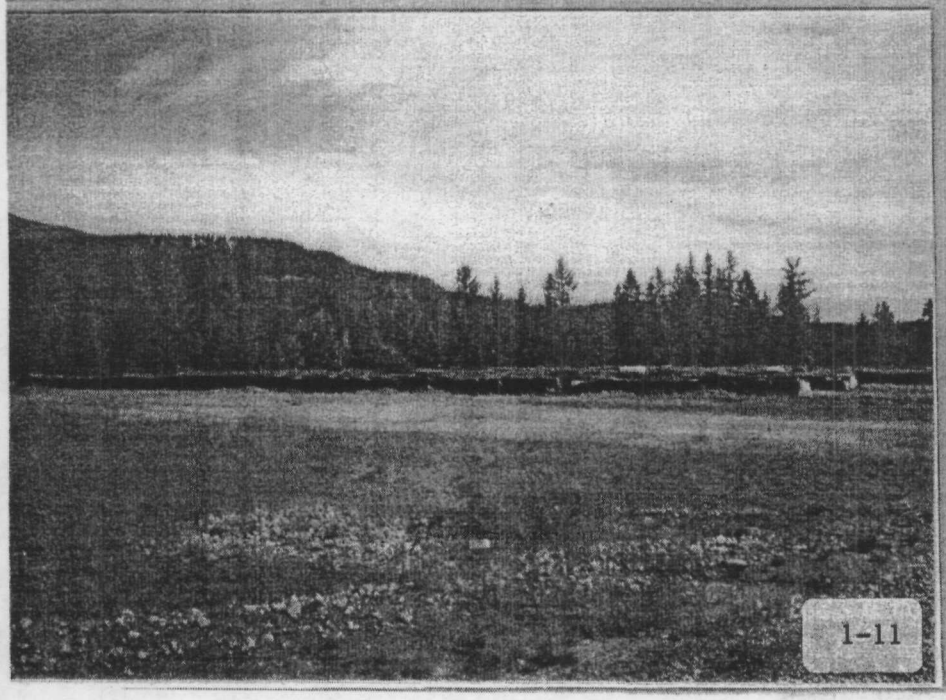

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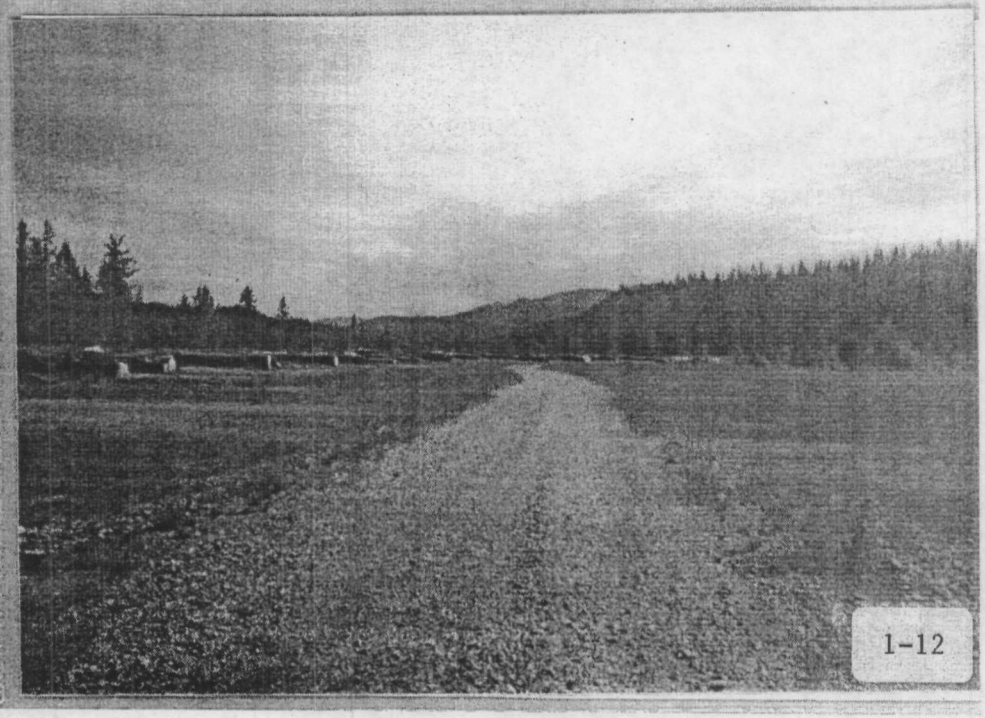

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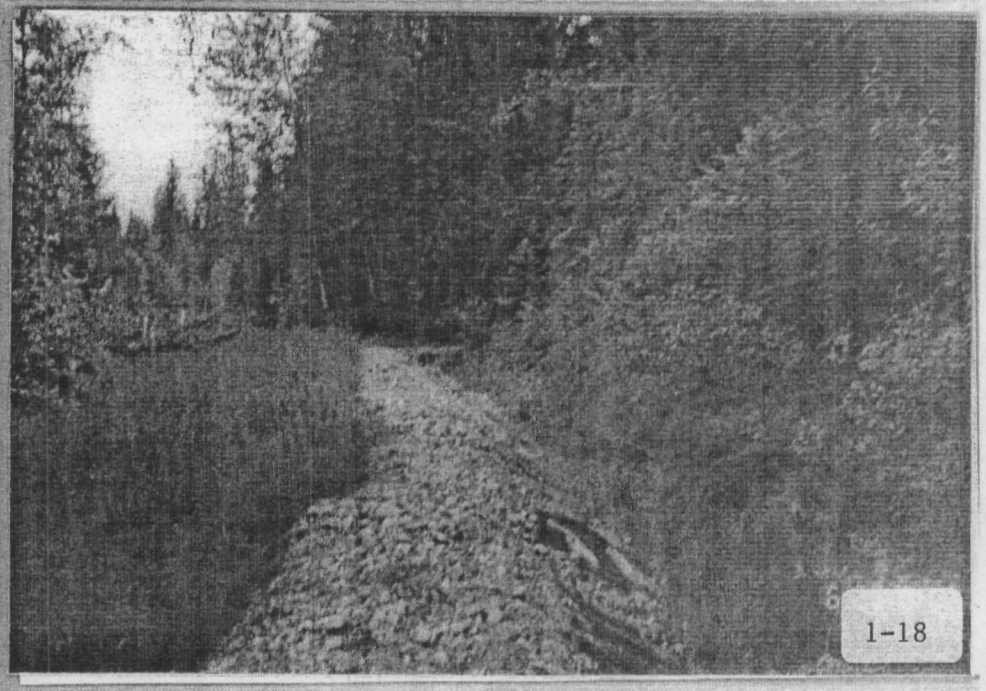

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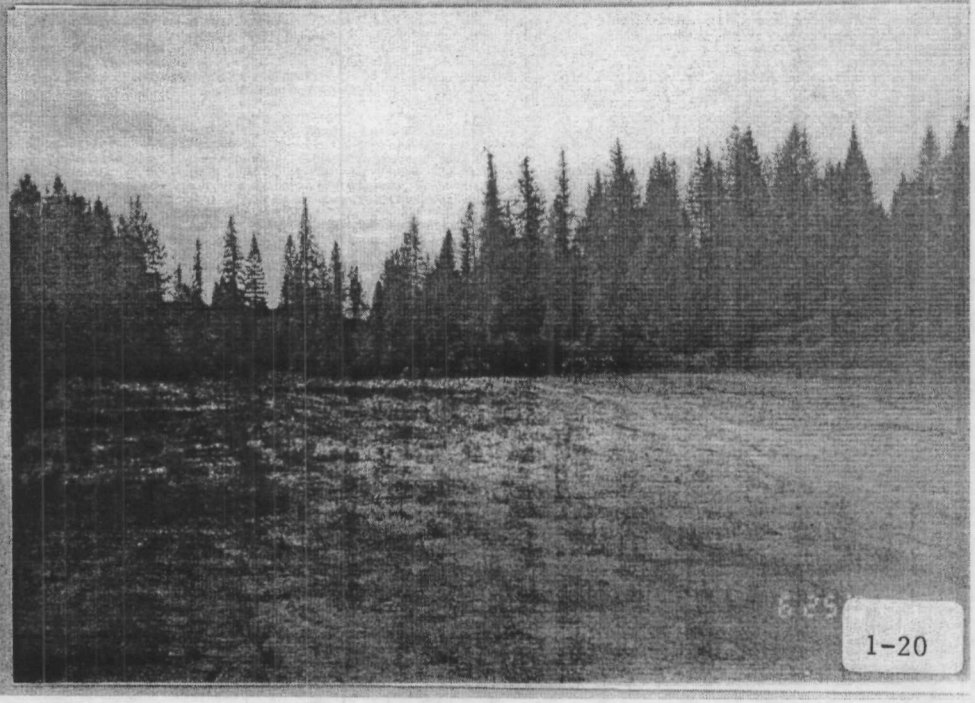

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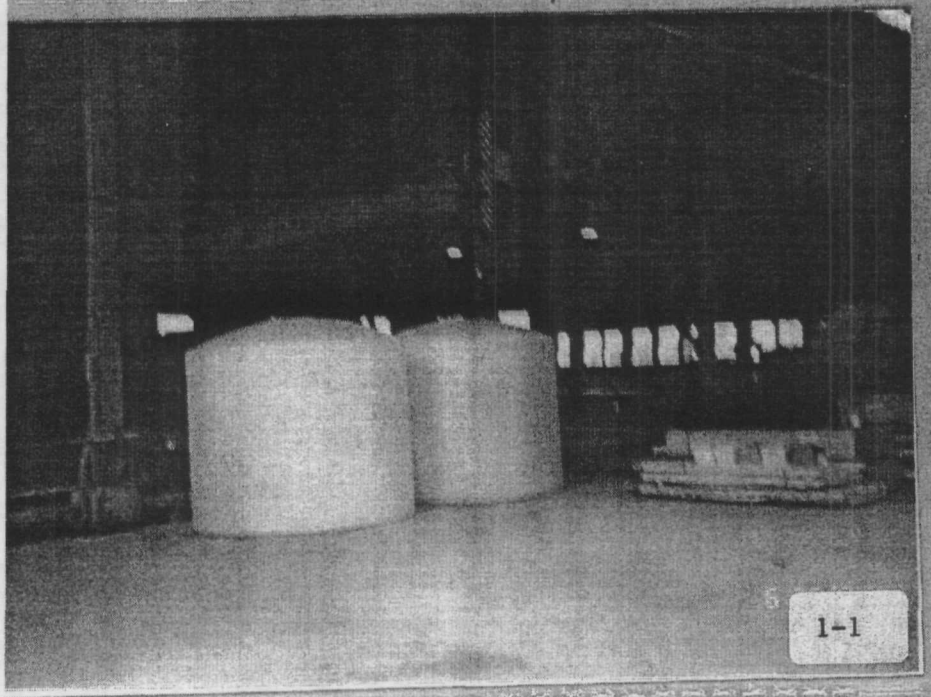

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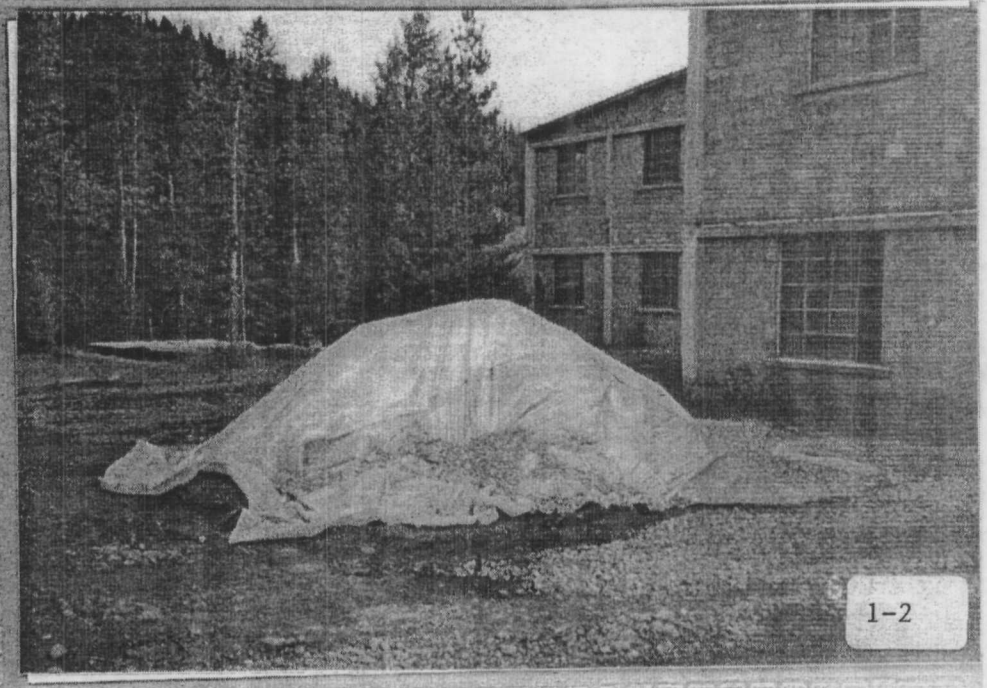

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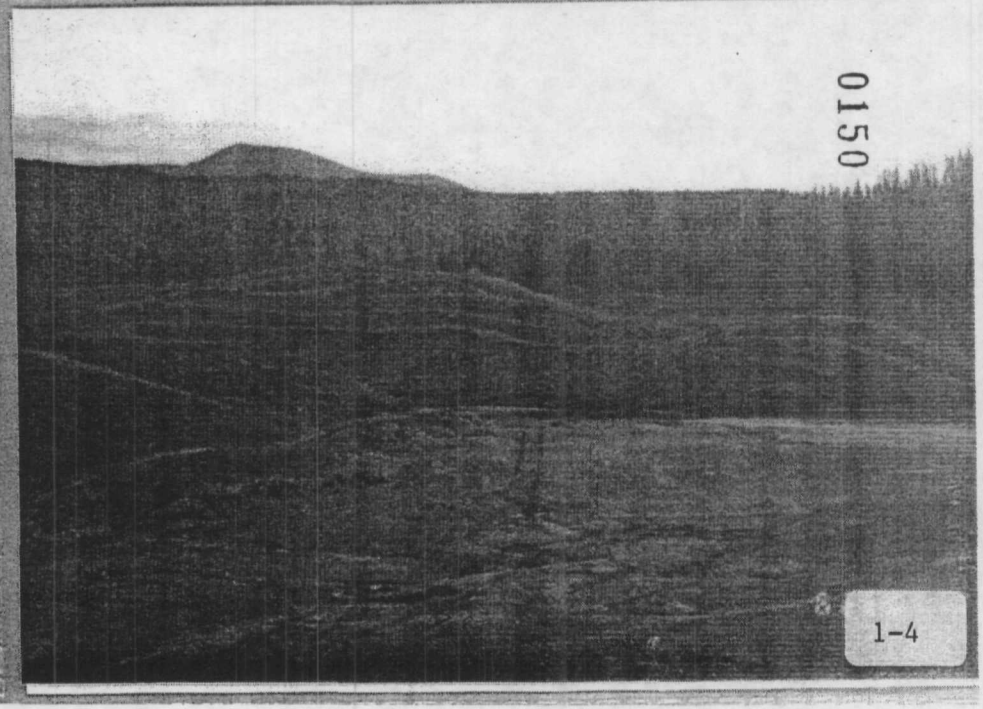

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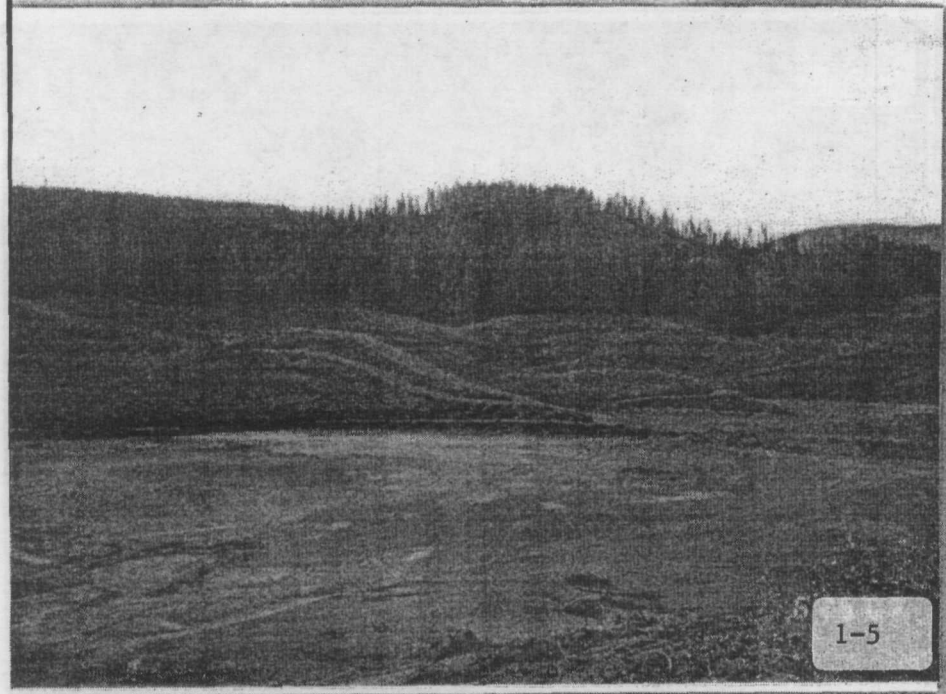

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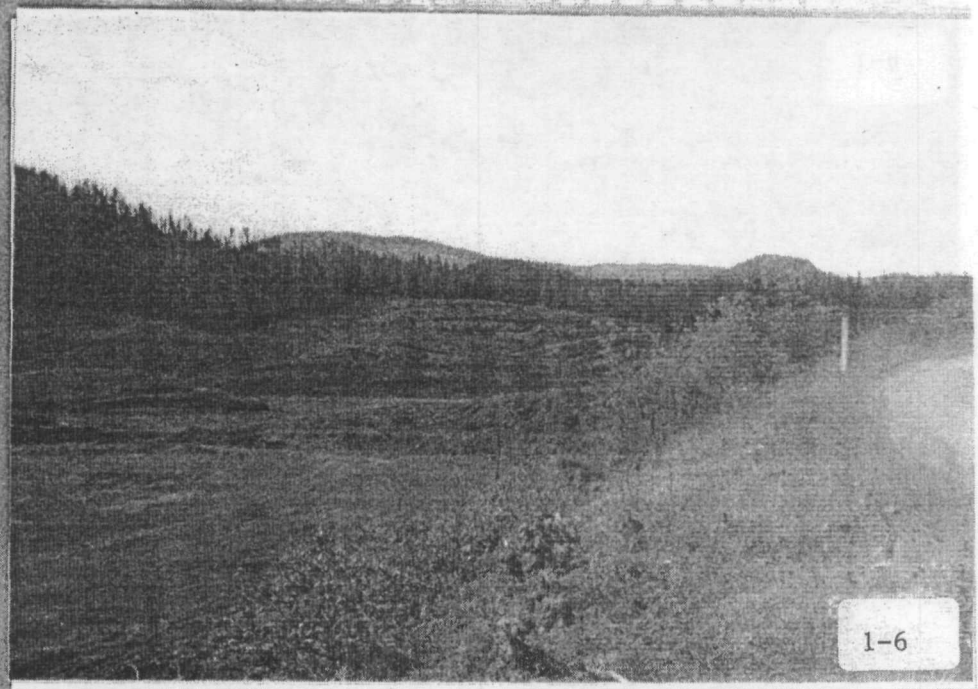

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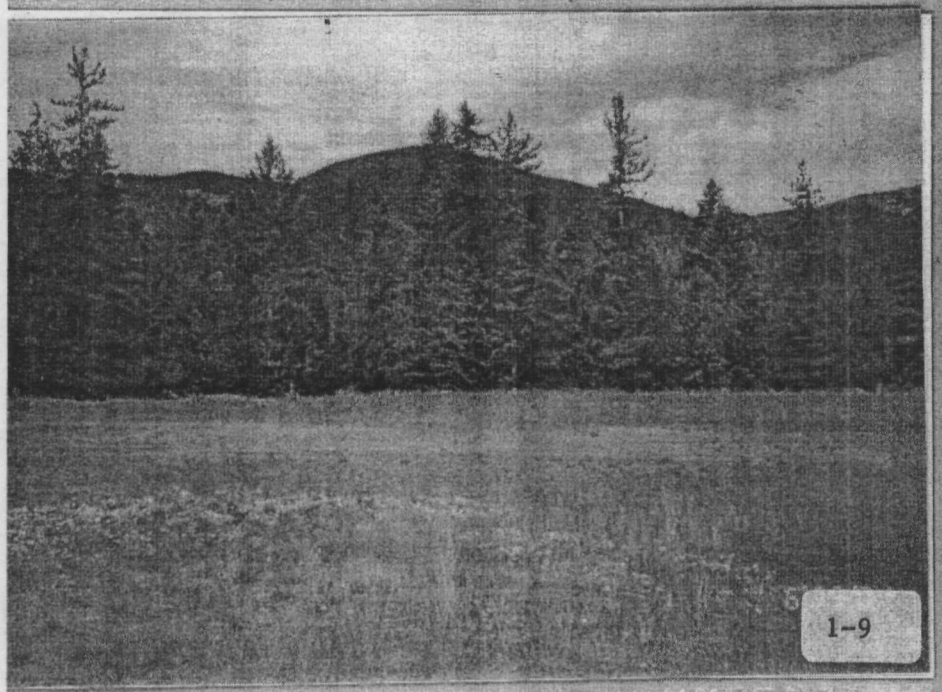

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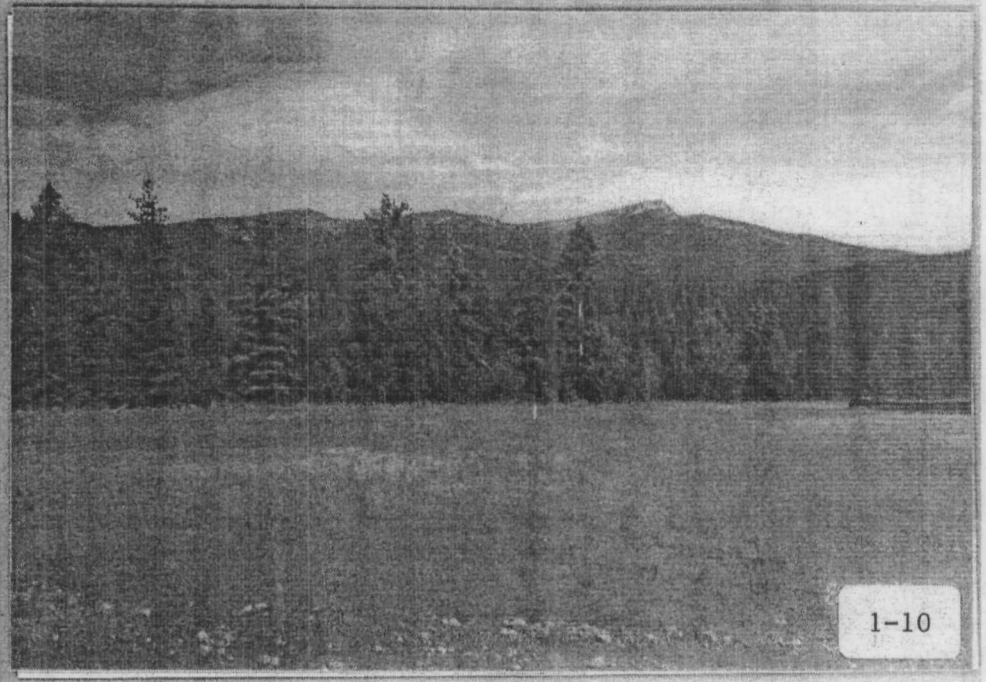

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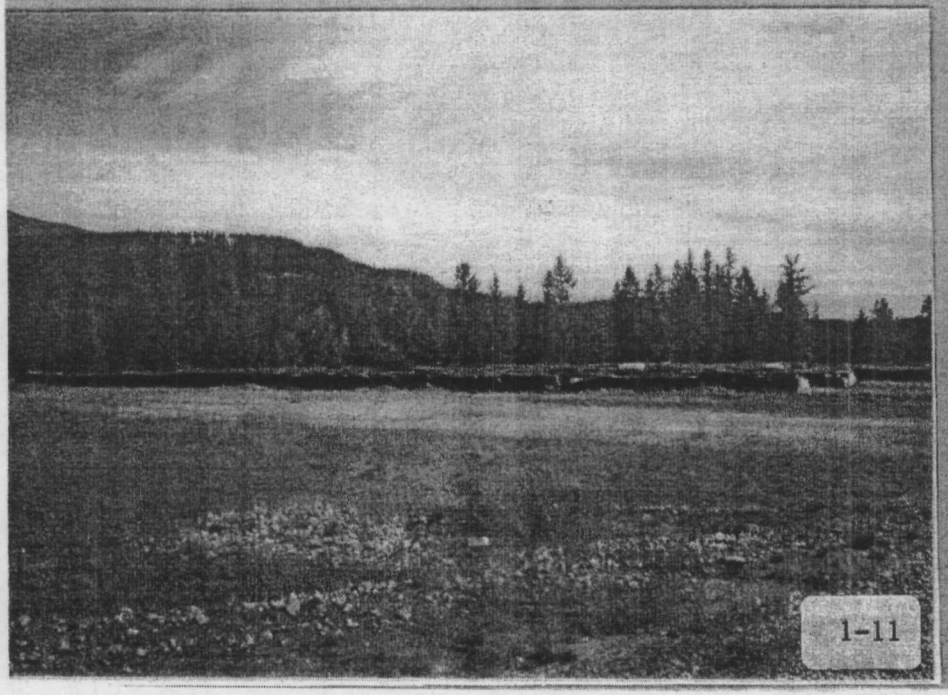

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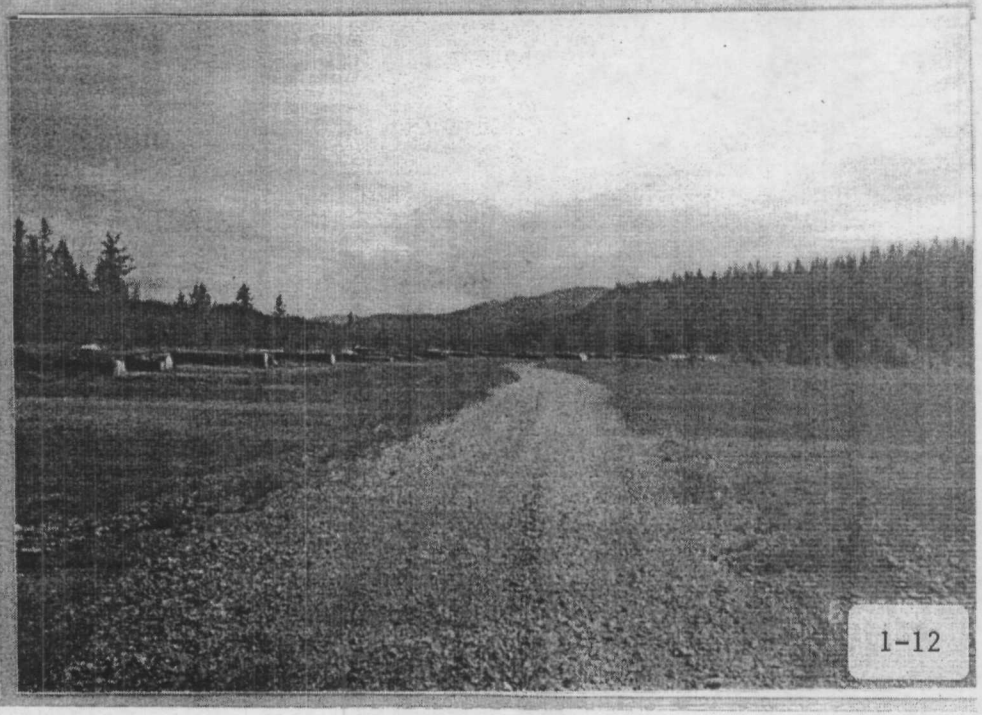

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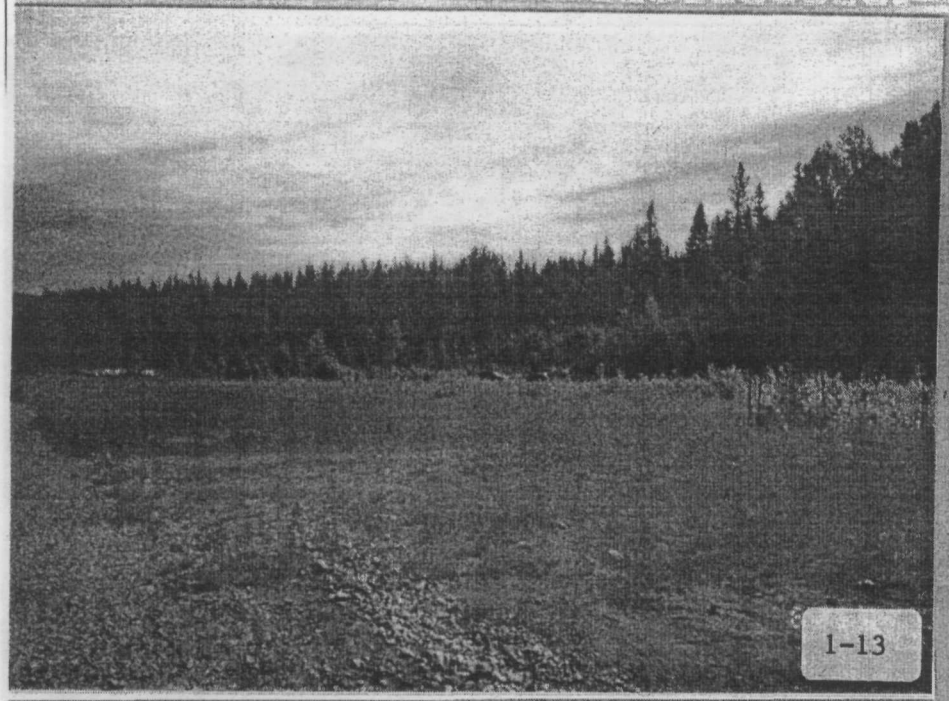
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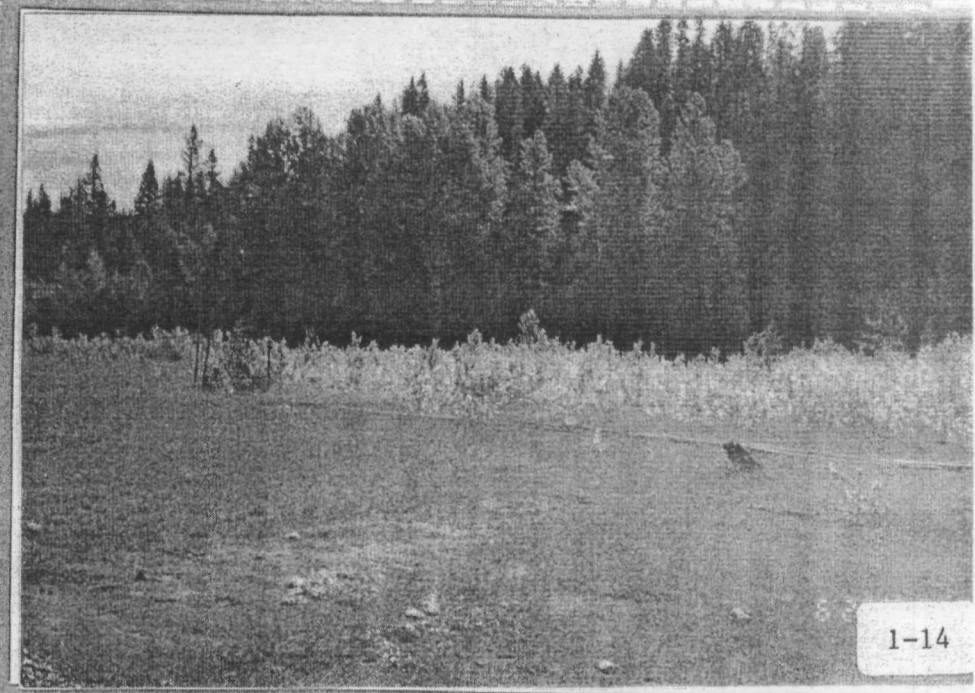
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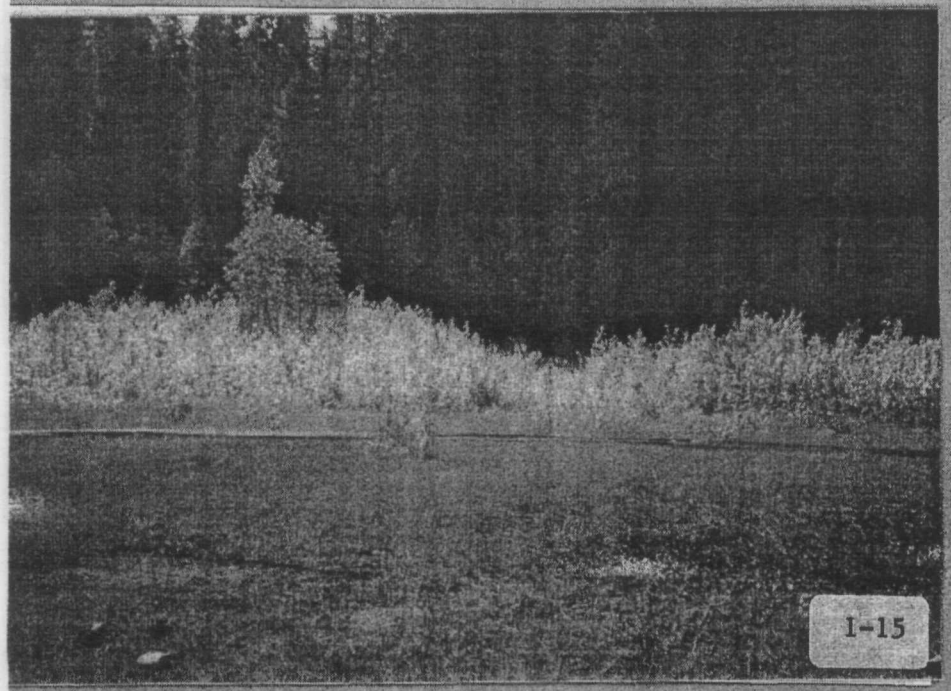
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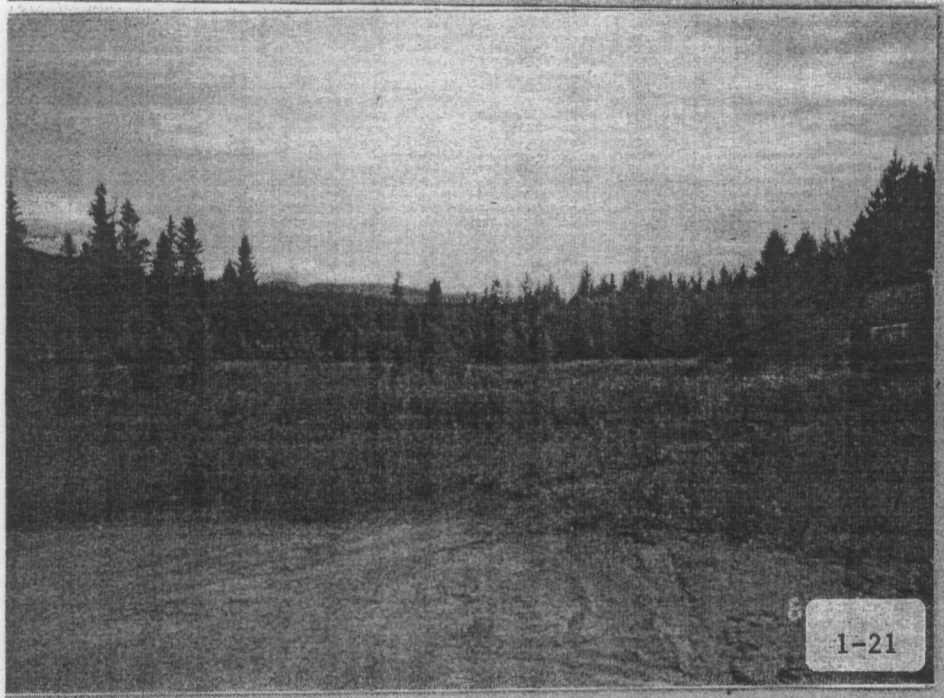

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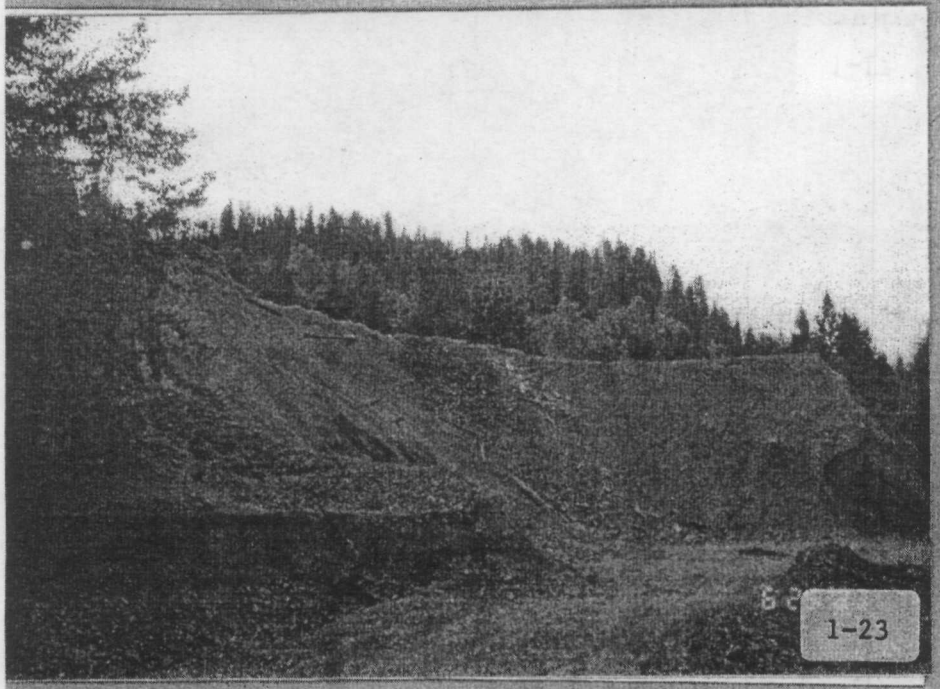

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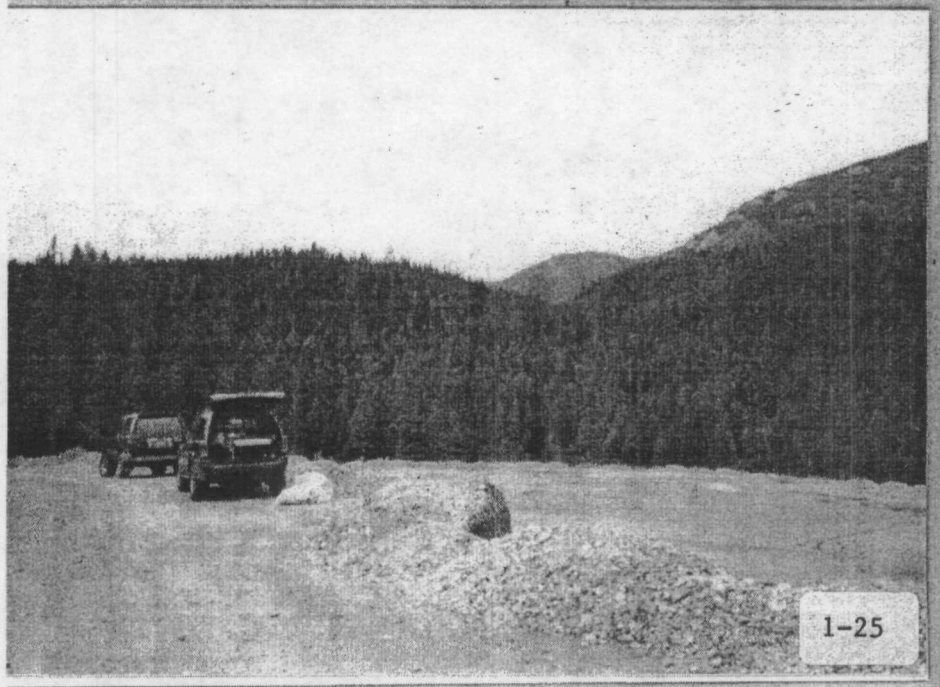

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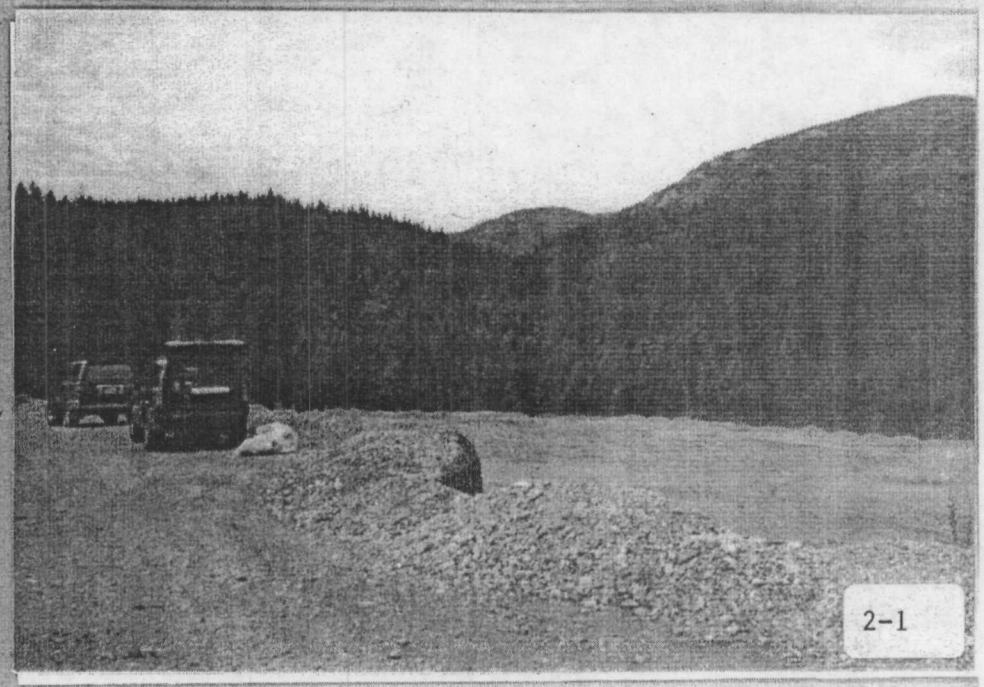

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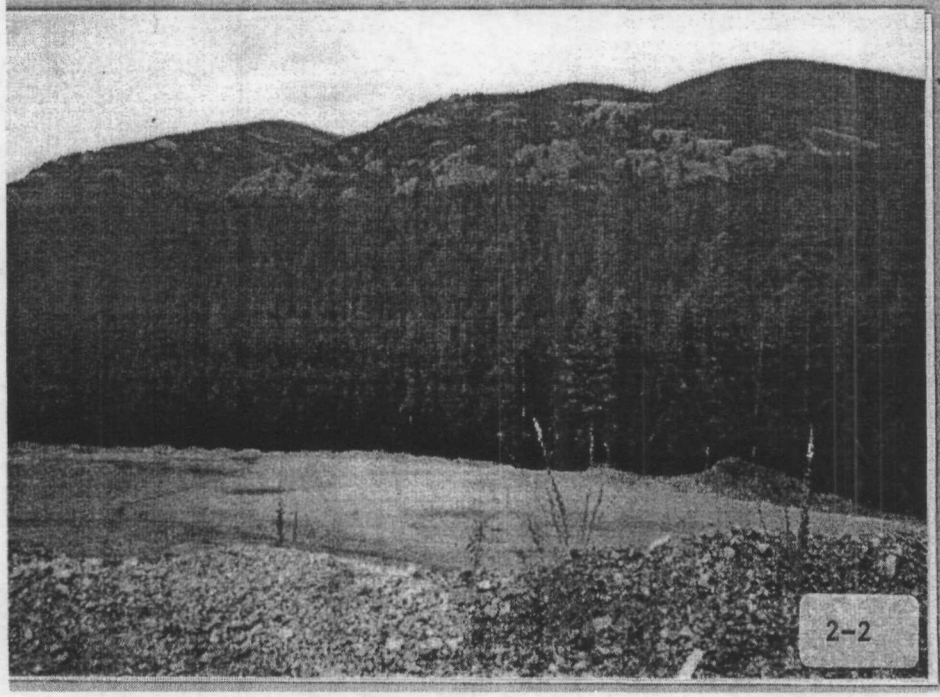

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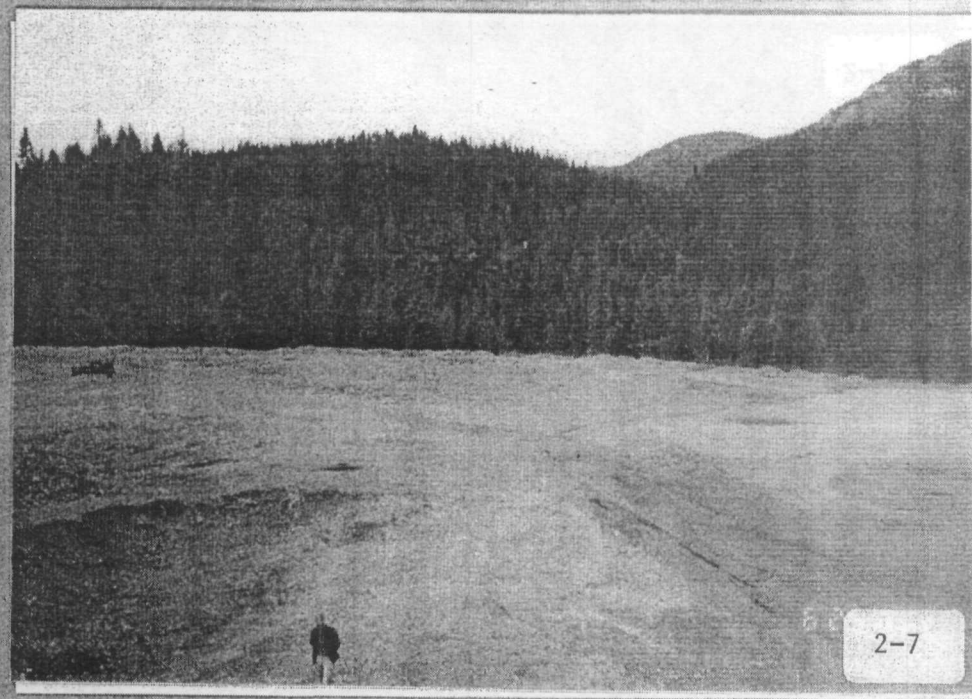

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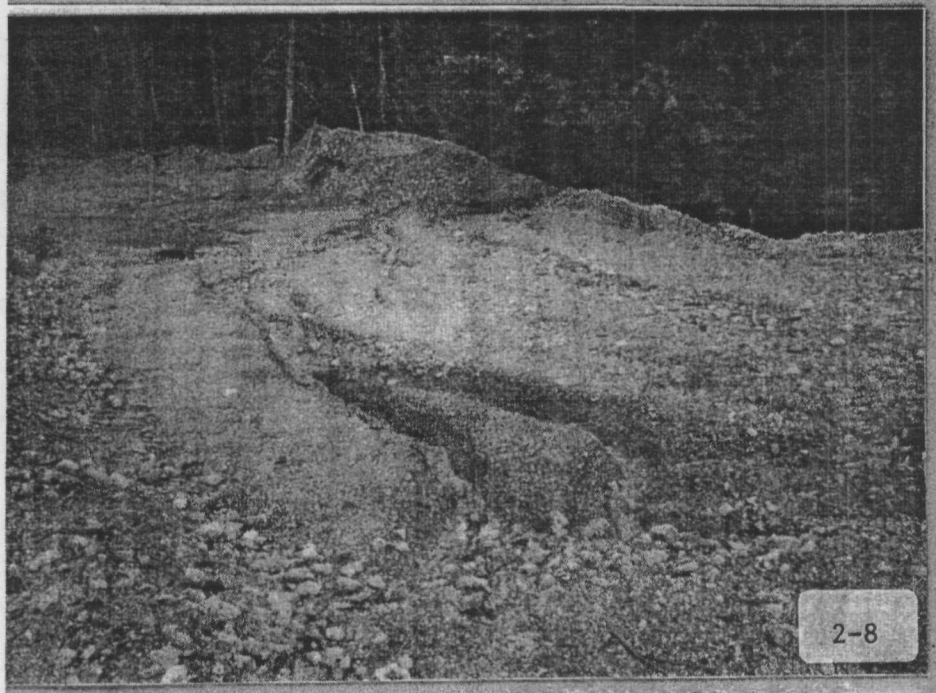

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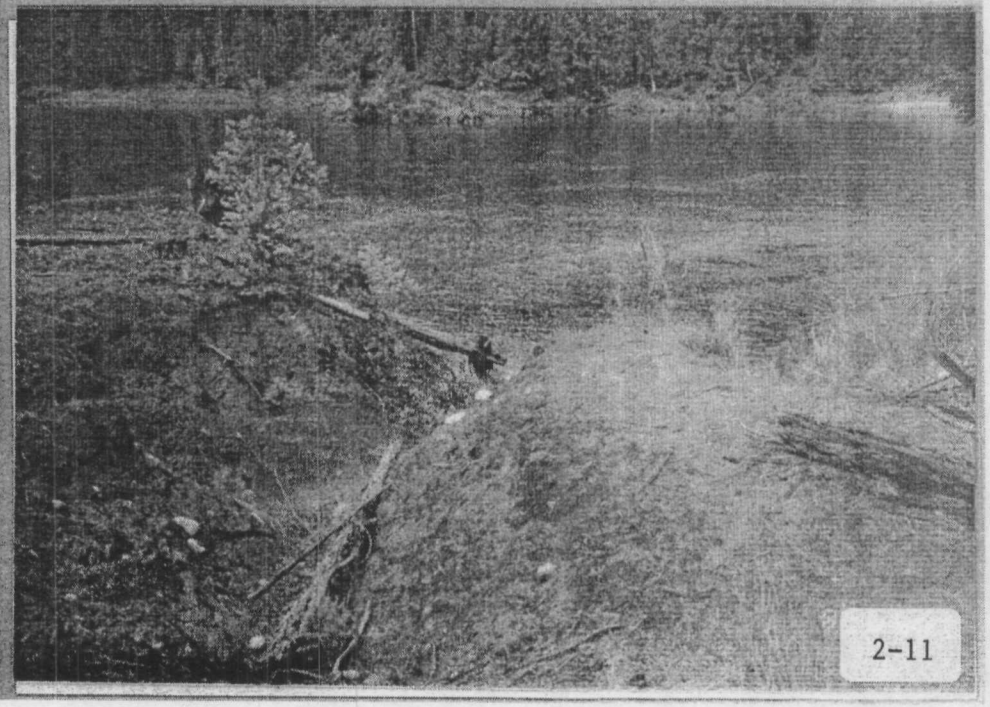

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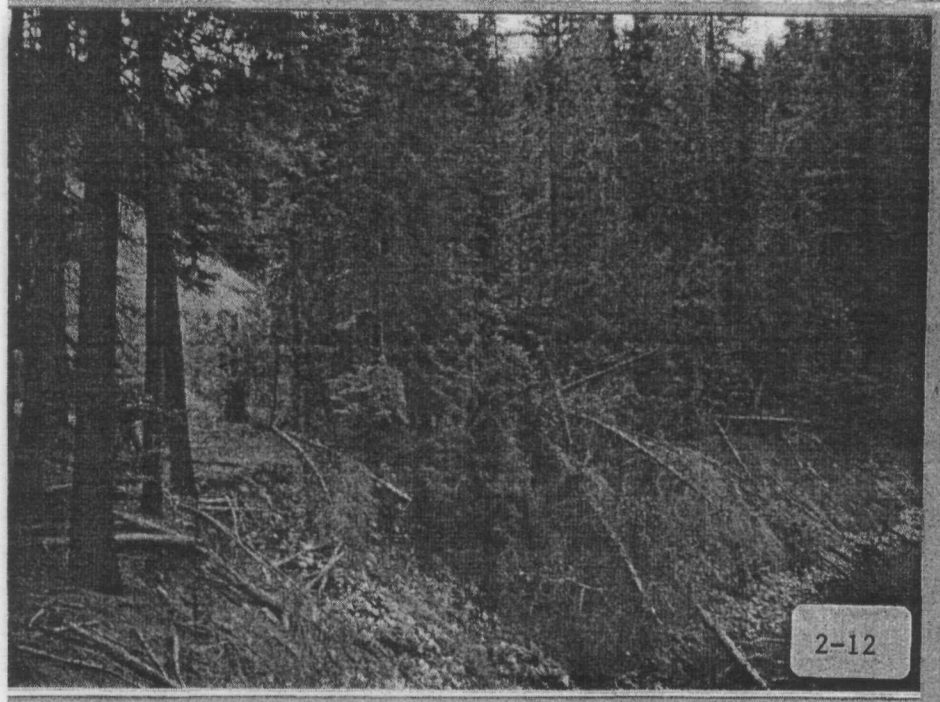

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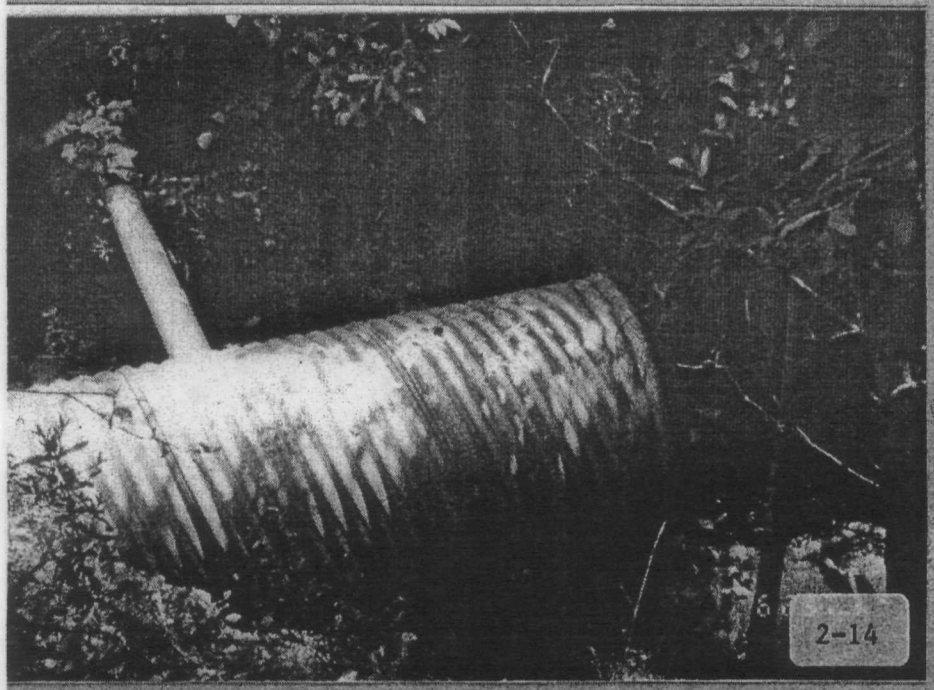

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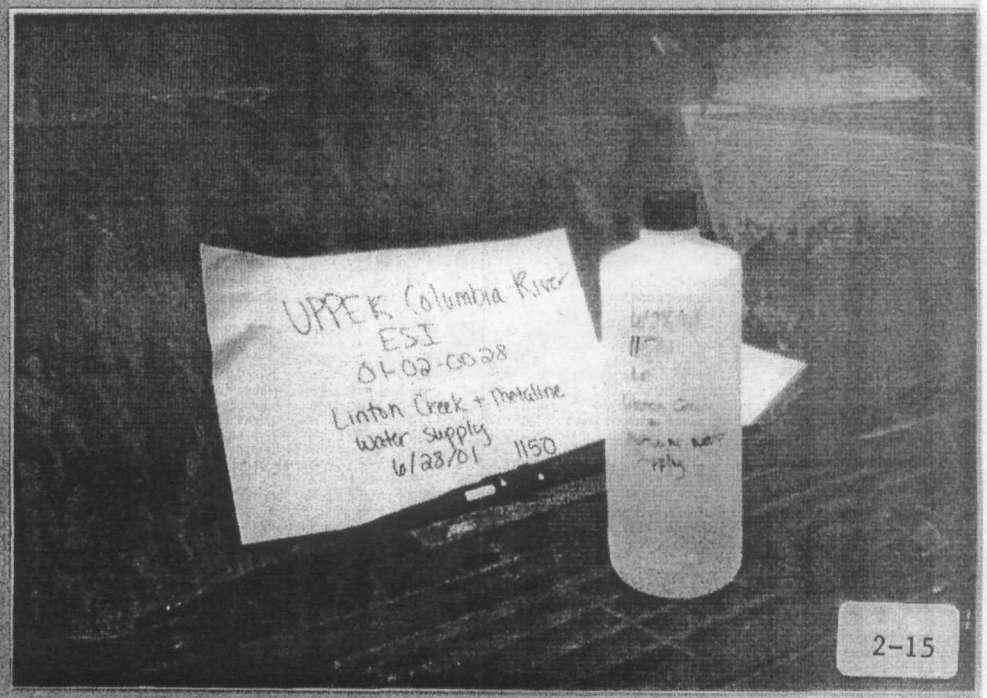

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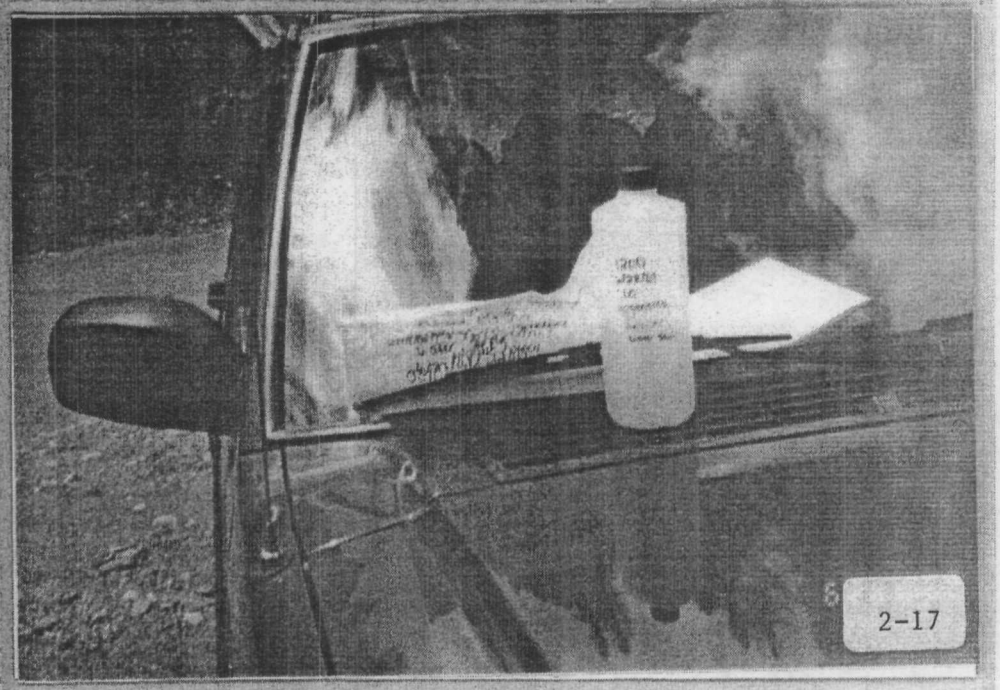

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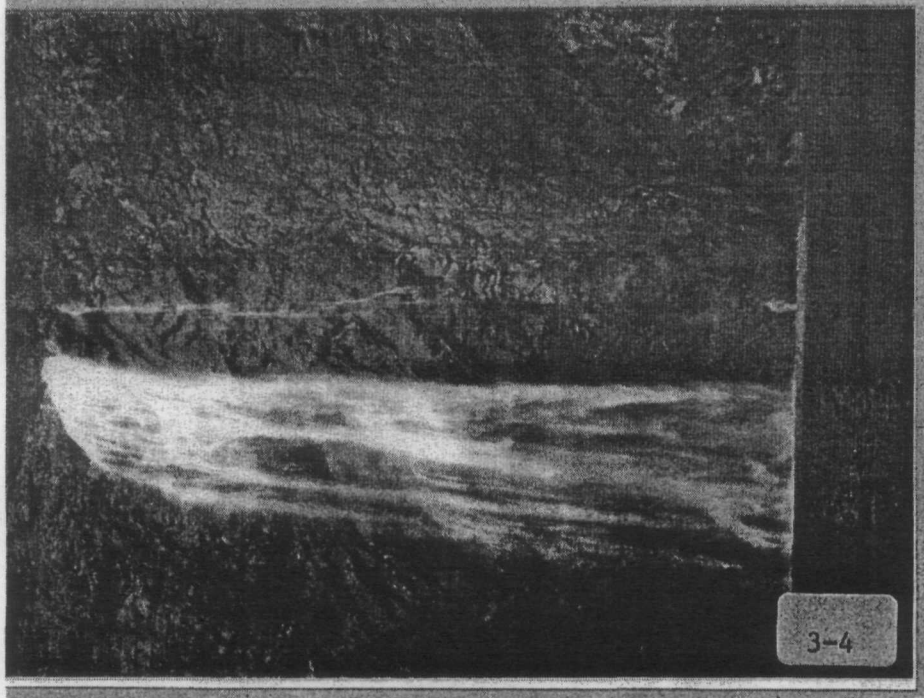
Trimble

3-2

UPPER COLUMBIA RIVER
RIVER TEAM
6-25-01
0126440Z
PRRS01SD
1100

3-3



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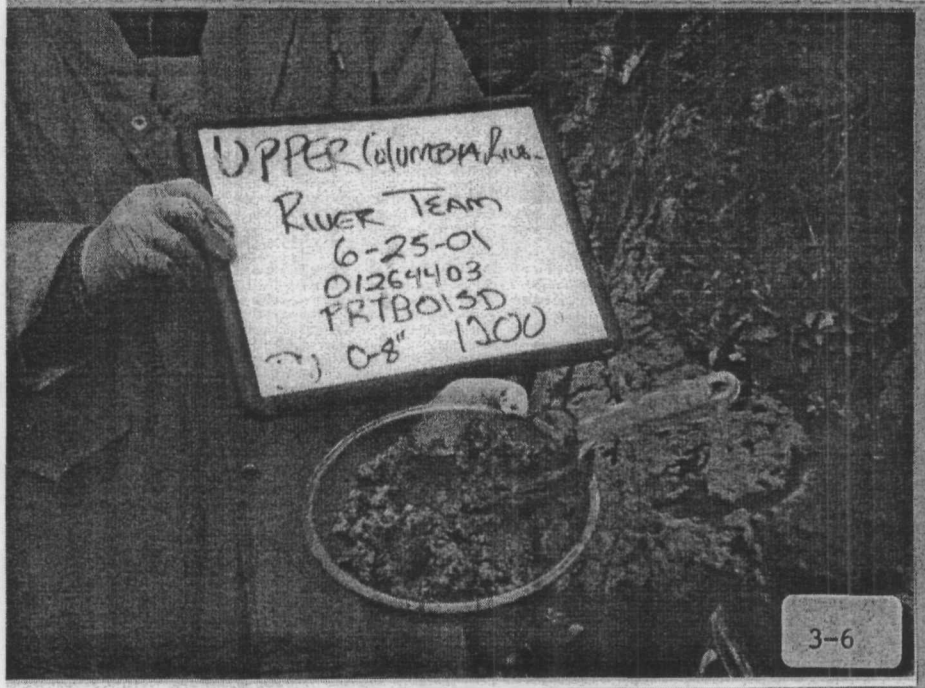

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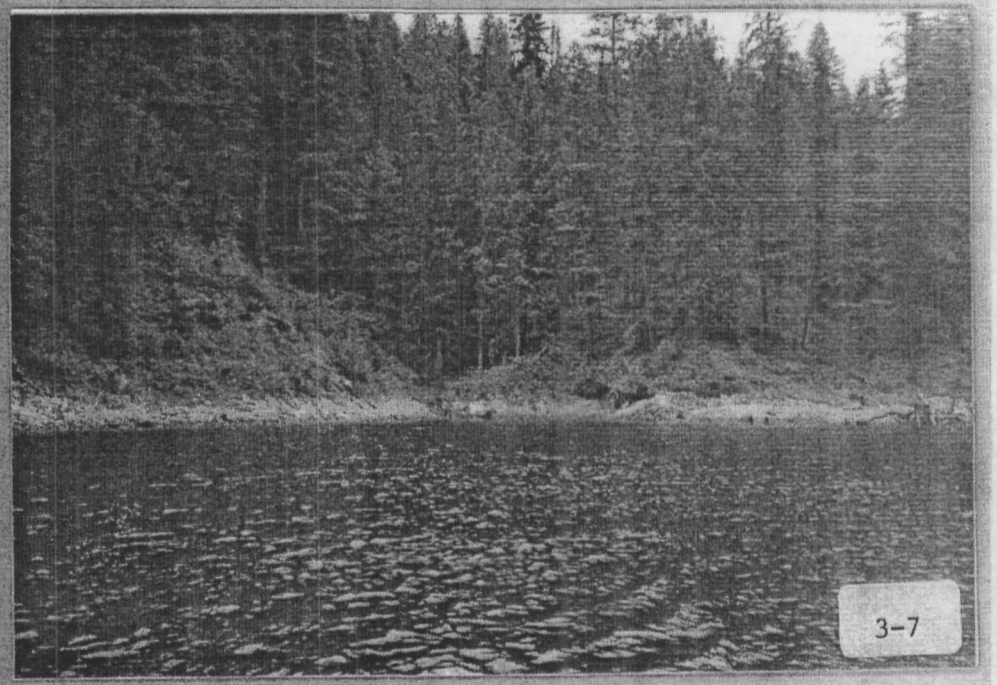

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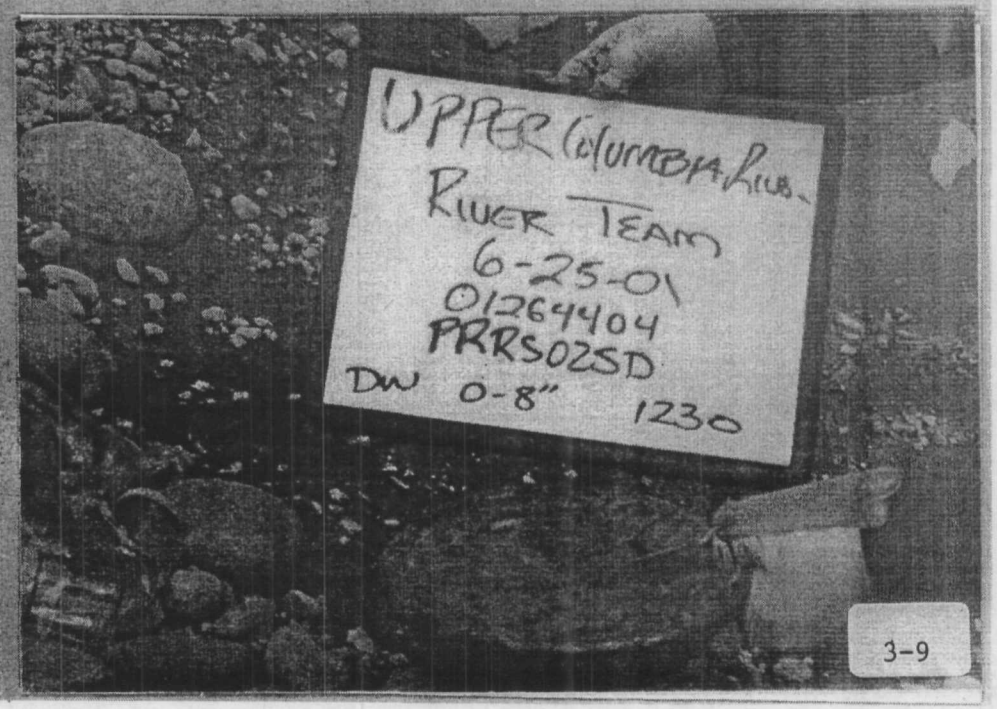

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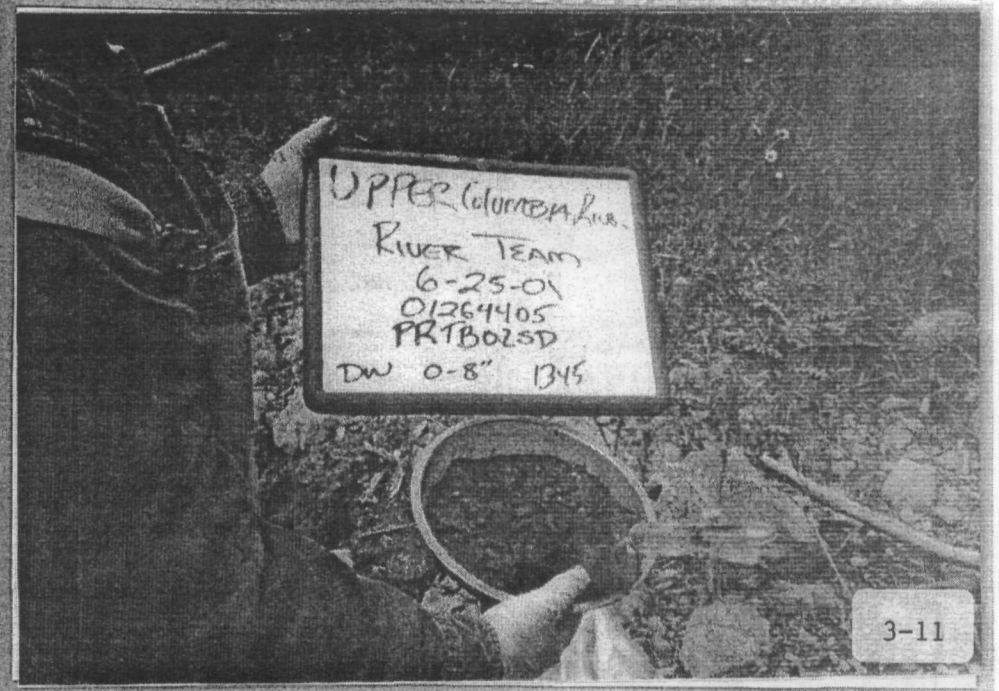

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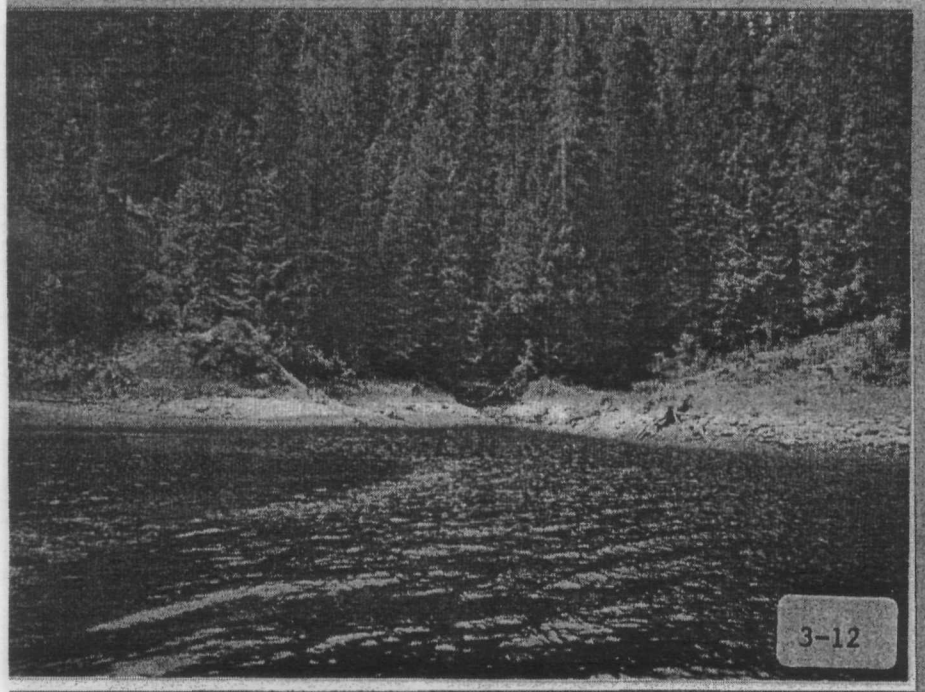

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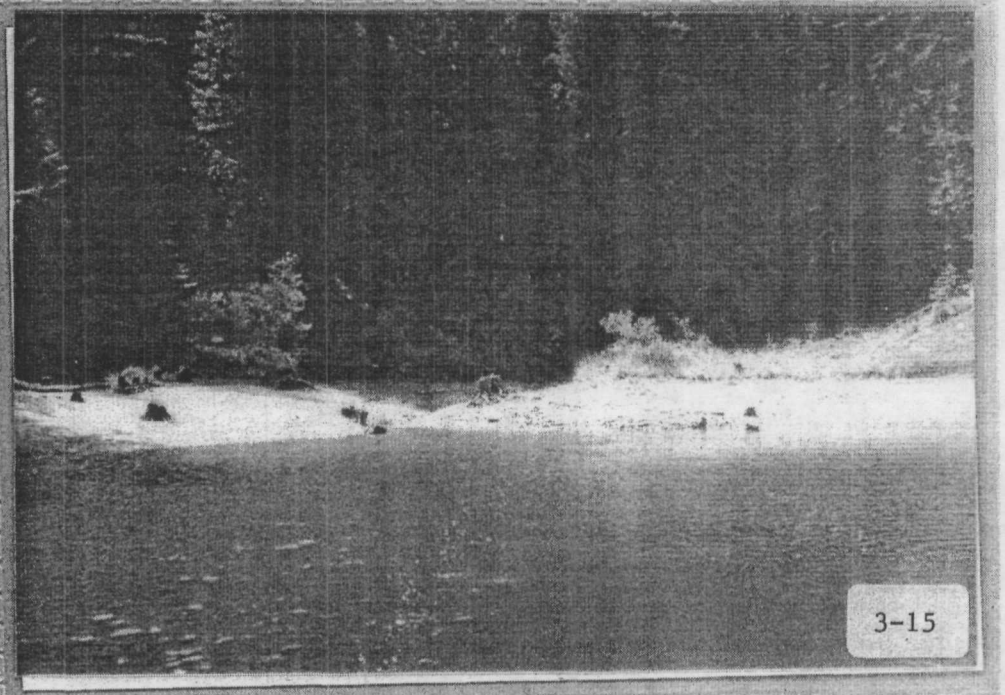

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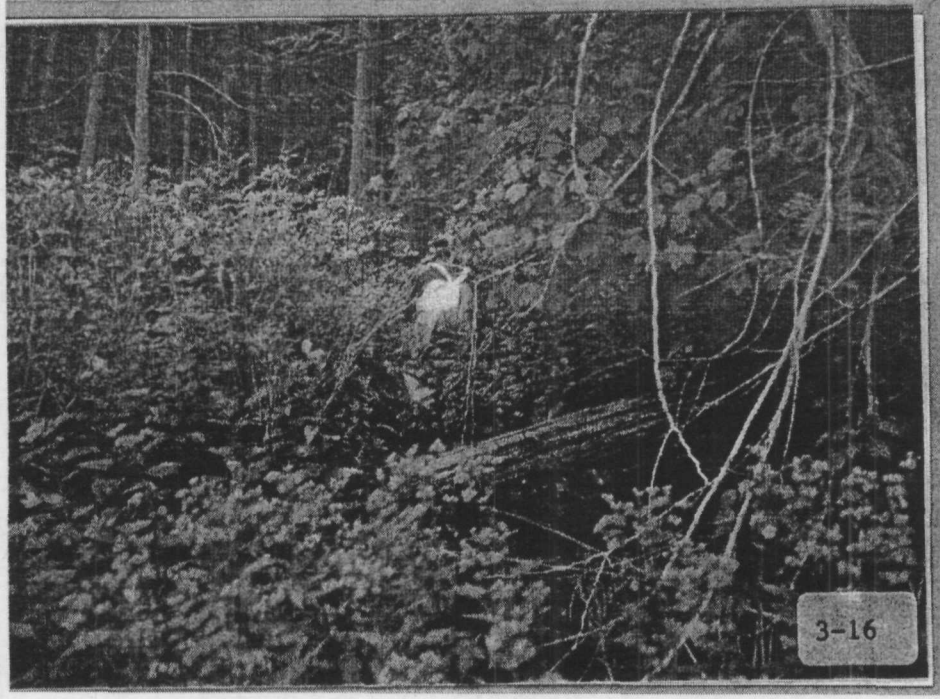

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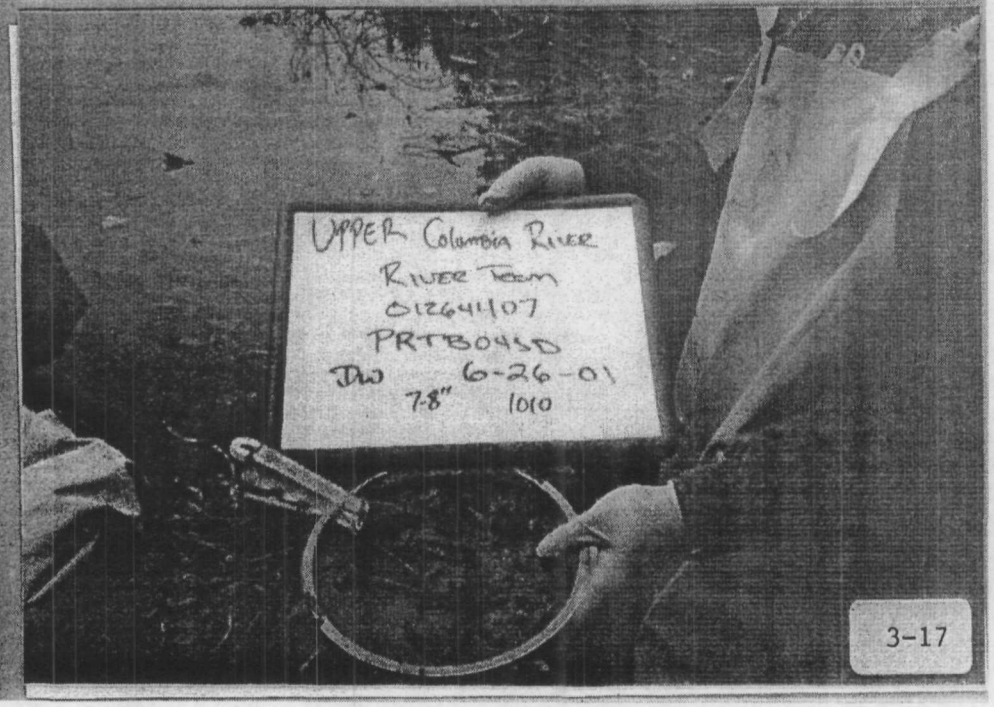

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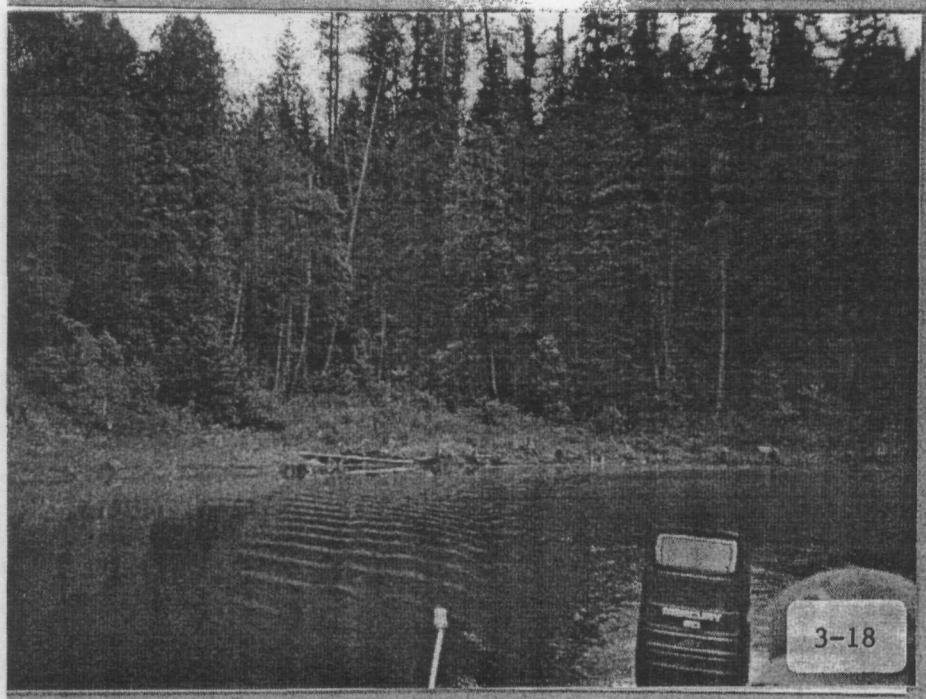

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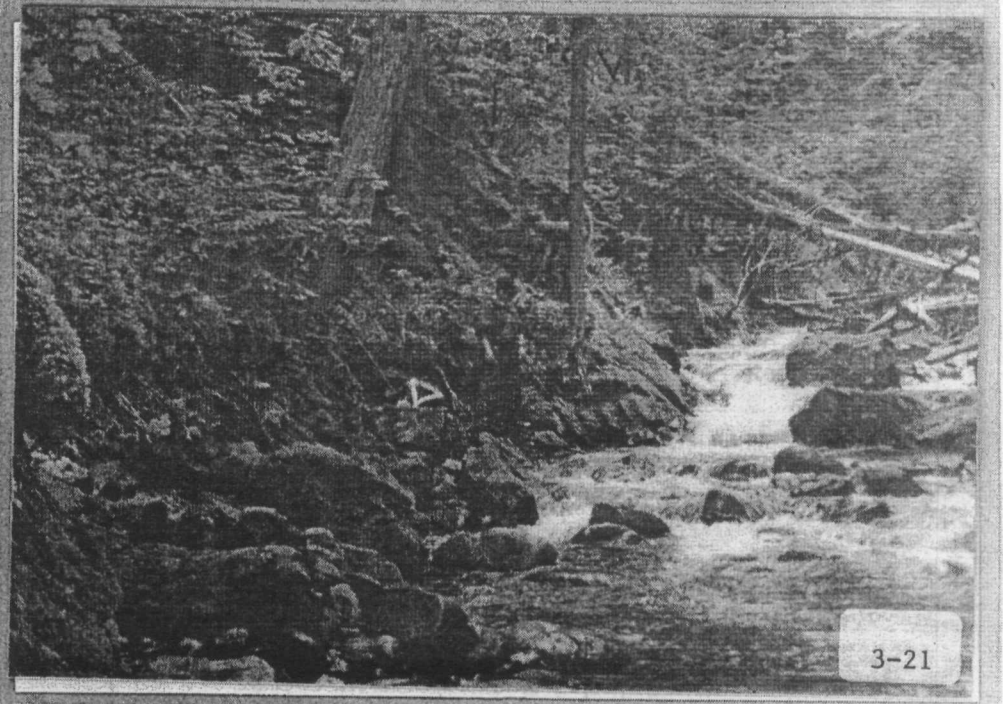

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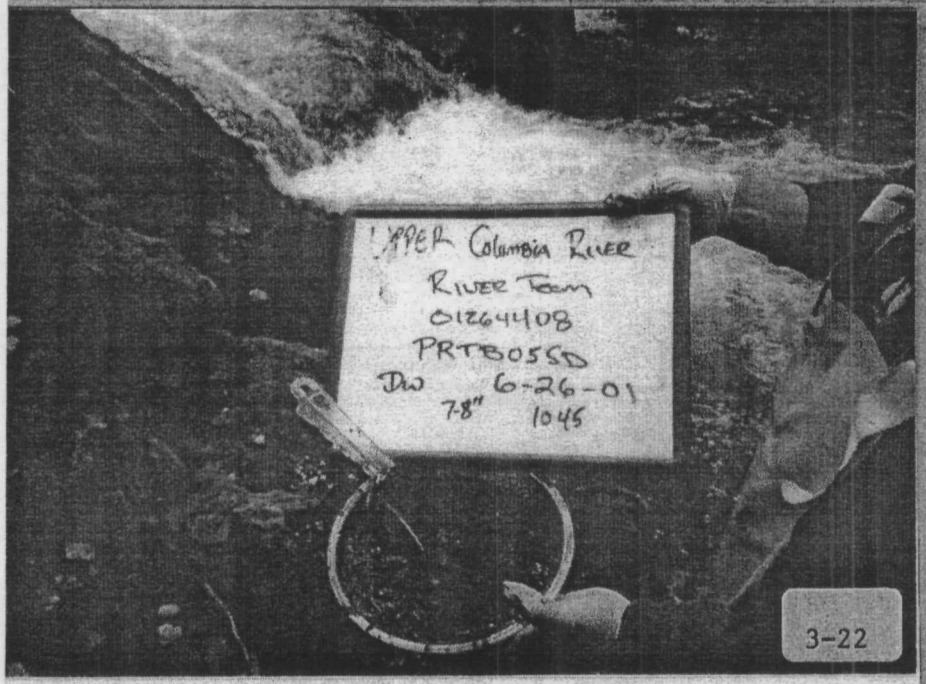

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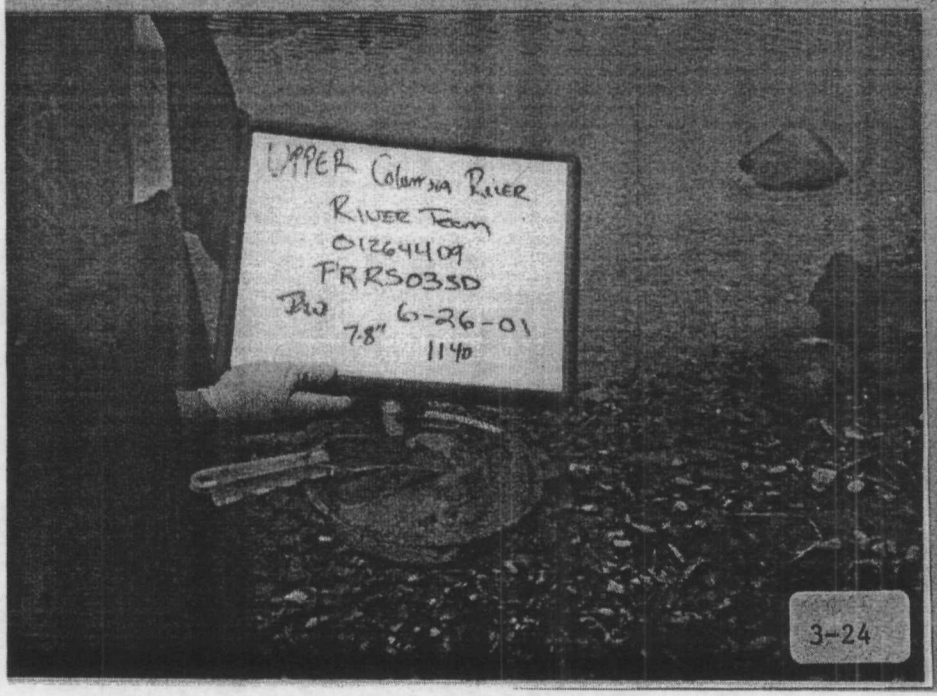

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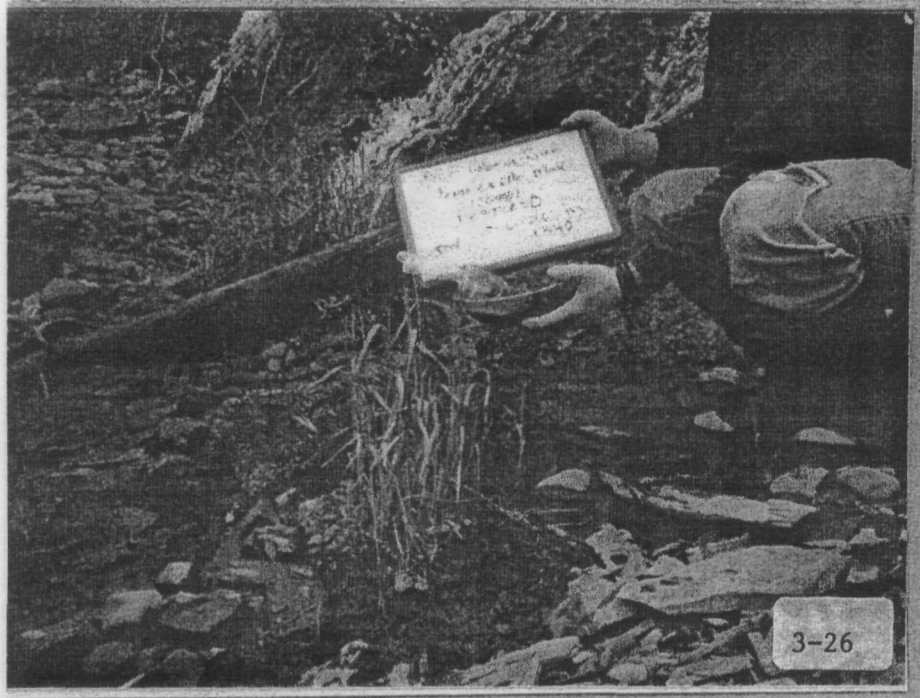

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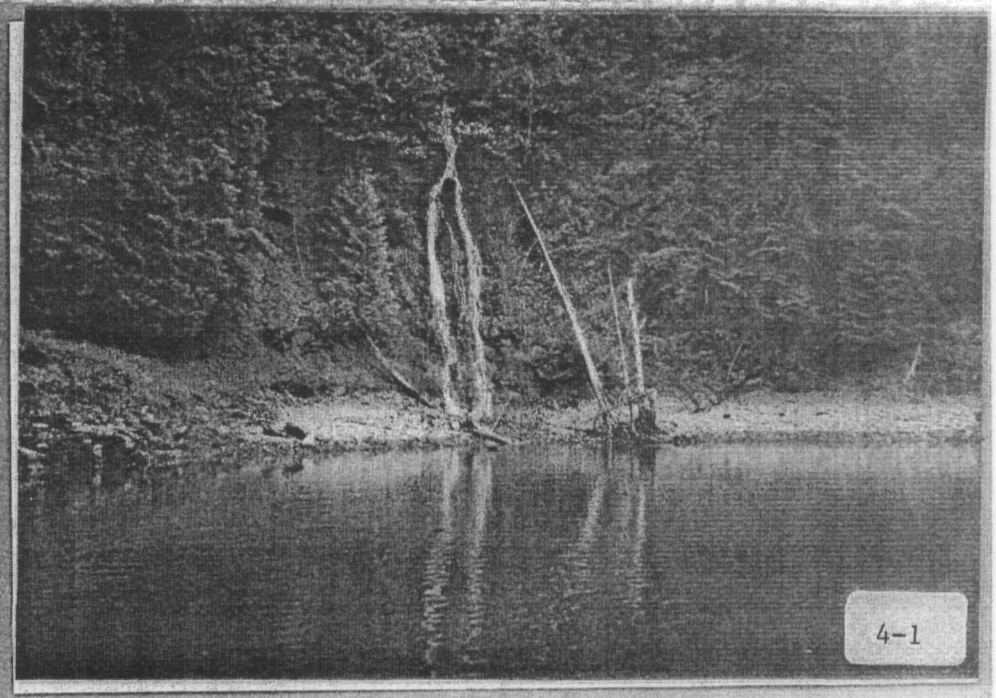

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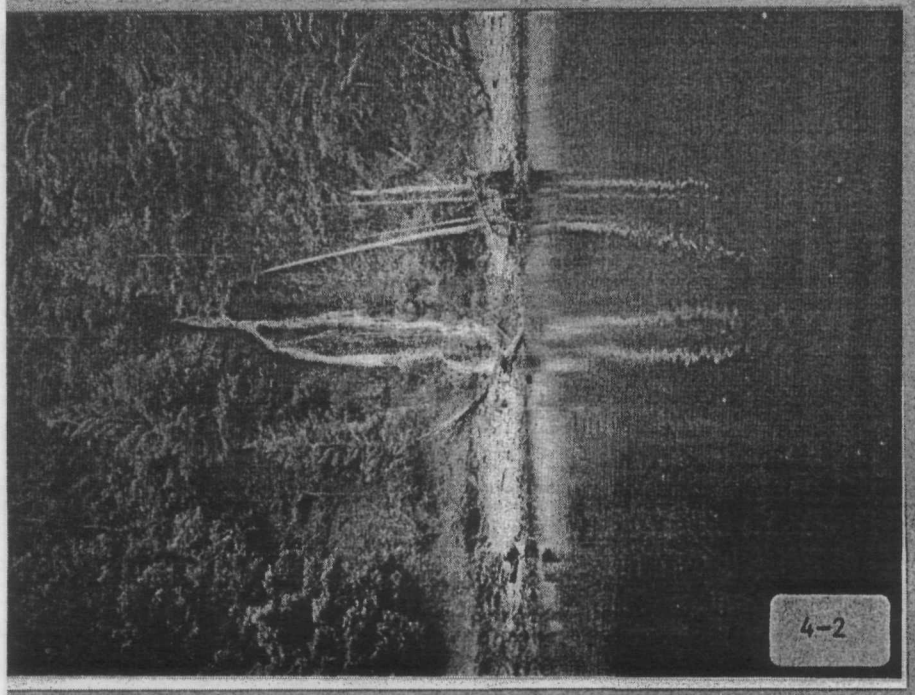

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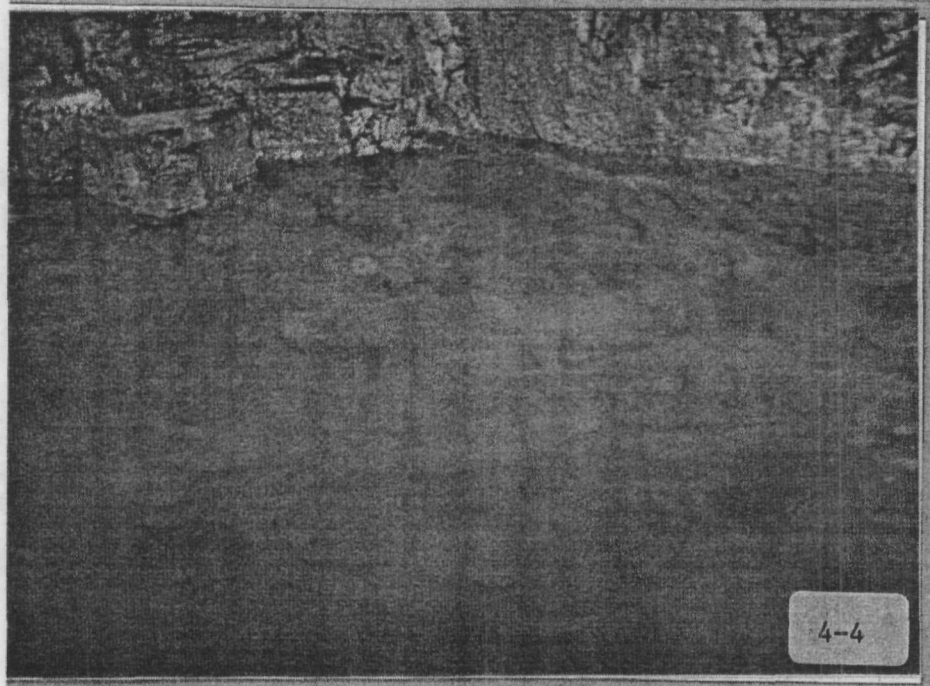

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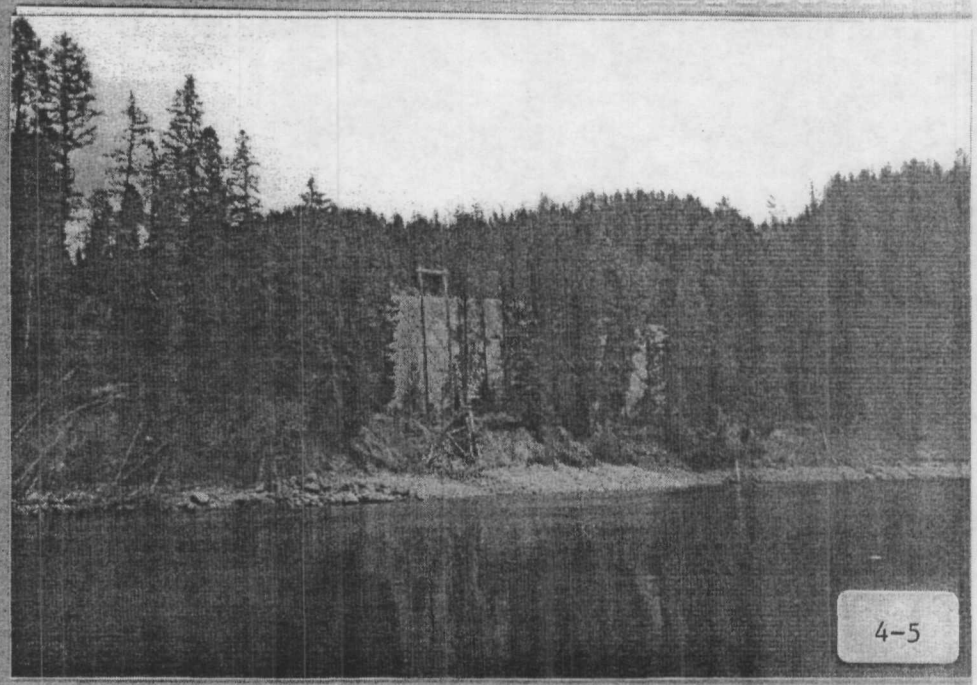

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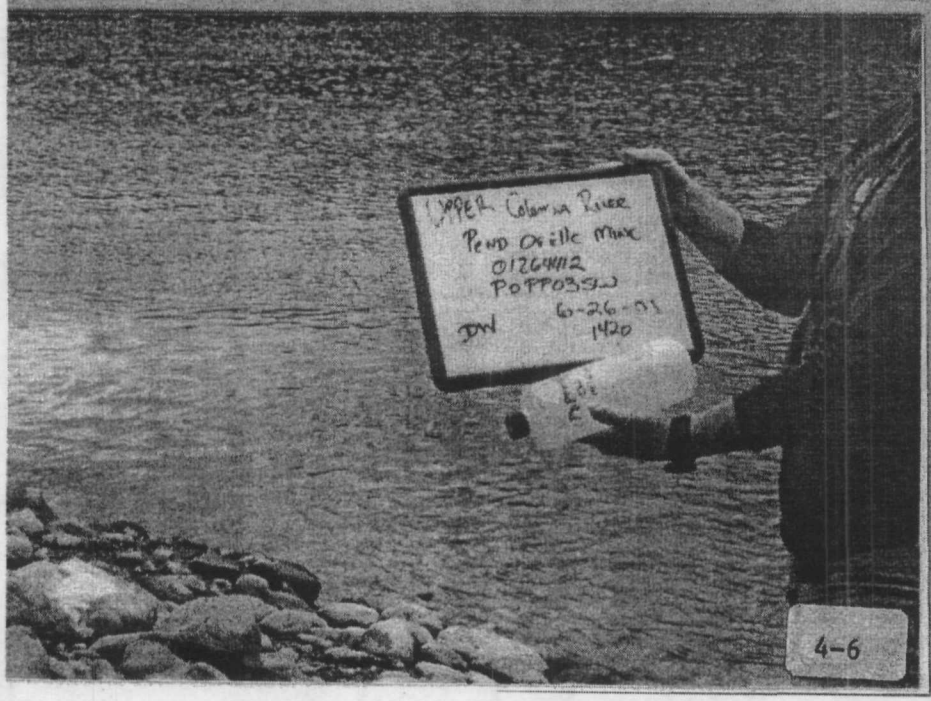

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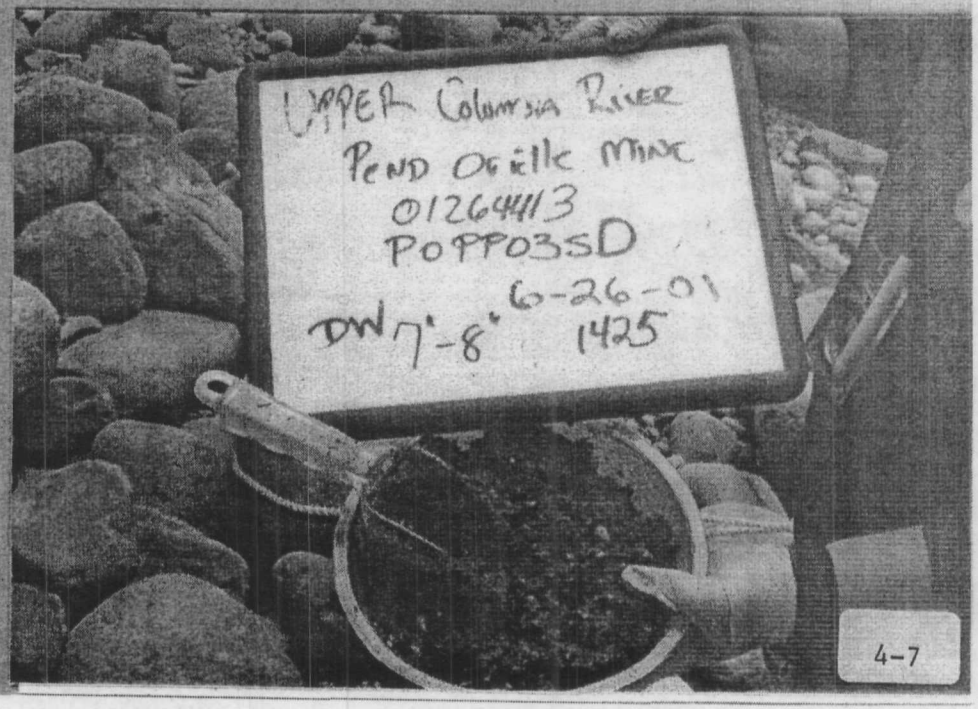

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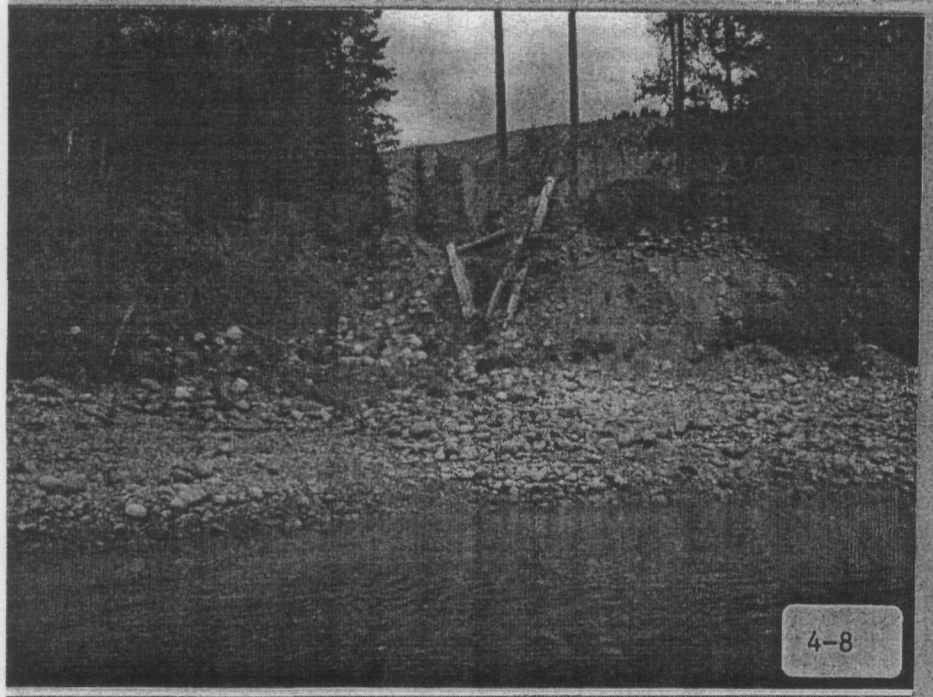

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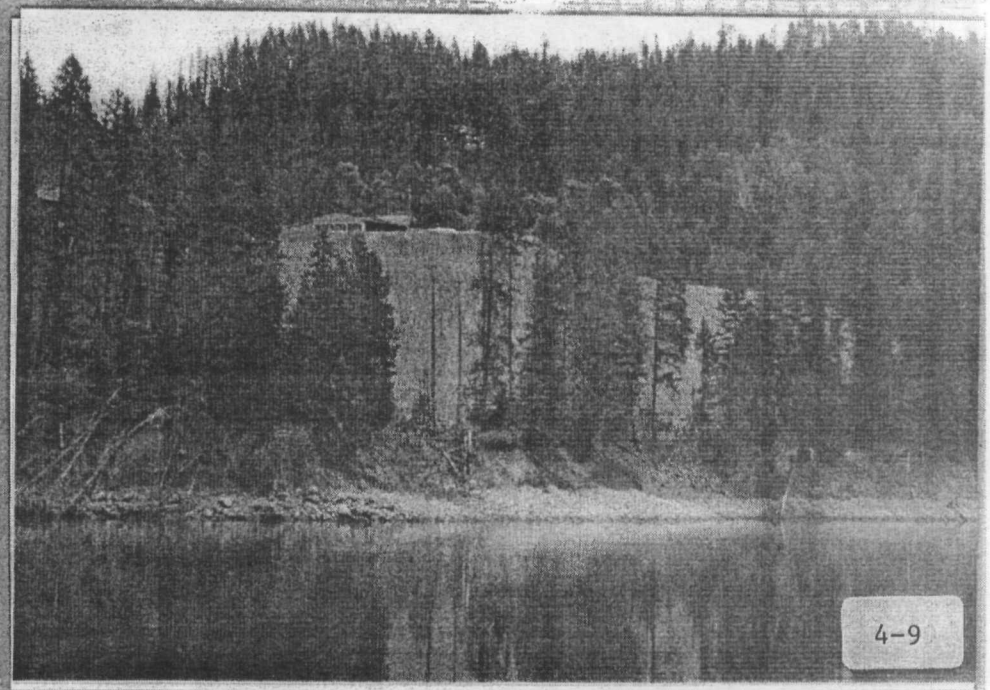

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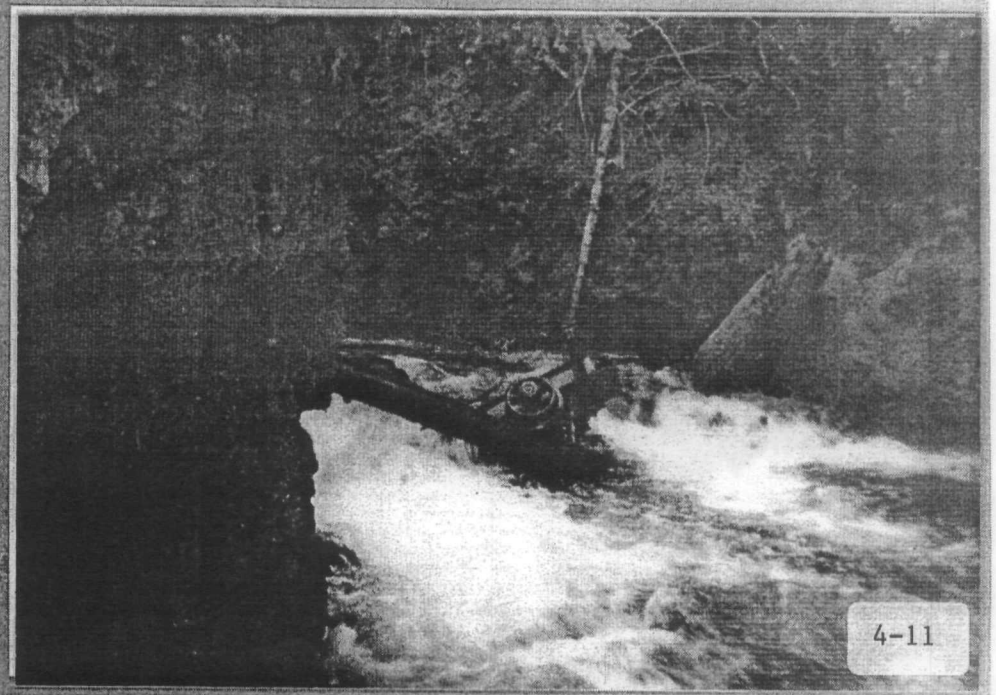

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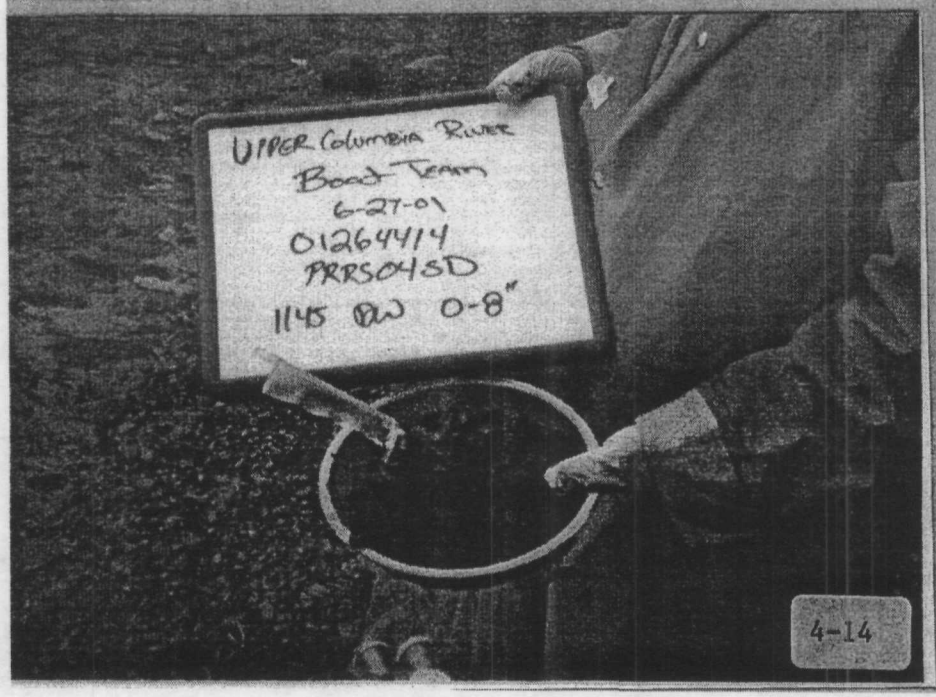

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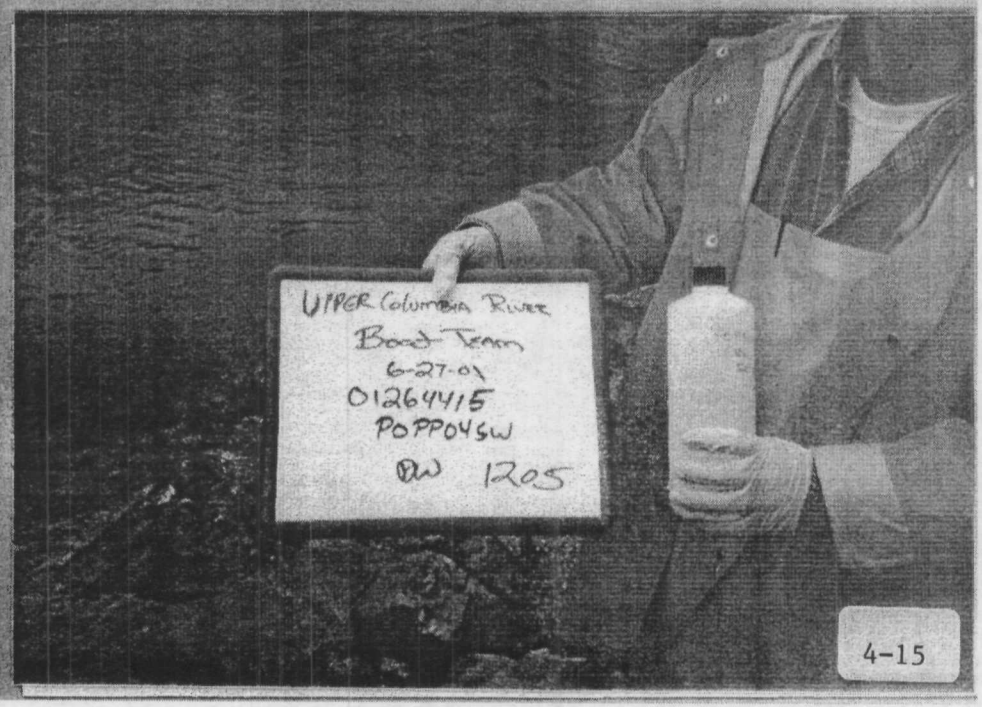

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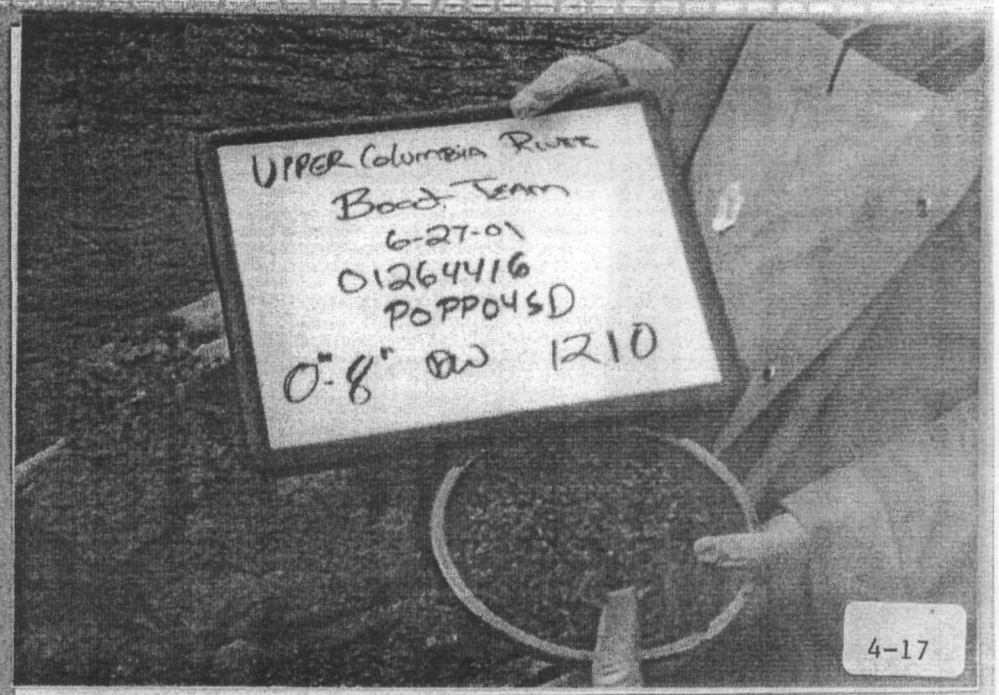

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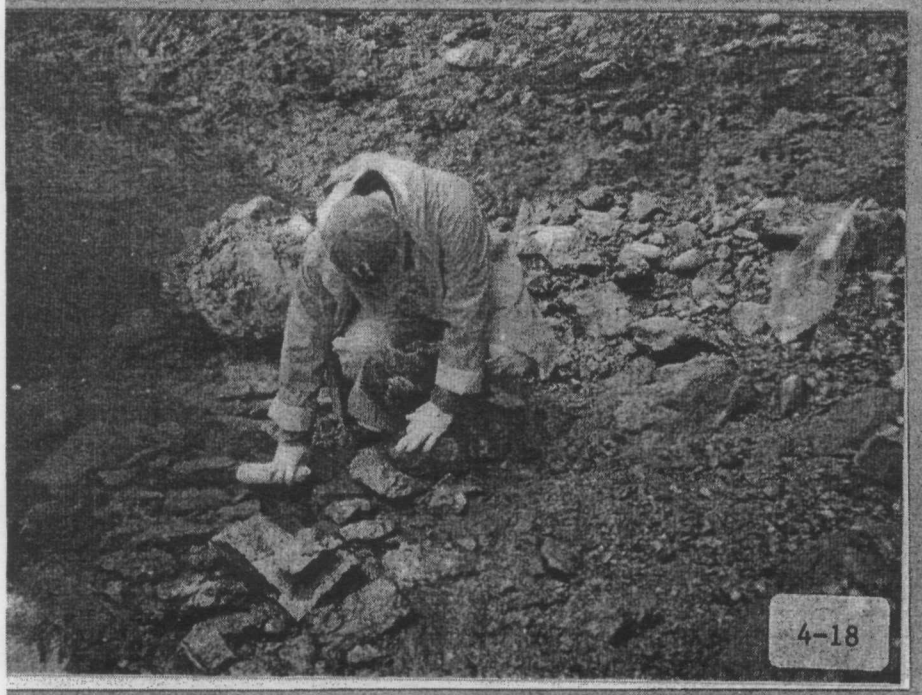

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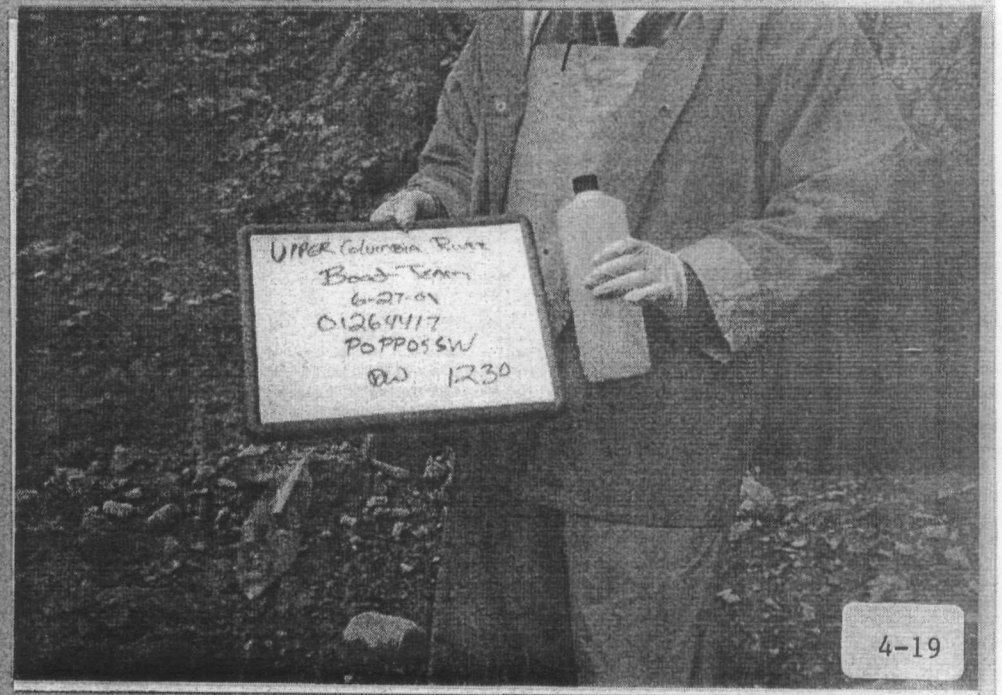

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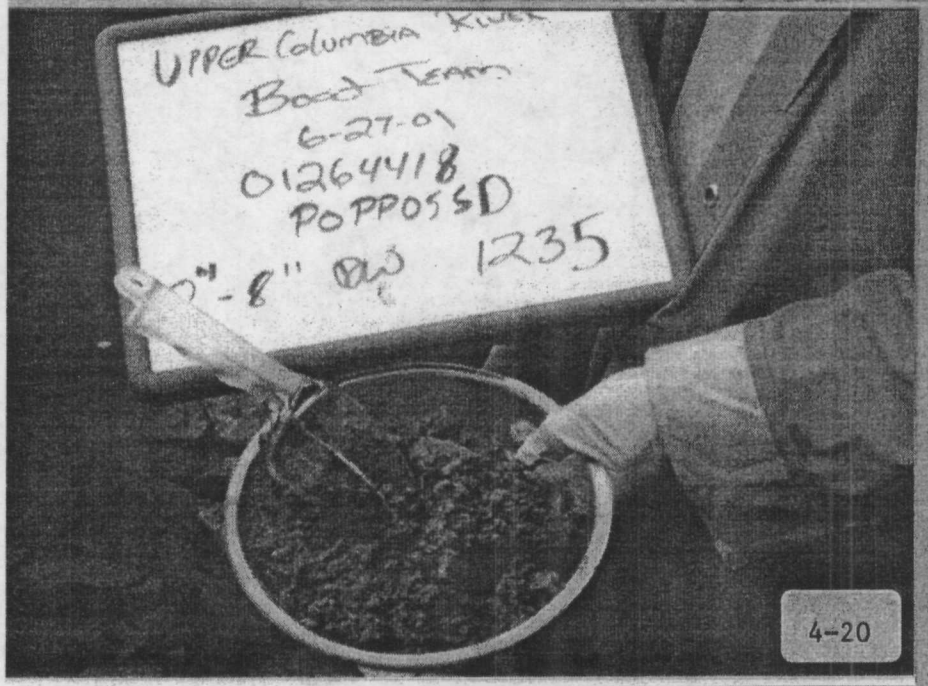

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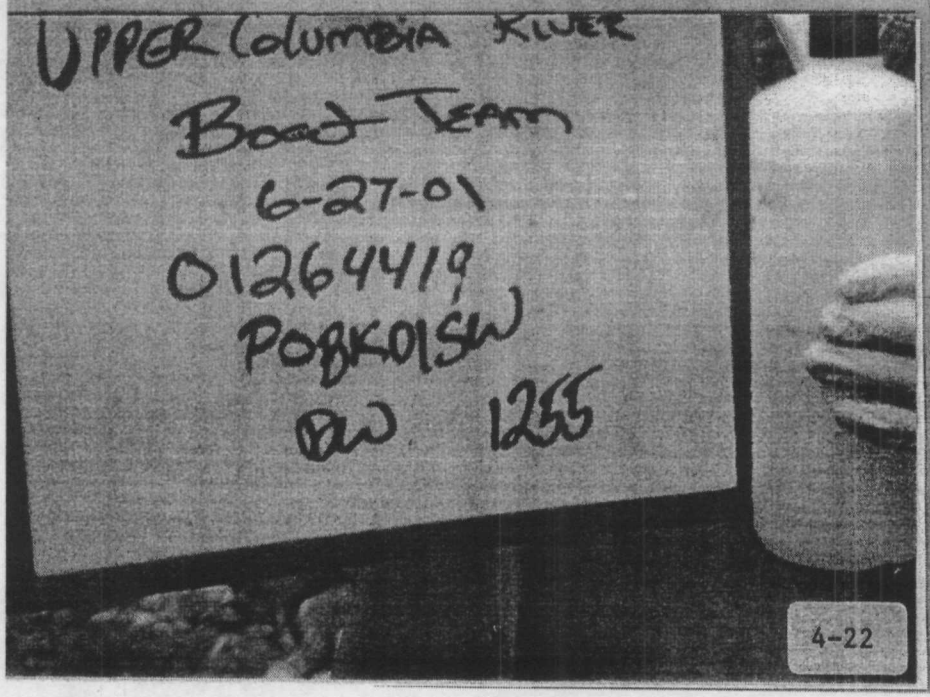

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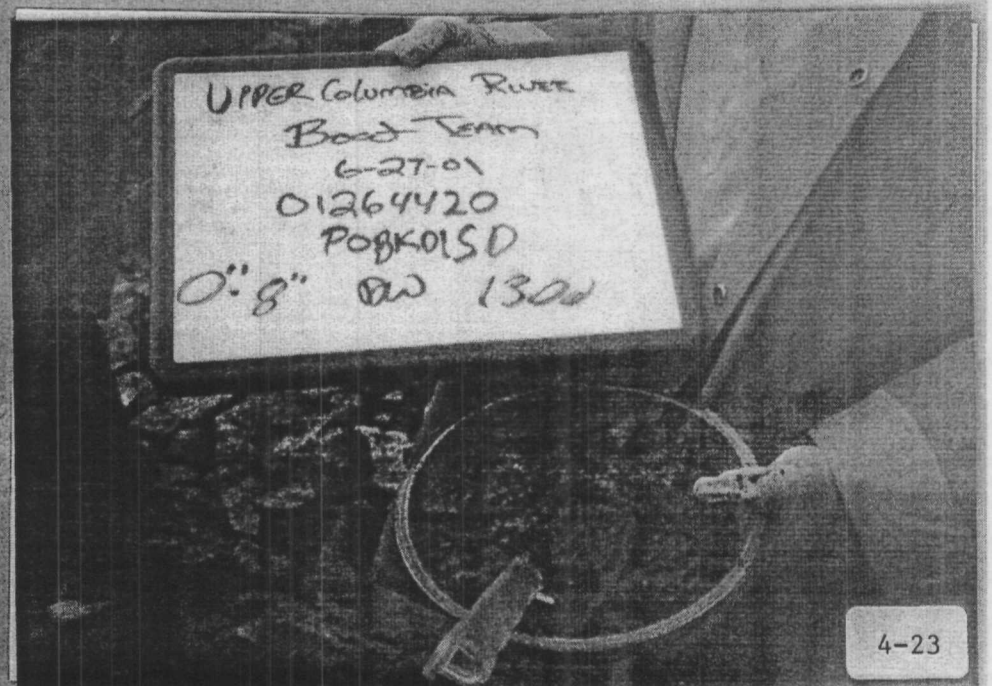

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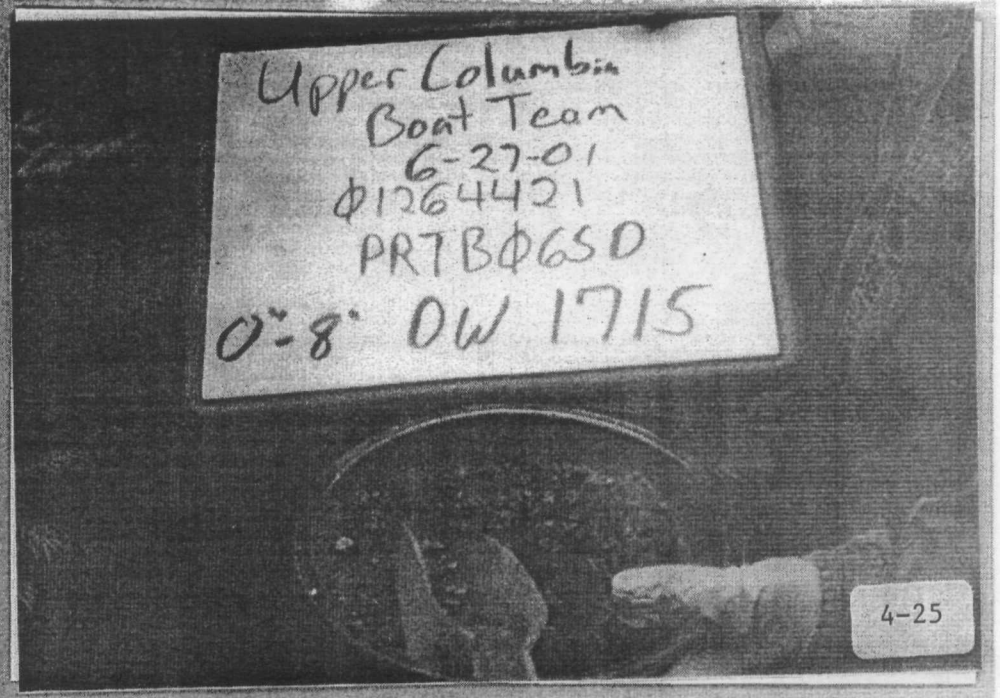
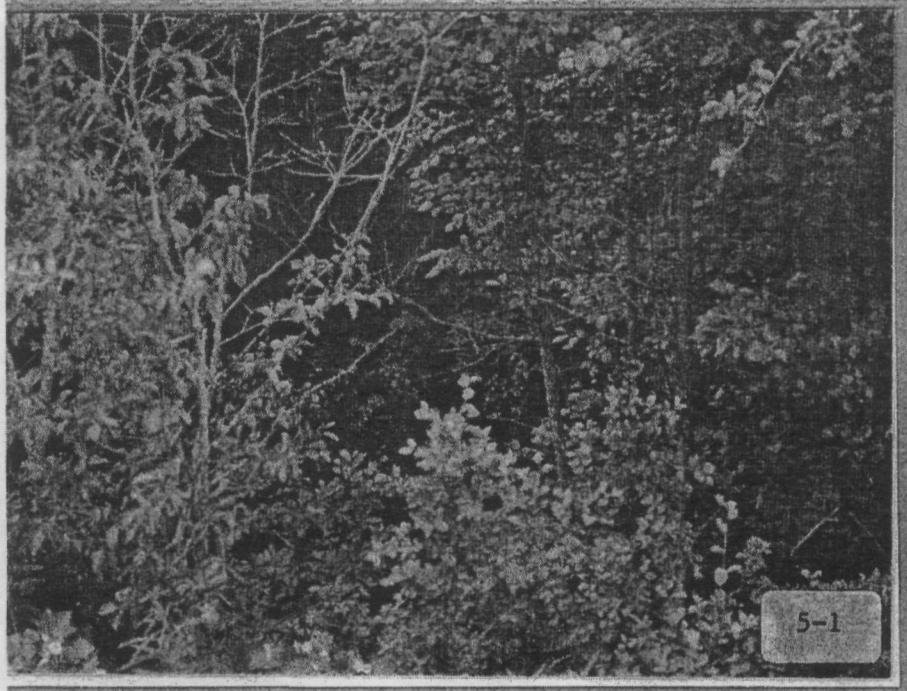

Upper Columbia
Boat Team
6-27-01
Ø1264421
PRTBØ6SD
0"-8" DW 1715

4-25



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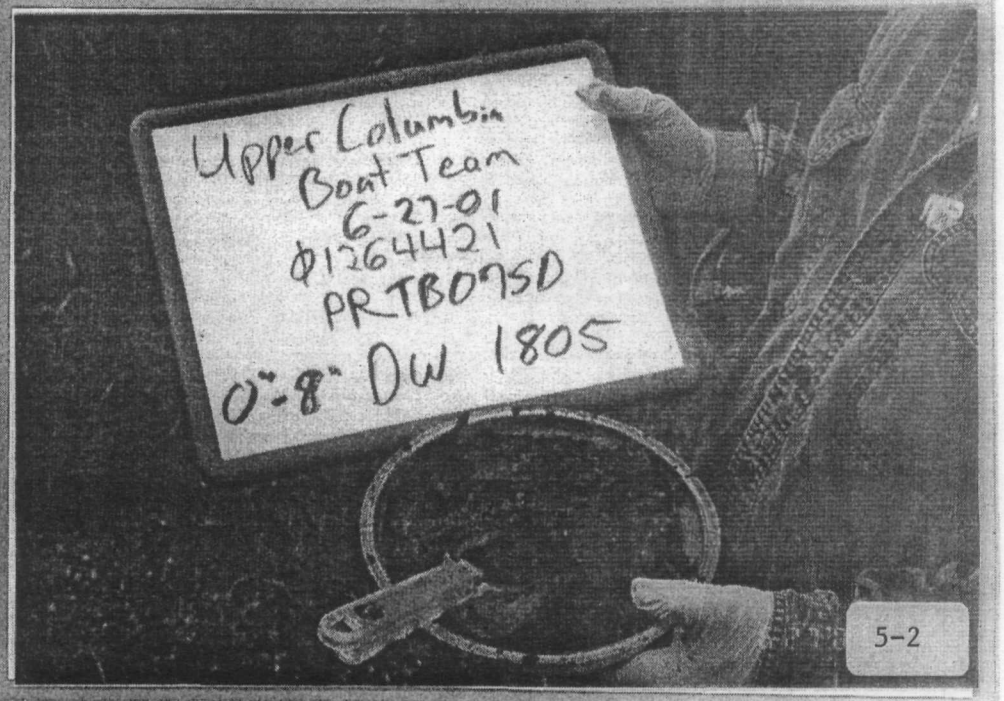
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Boat Team
6-27-01
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0"-8" DW 1805

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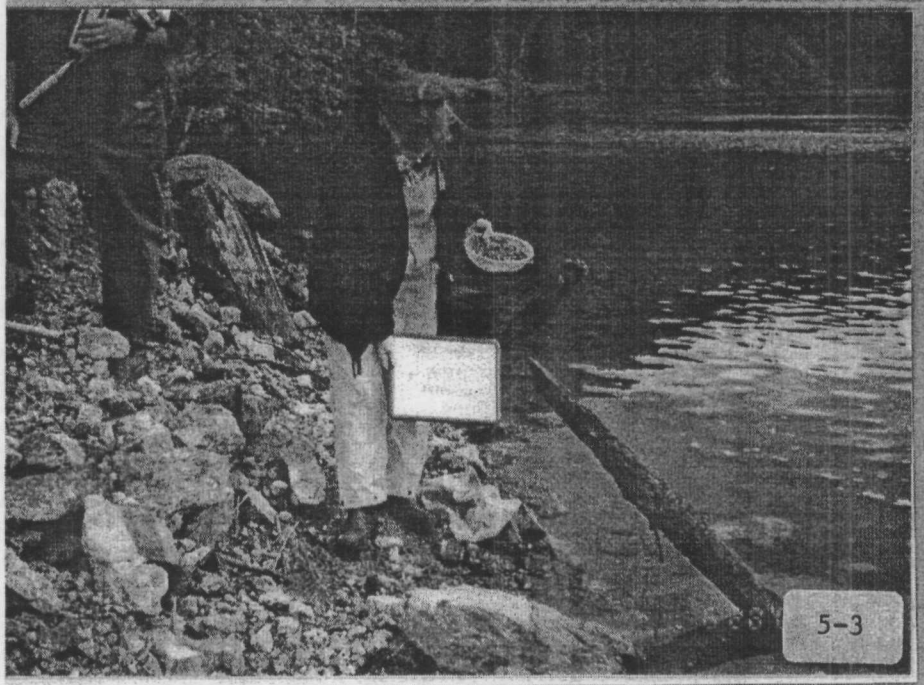

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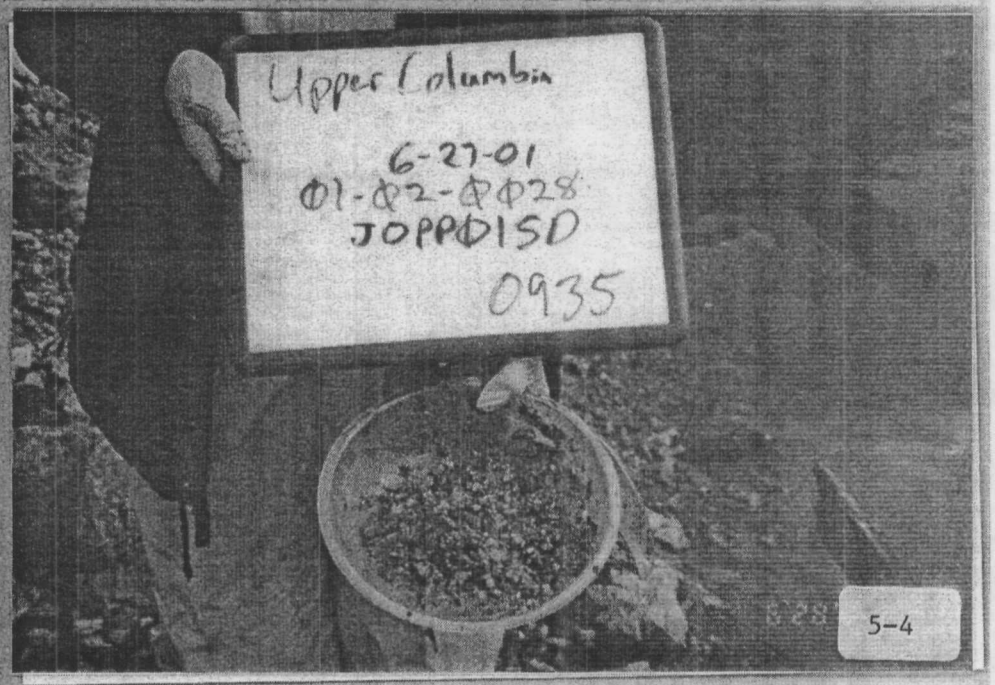

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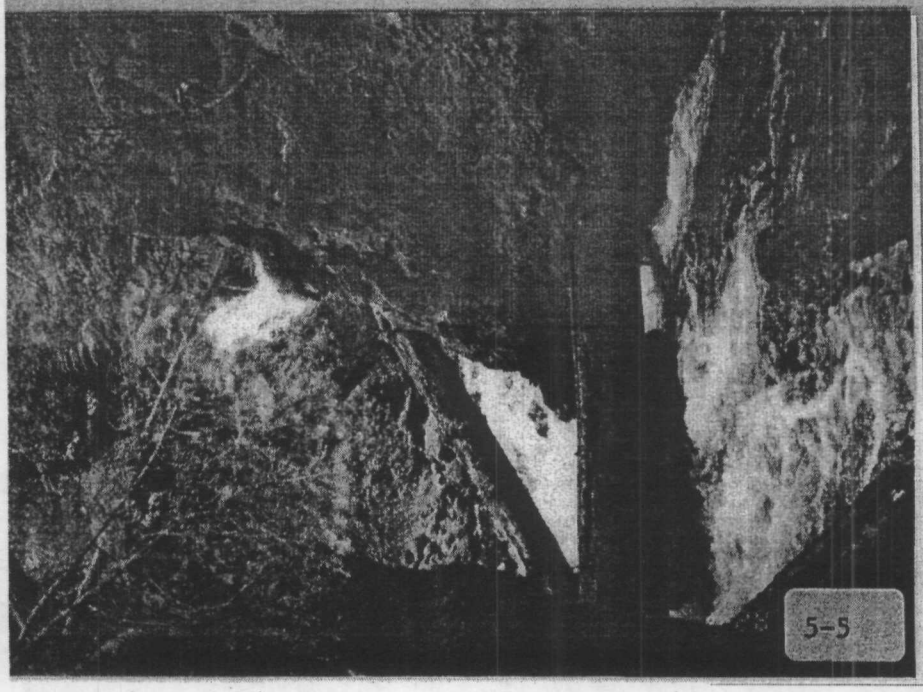

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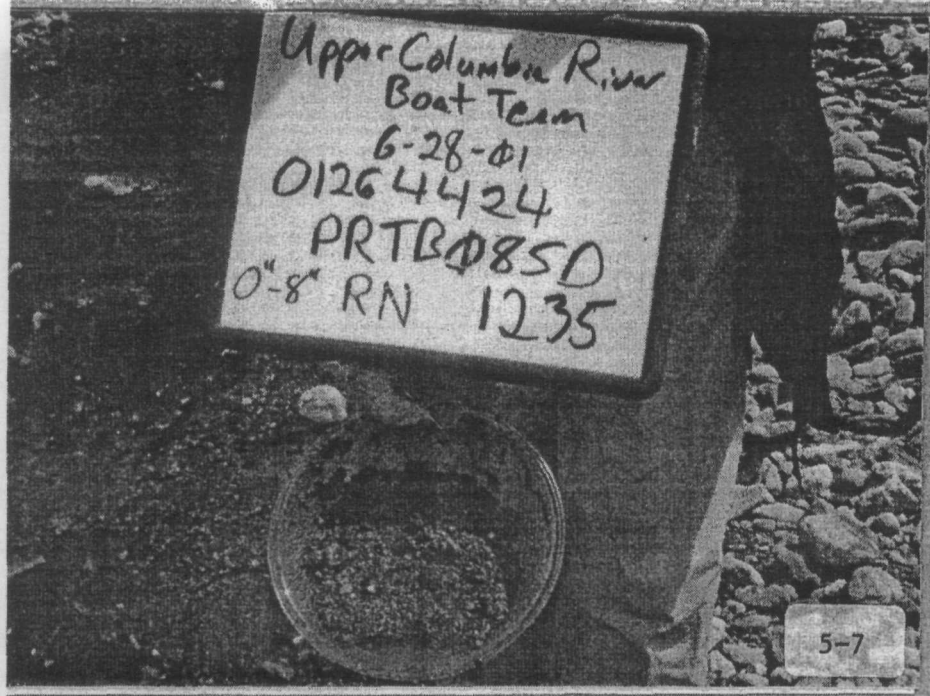
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Boat Team
6-28-01
01264424
PRTB085D
0"-8" RN 1235

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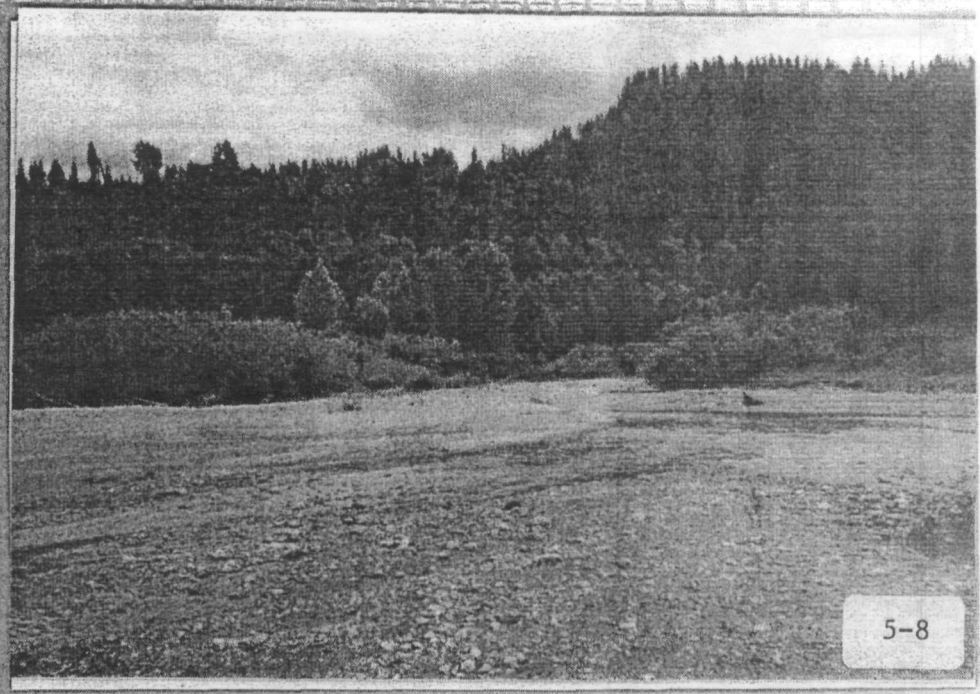

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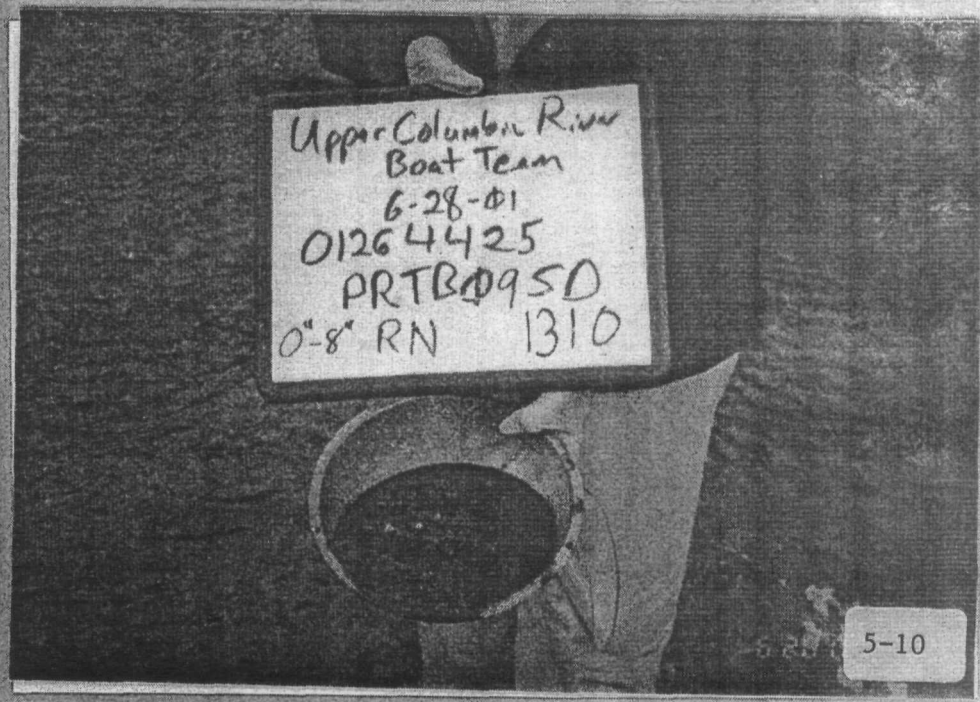
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Boat Team
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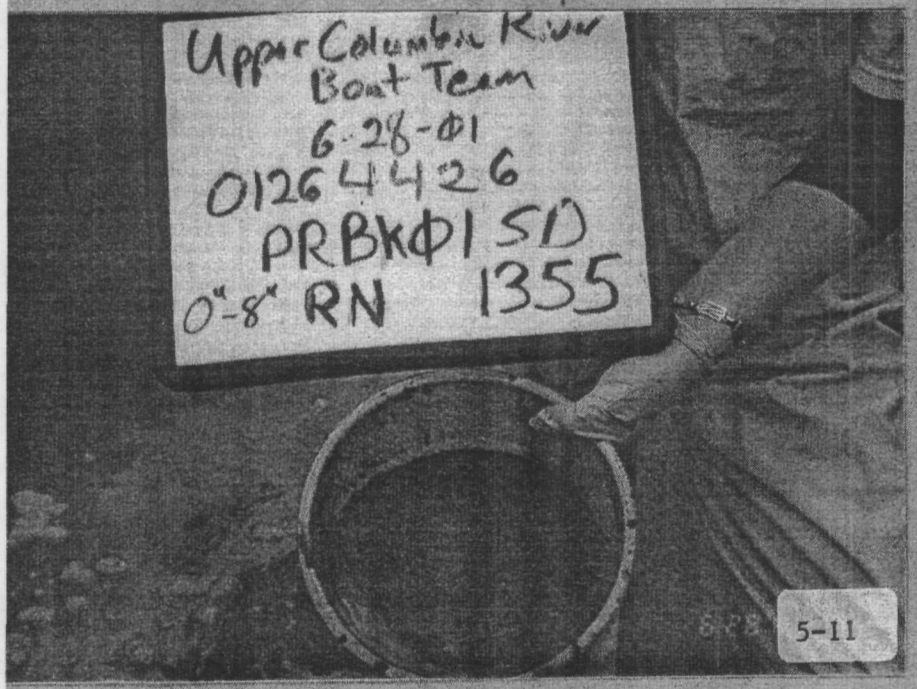

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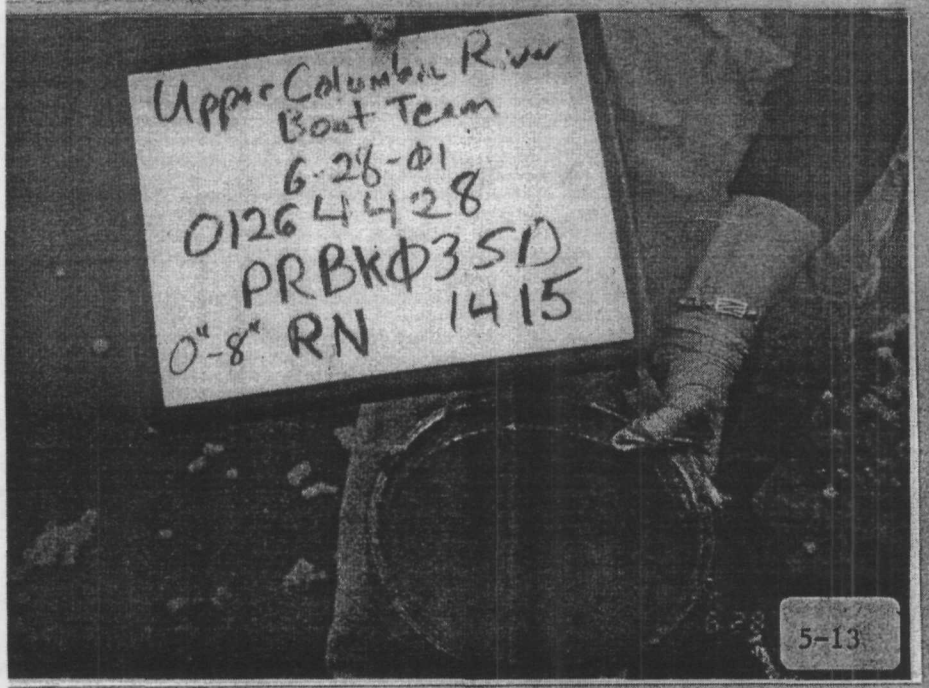

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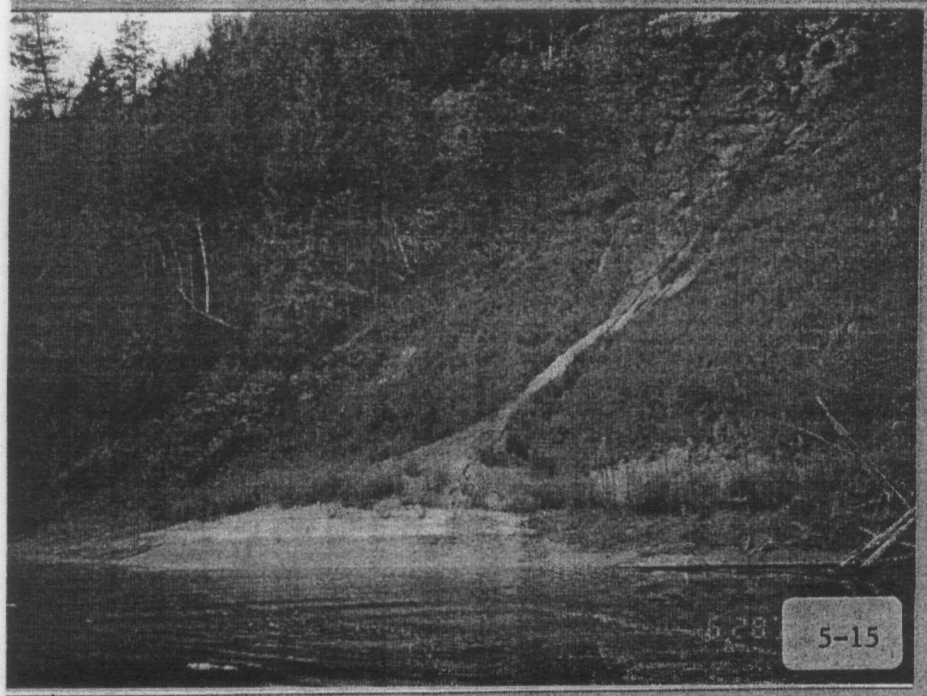


5-15

5-16

7-1

Pend Oreille Mine
01-01-0028
POSPO2ST
7-2

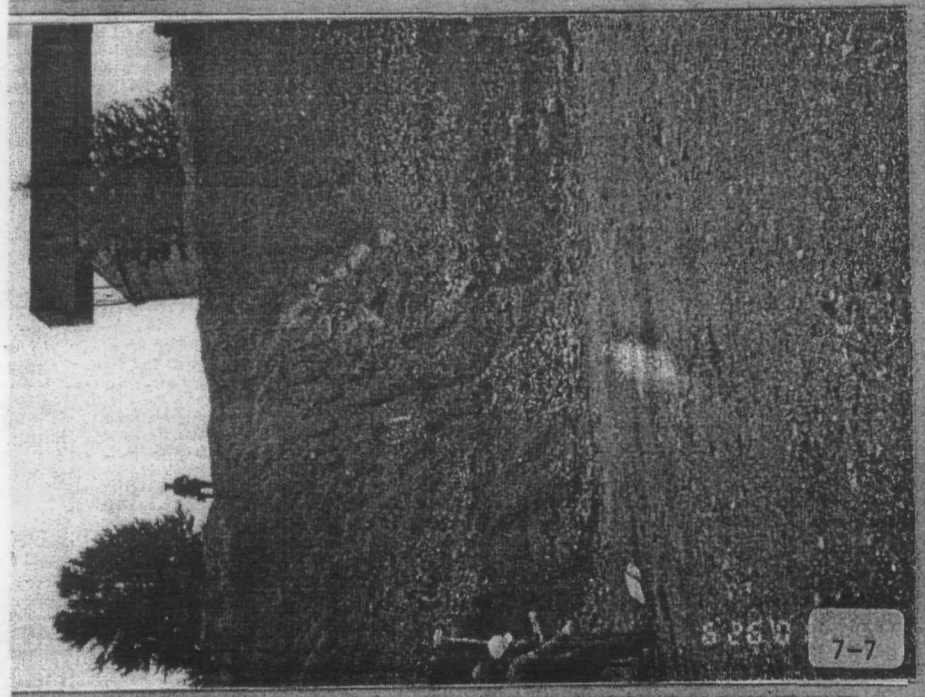
7-3

Pend Oreille Mine
01-01-0028
10/26/01 1025
POWPO1SS
7-4

0178

7-5

7-6



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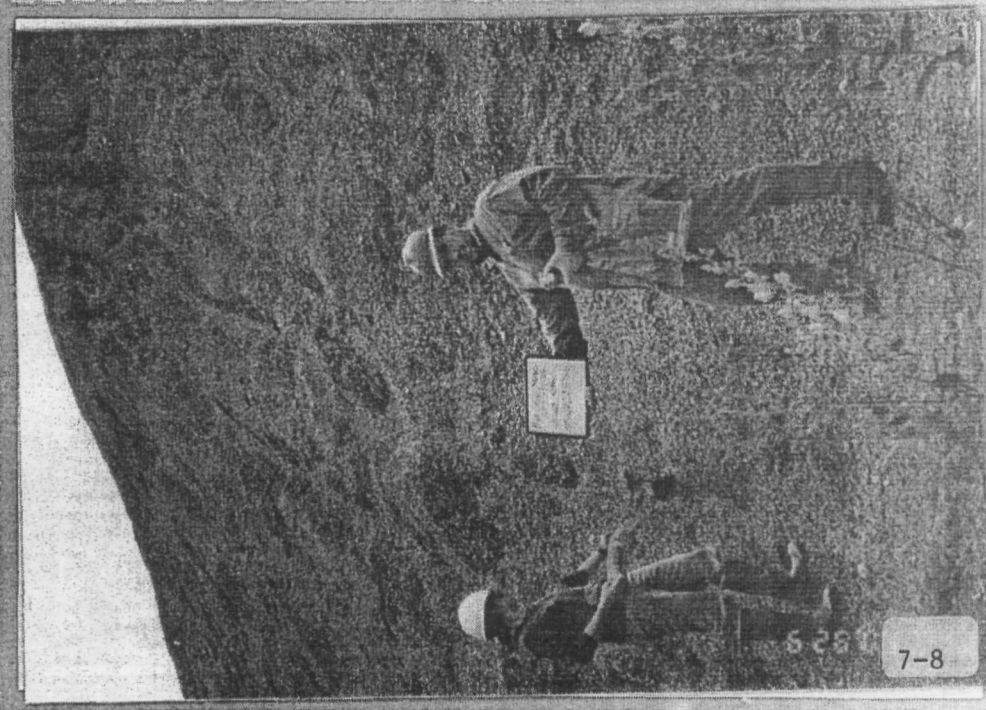

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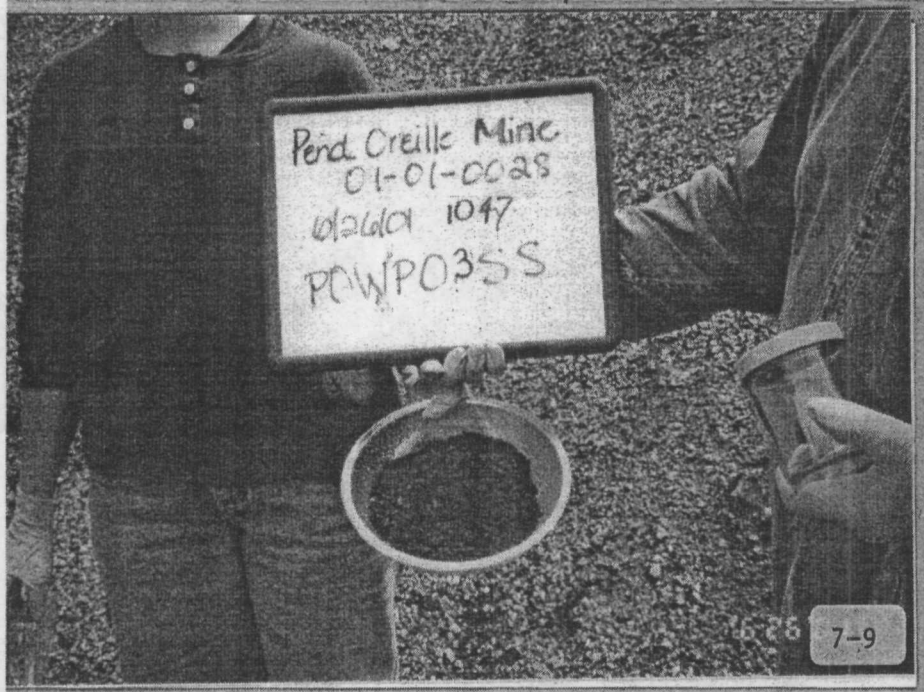

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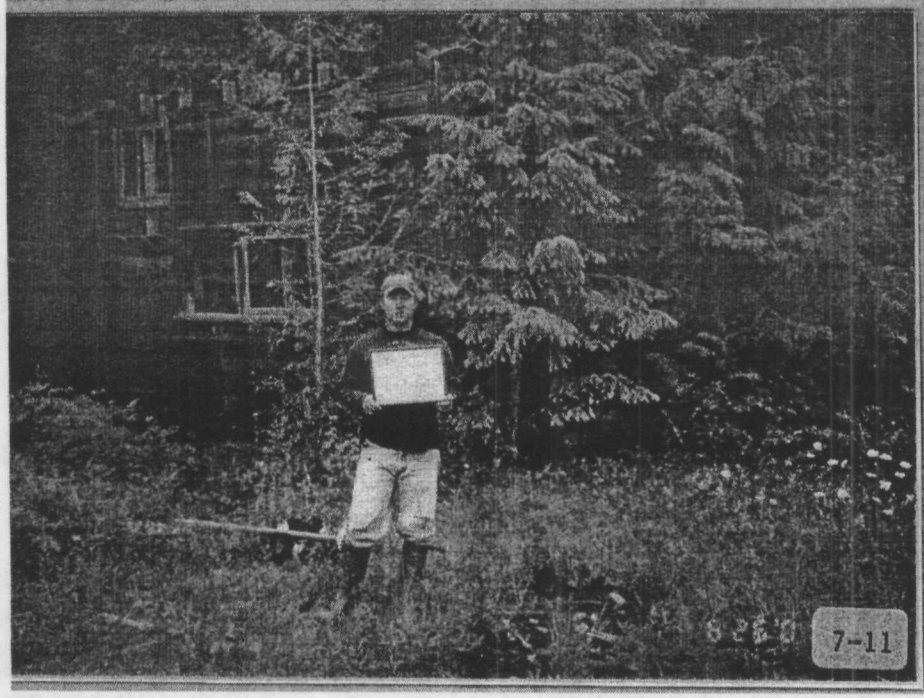

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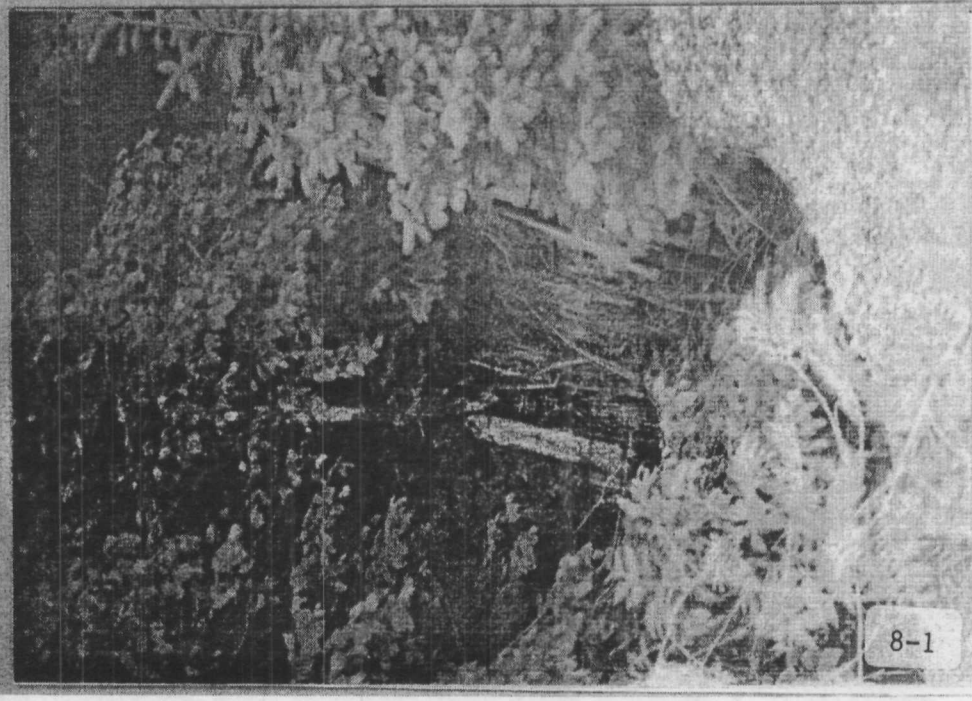

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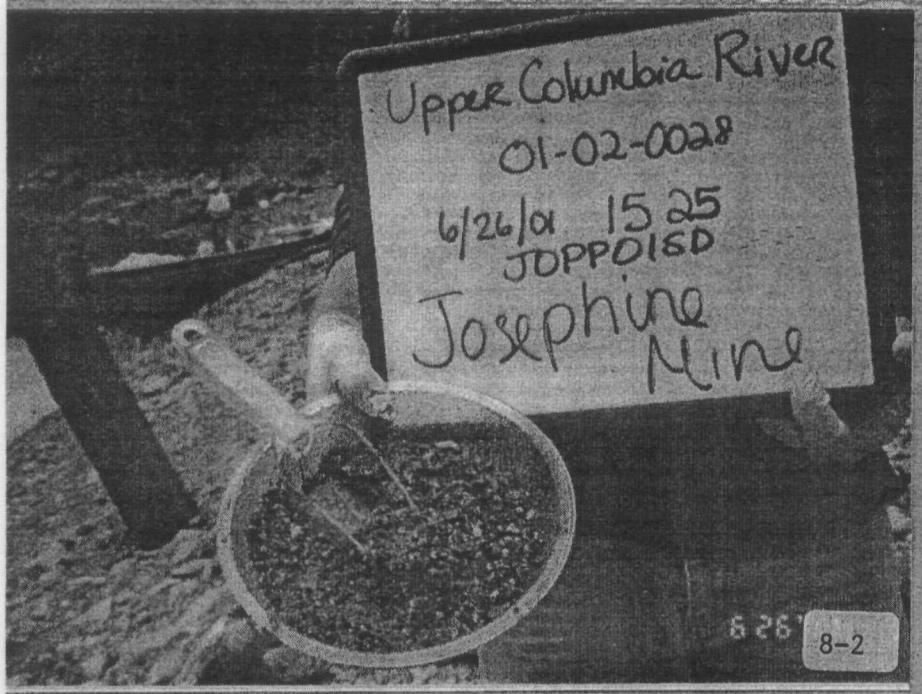
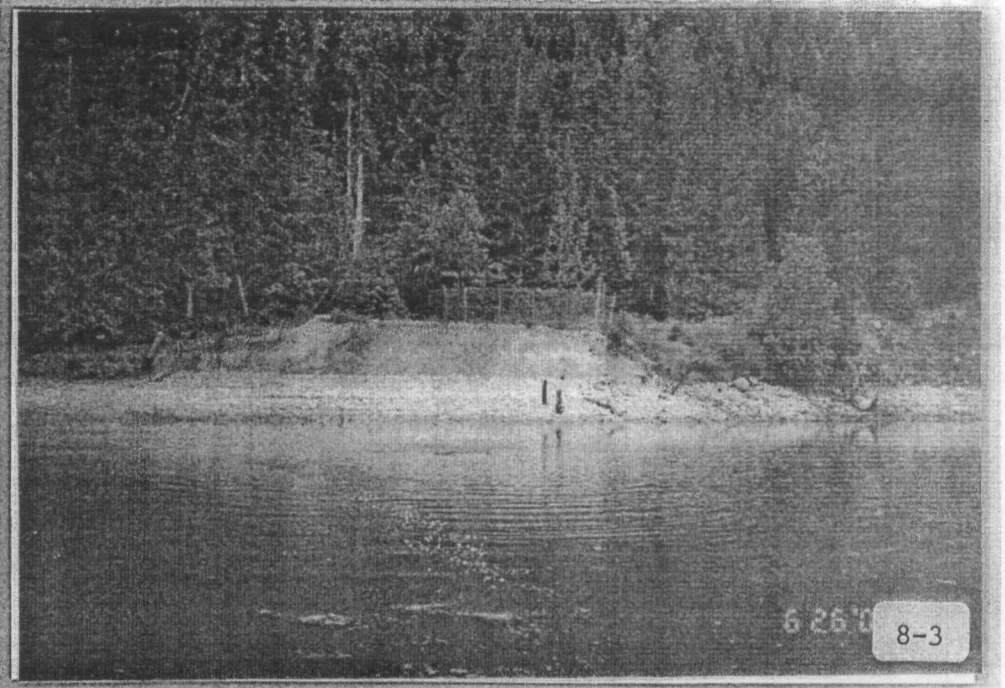

Upper Columbia River
01-02-0028
6/26/01 1525
JDPPO16D
Josephine Mine
8-2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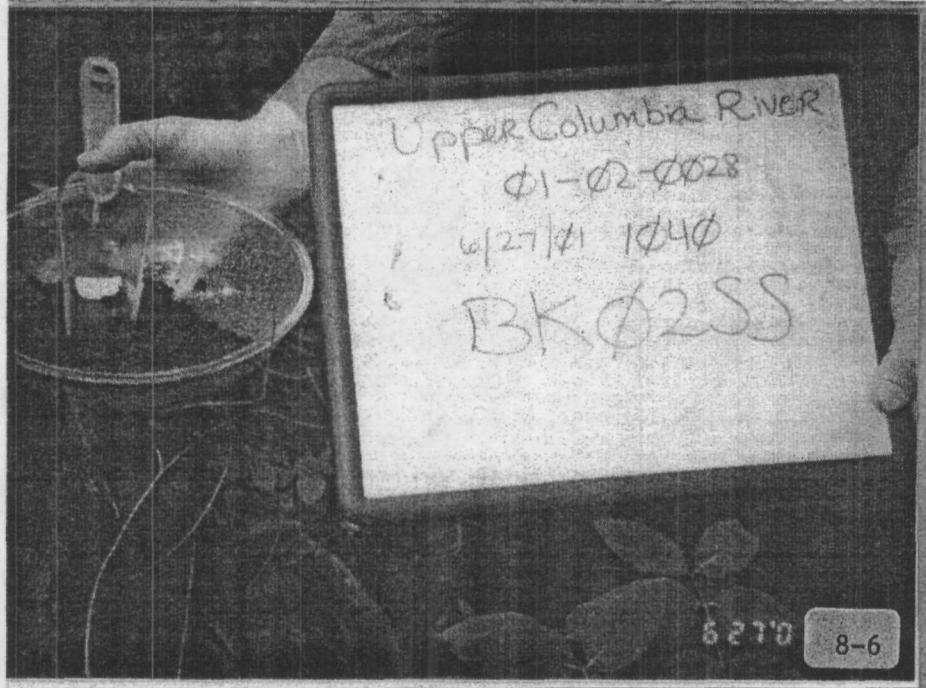
8-4

8-5


Upper Columbia River
01-02-0028
6/27/01 1040
BK0255
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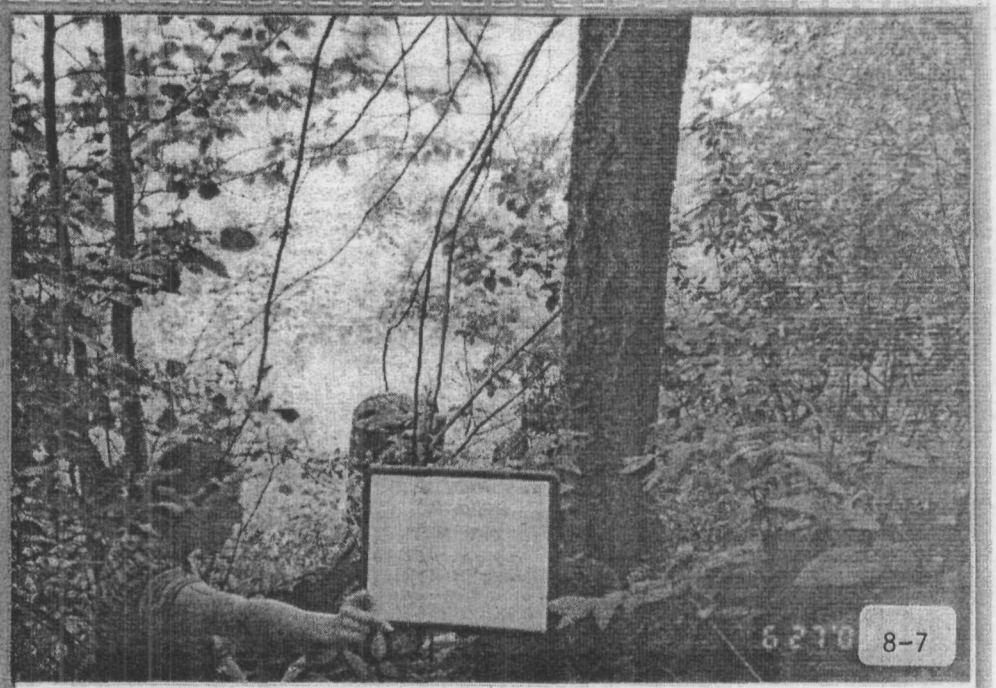

8-7

This Road is Open To:
Closed To All Motorized Vehicles
To Protect Habitat of Threatened or Endangered Wildlife
8-8

ROAD CLOSED
THIS ROAD WILL BE CLOSED TO MOTOR VEHICLES FROM APR 1 TO JUL 1
8-9

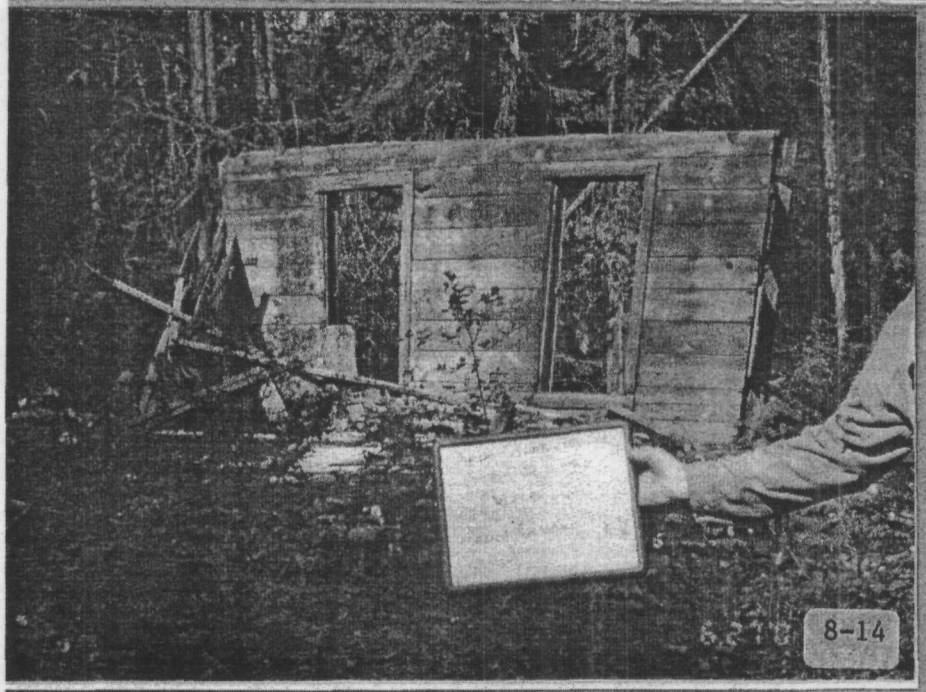
0182

8-13

8-12

8-11

8-10



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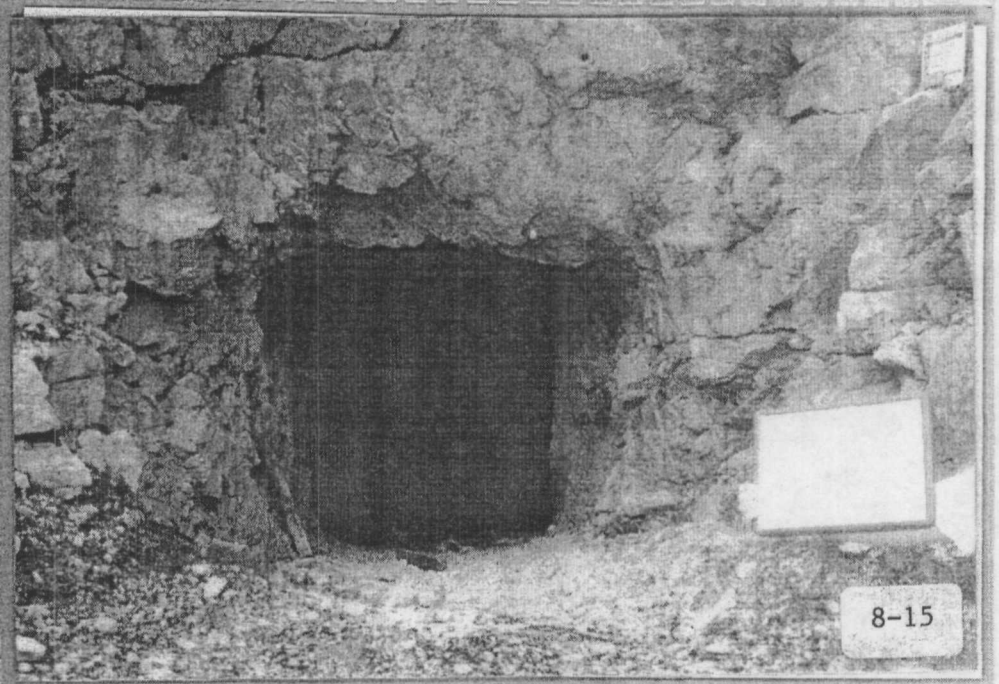

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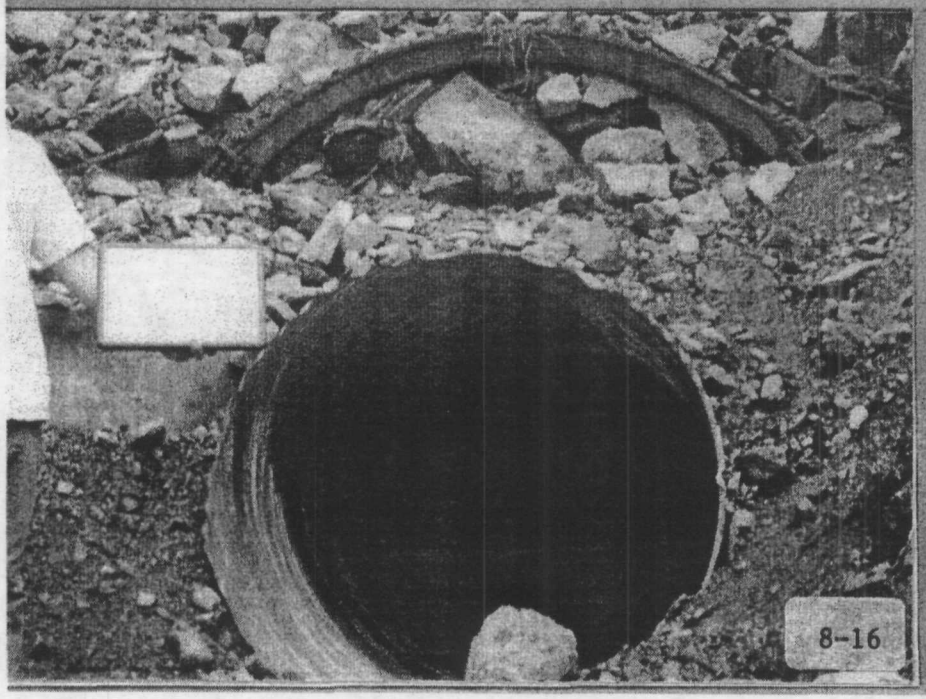

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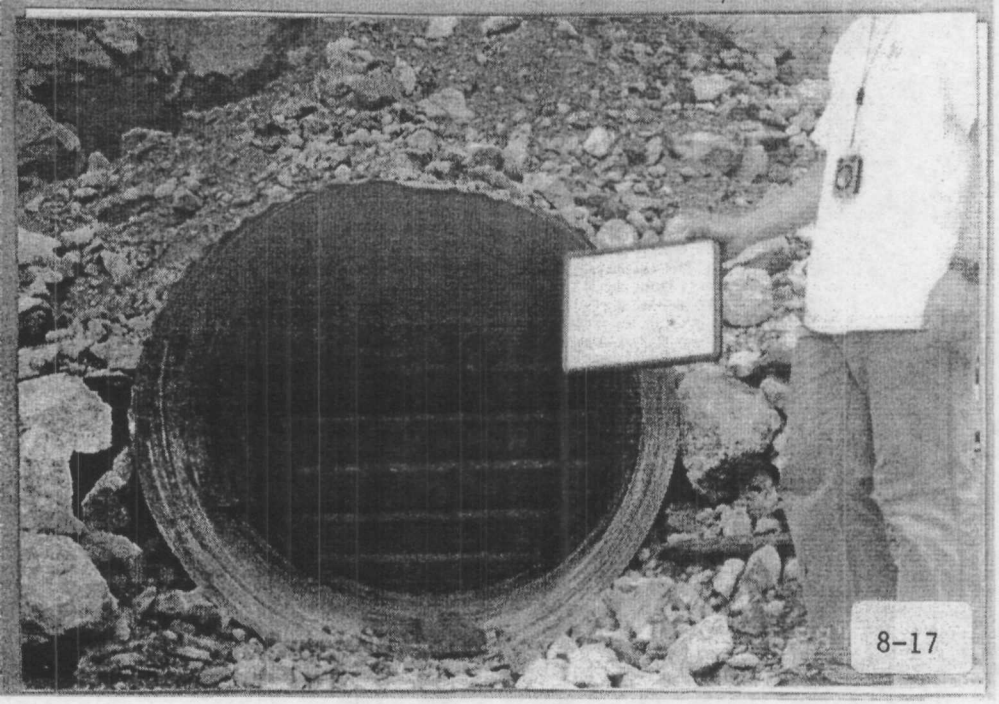

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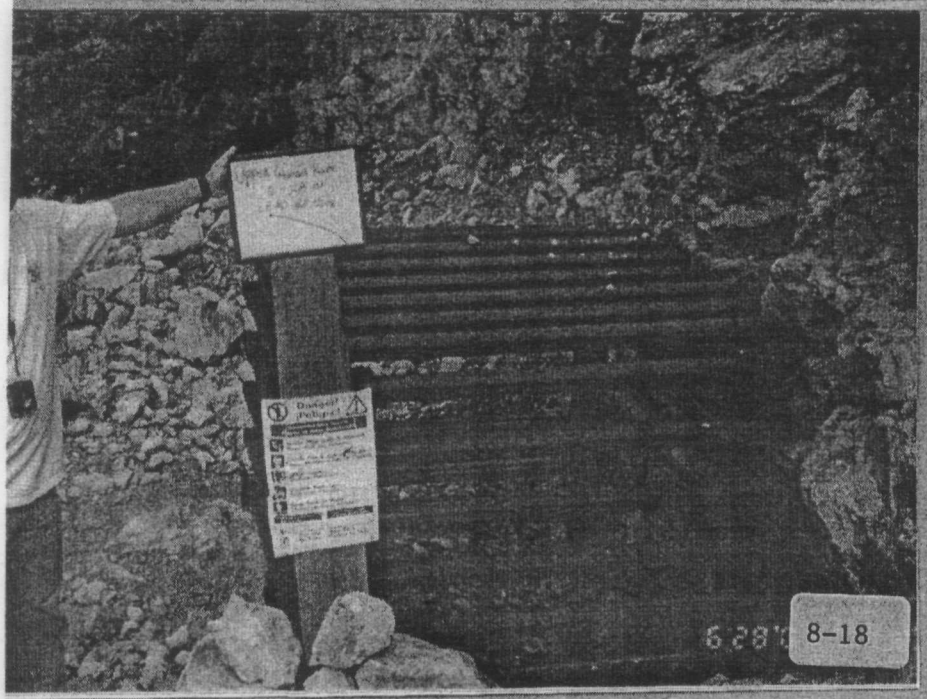

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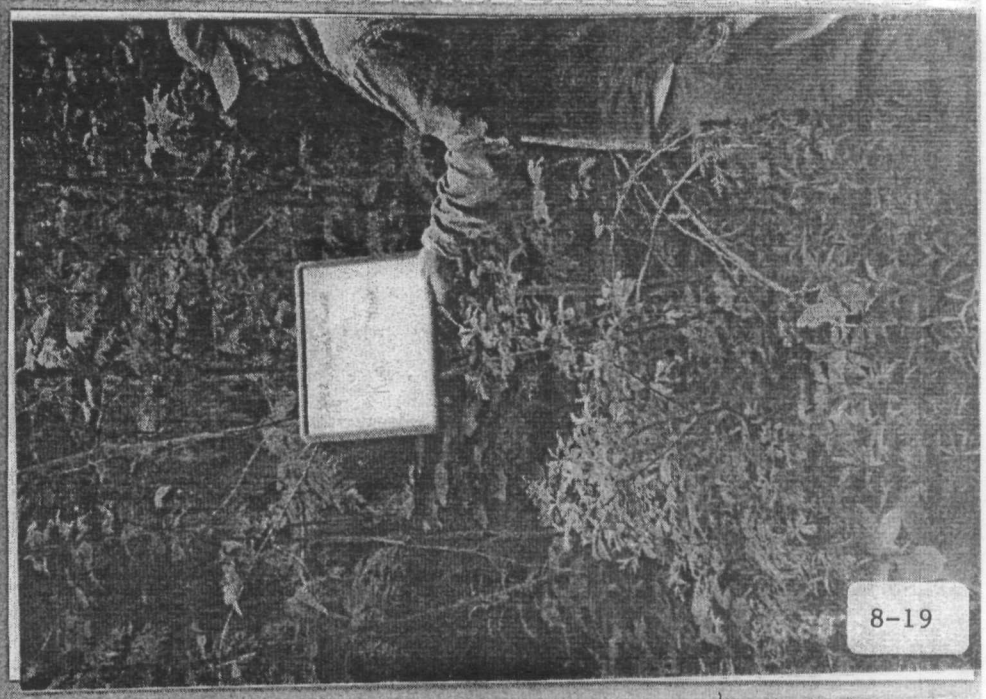

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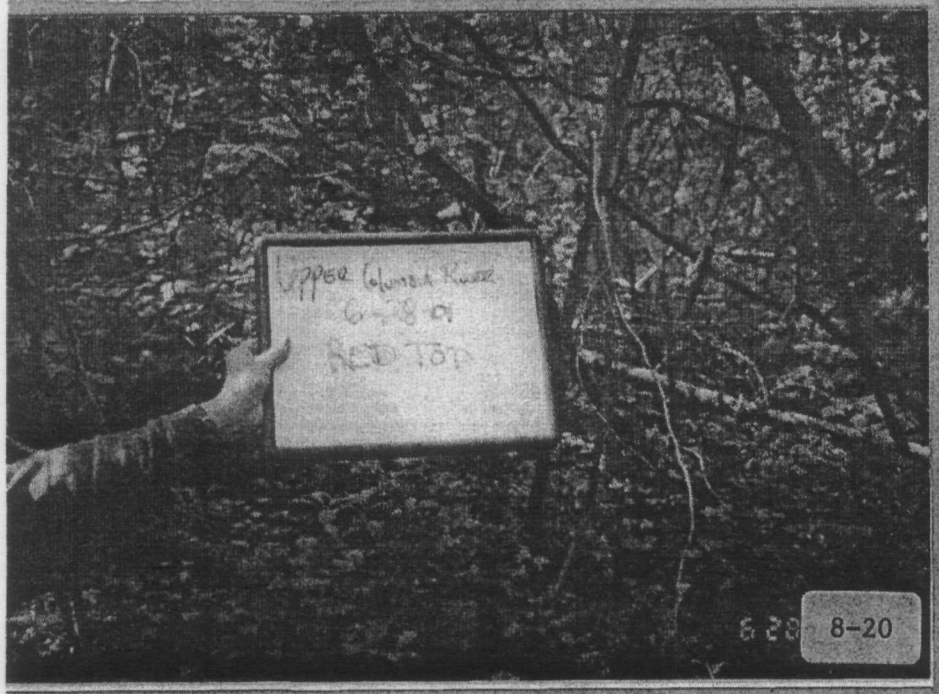

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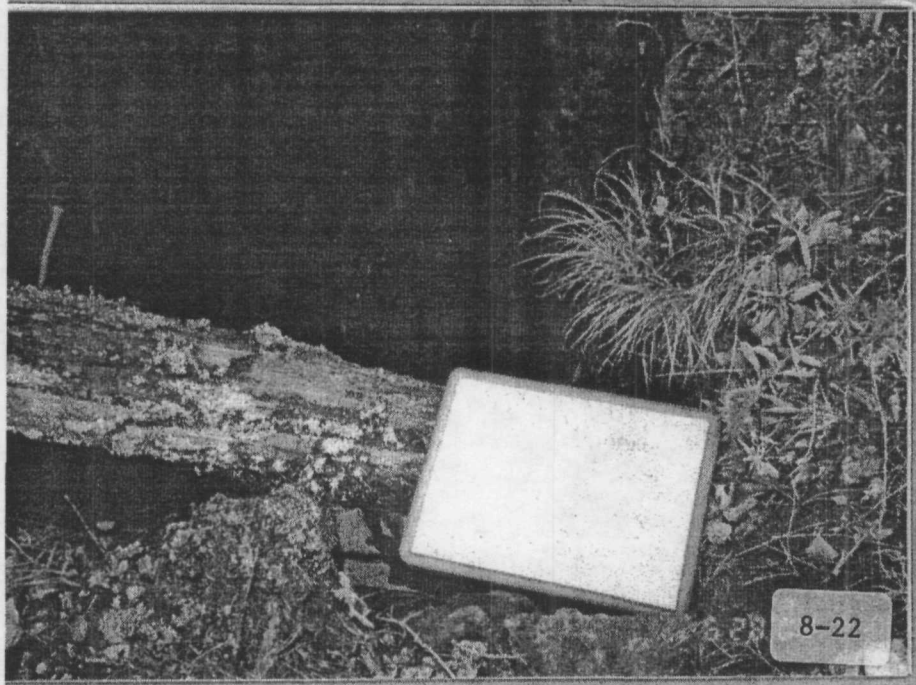

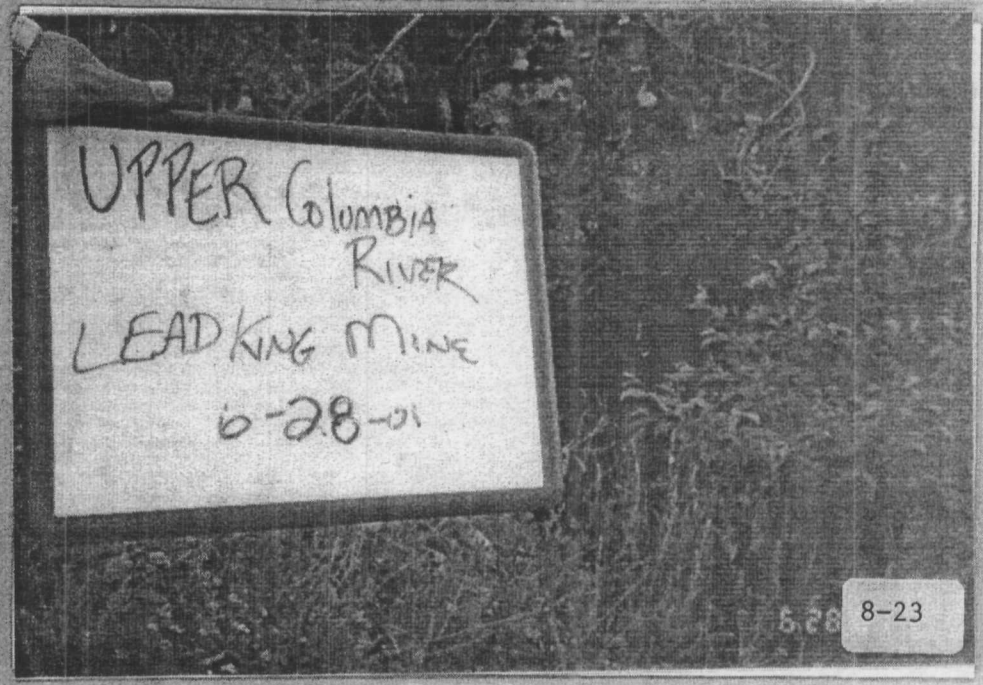

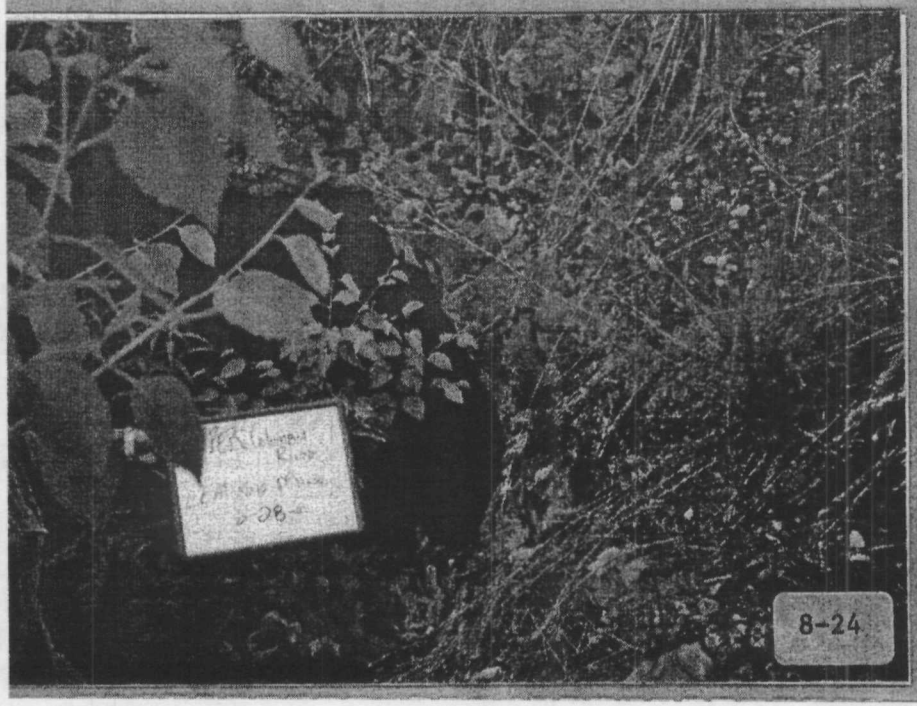

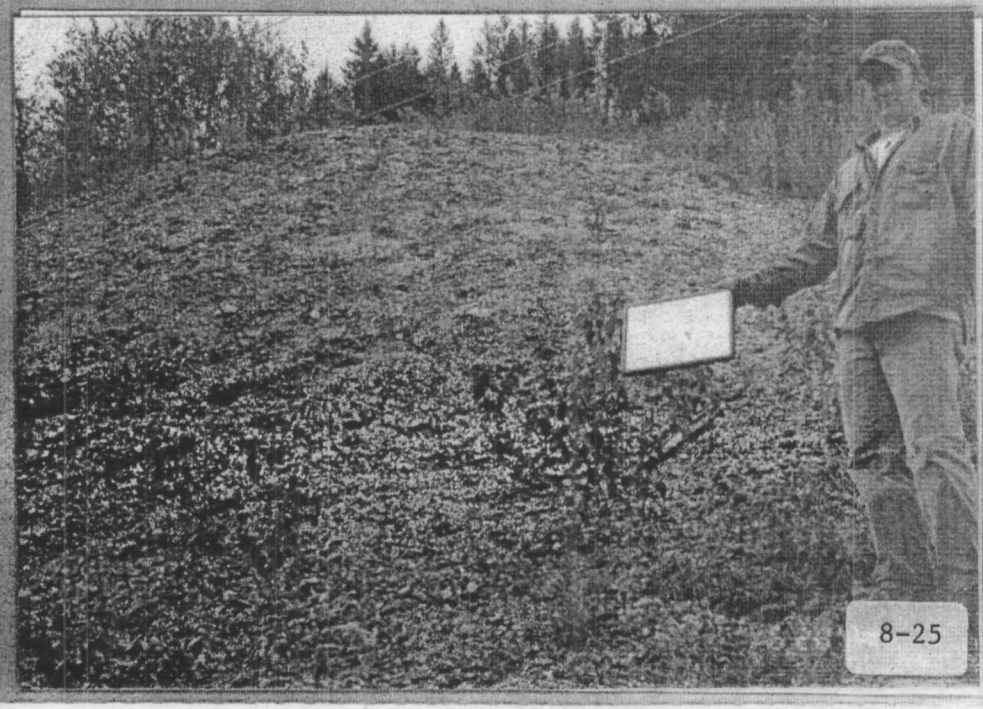

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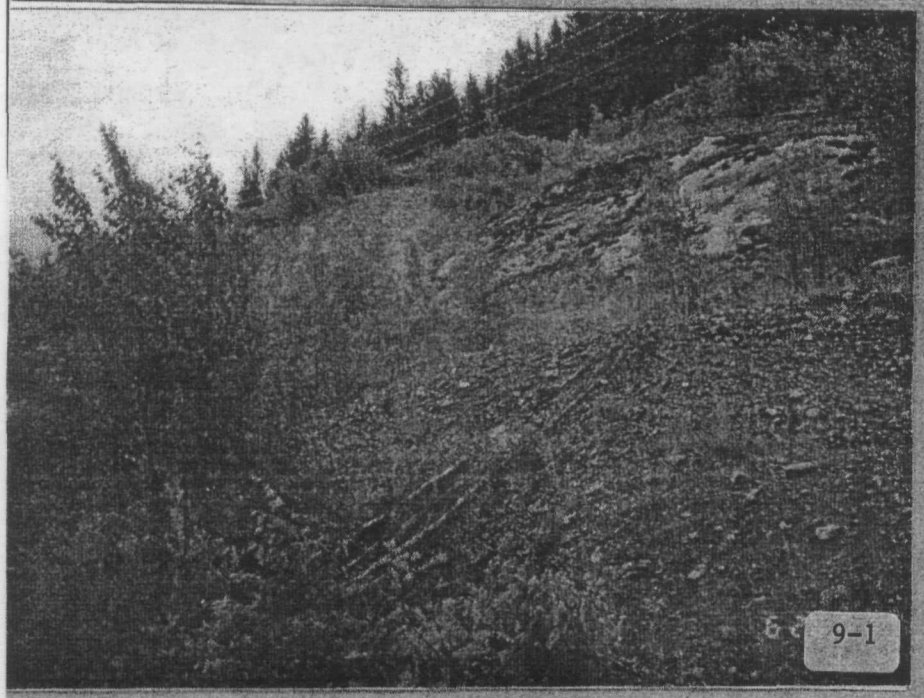

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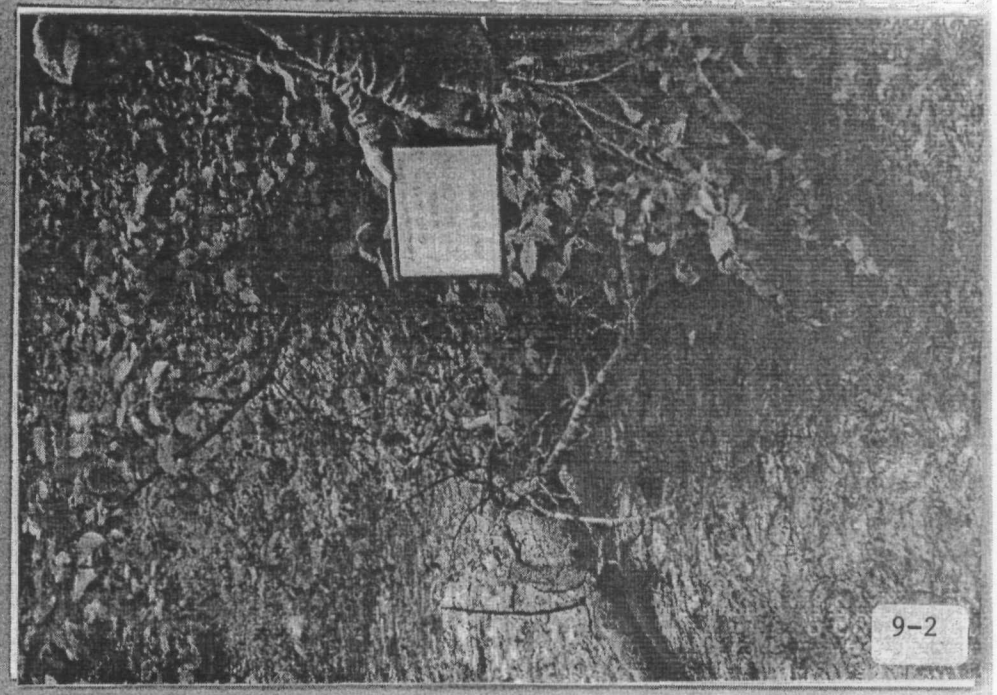

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9-3

9-4

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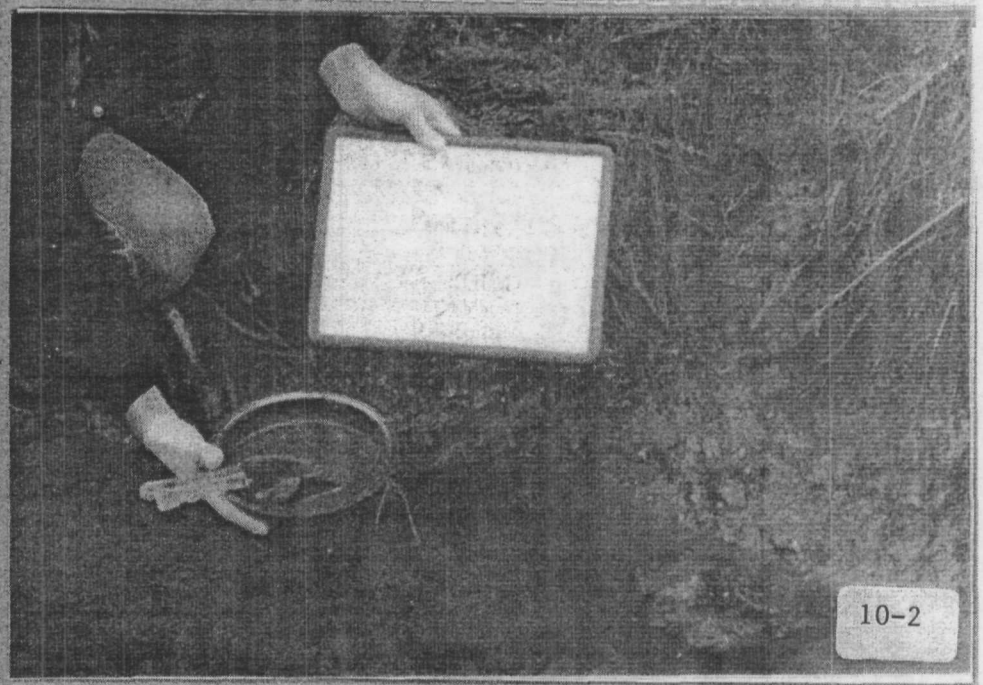

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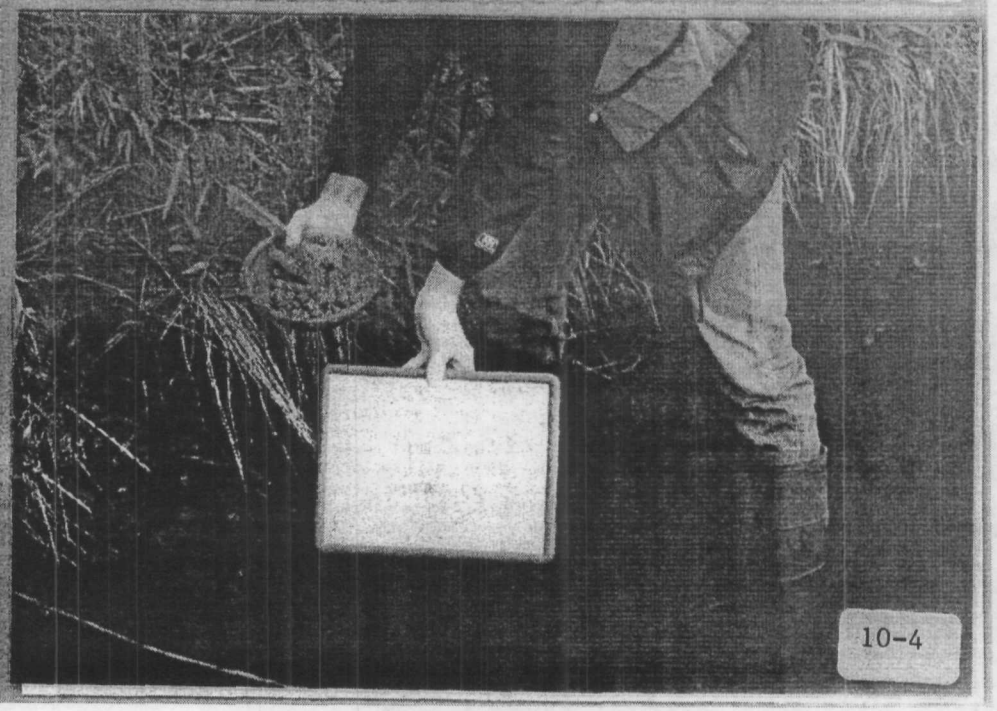

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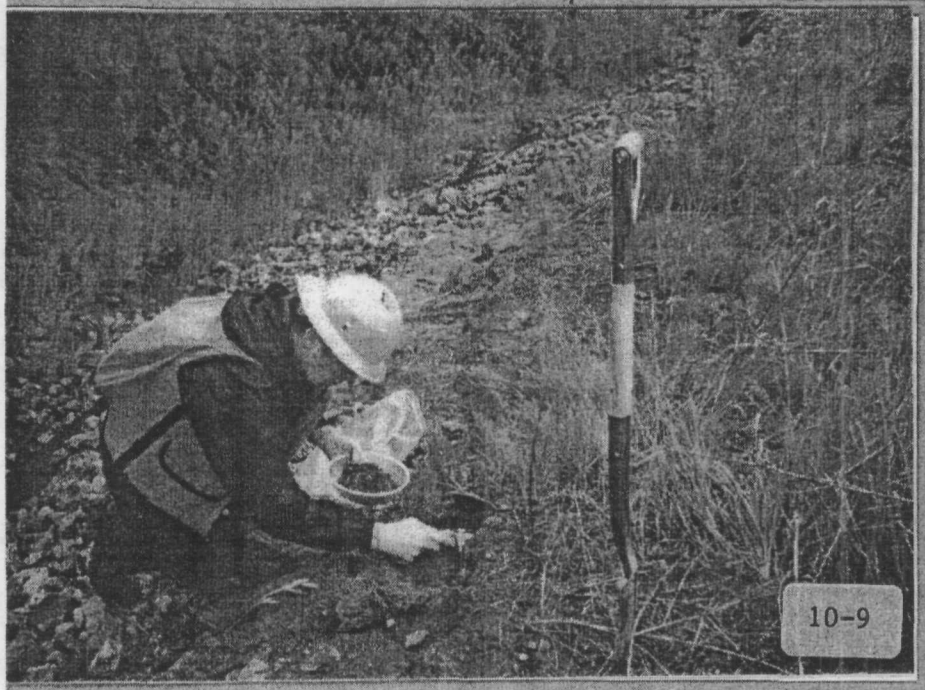

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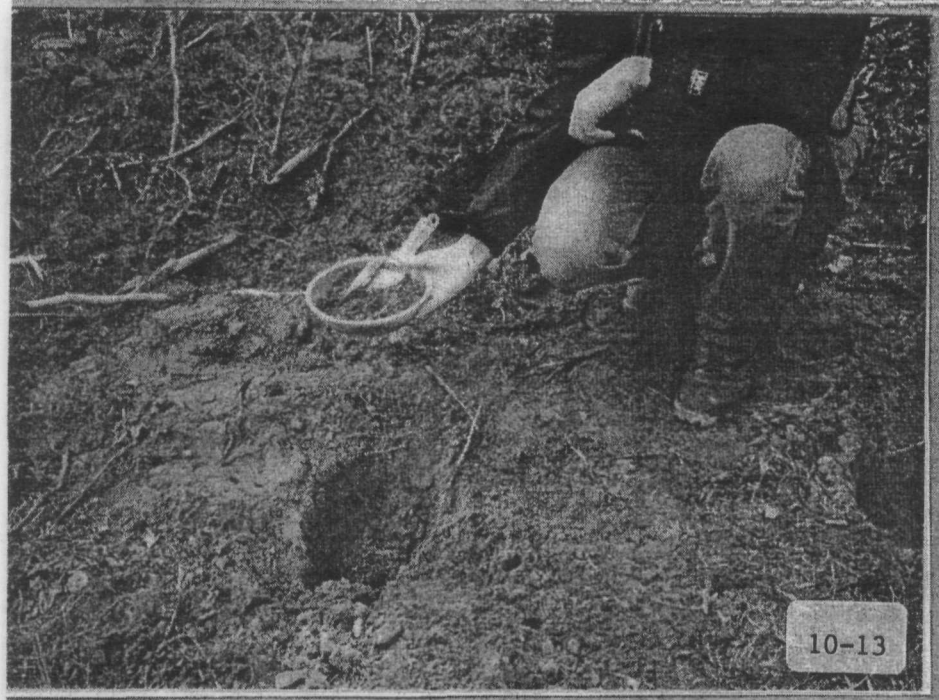

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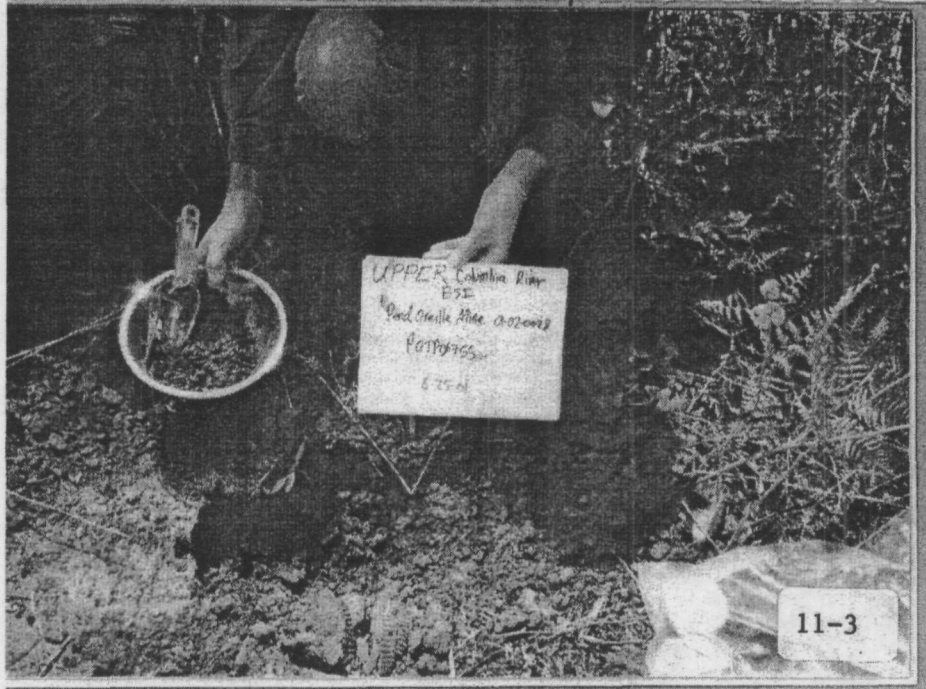

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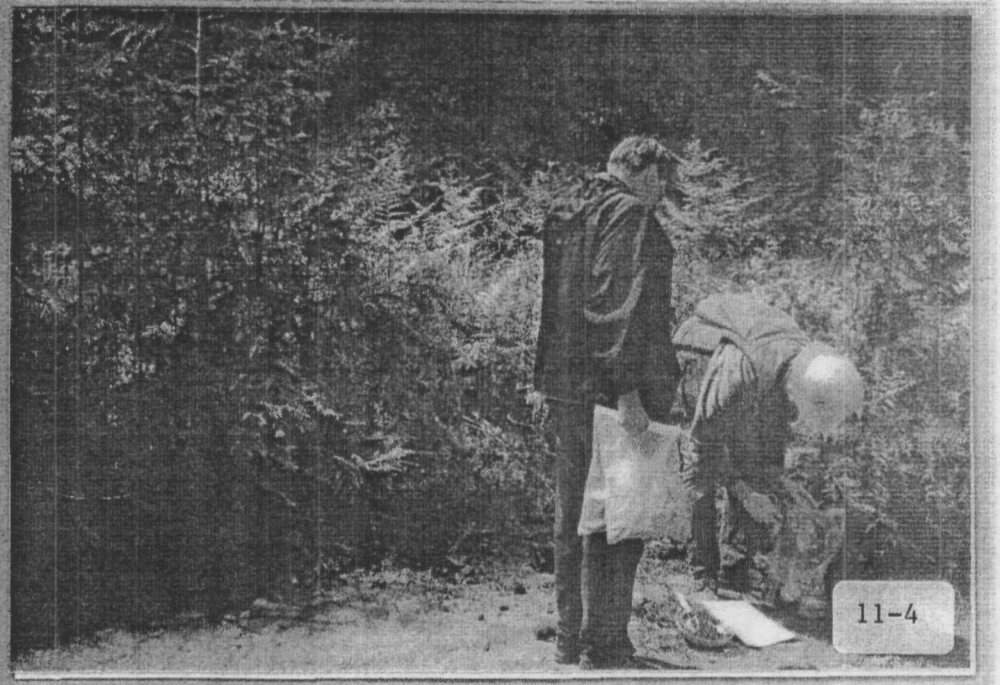

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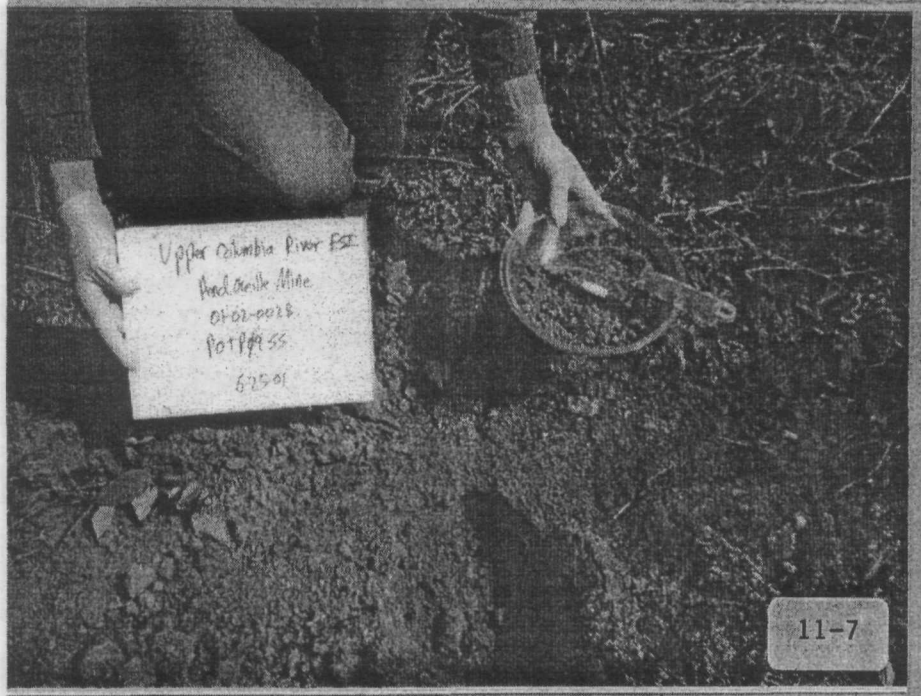

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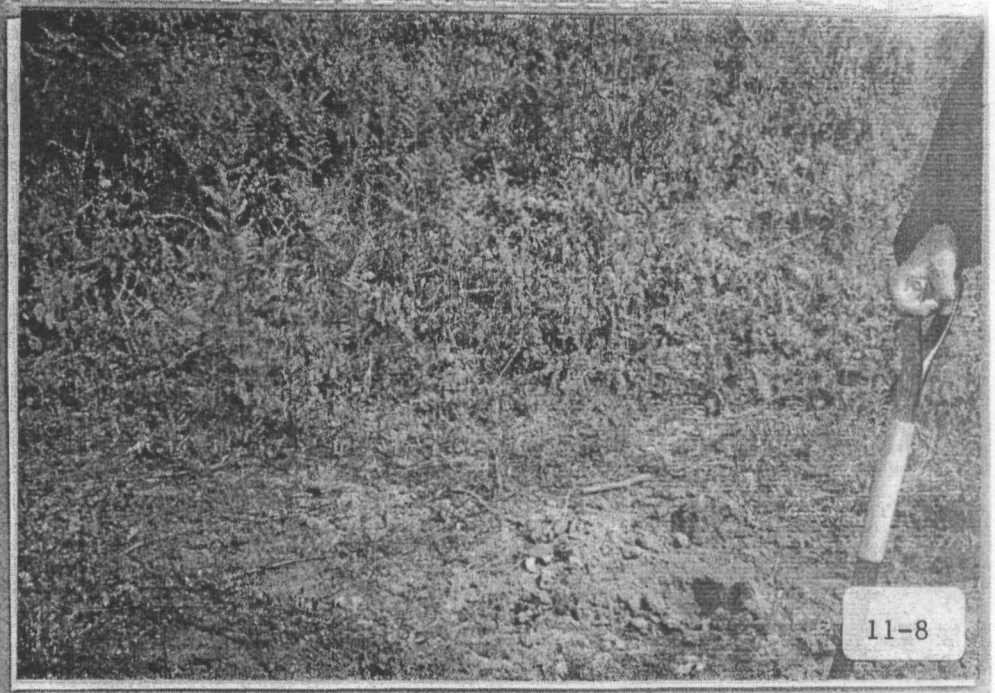

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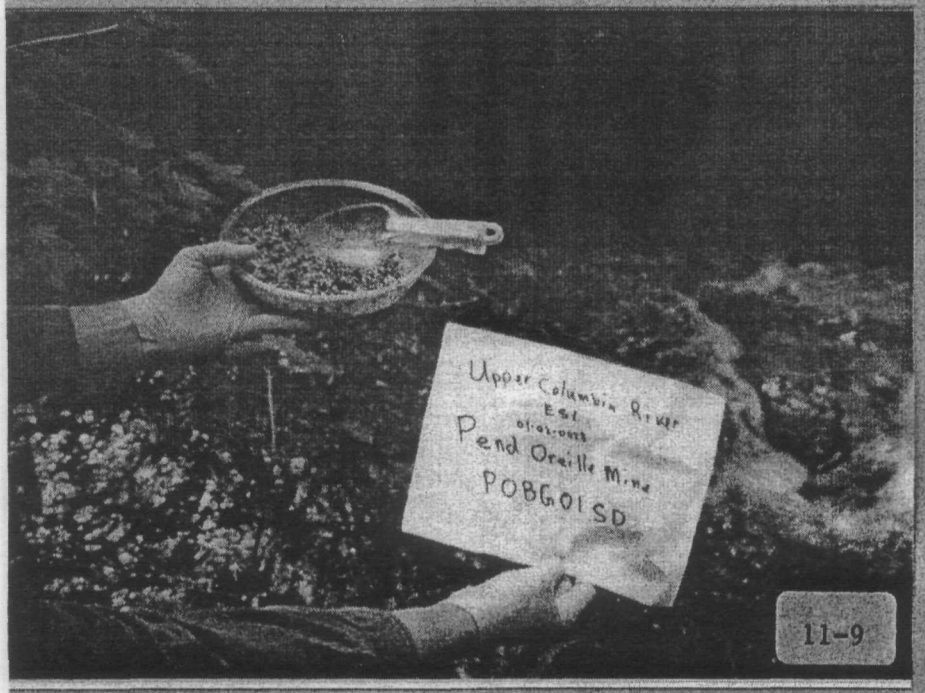

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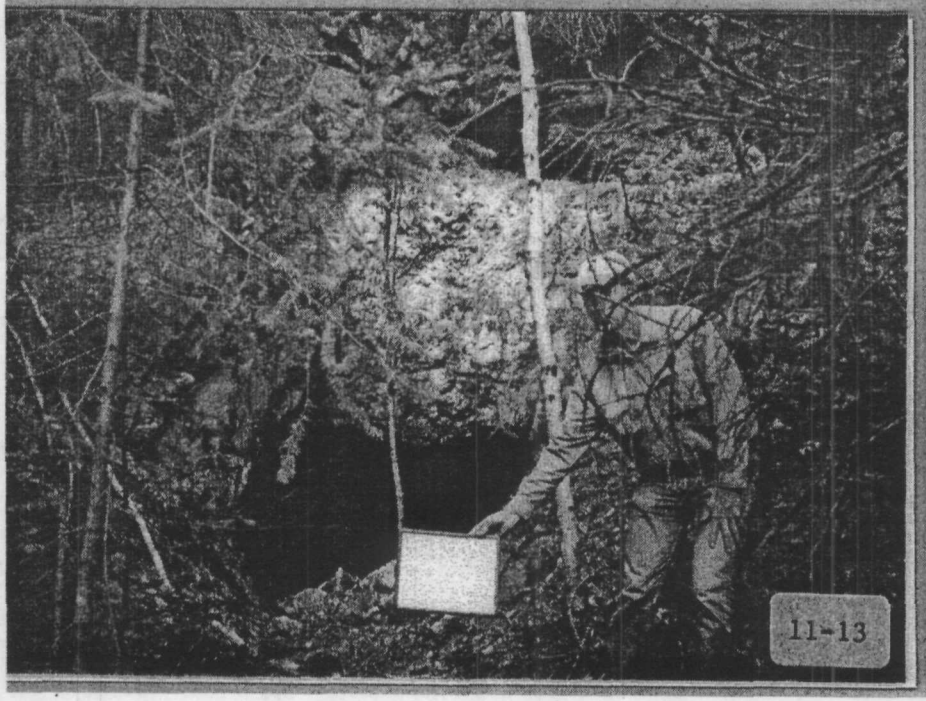

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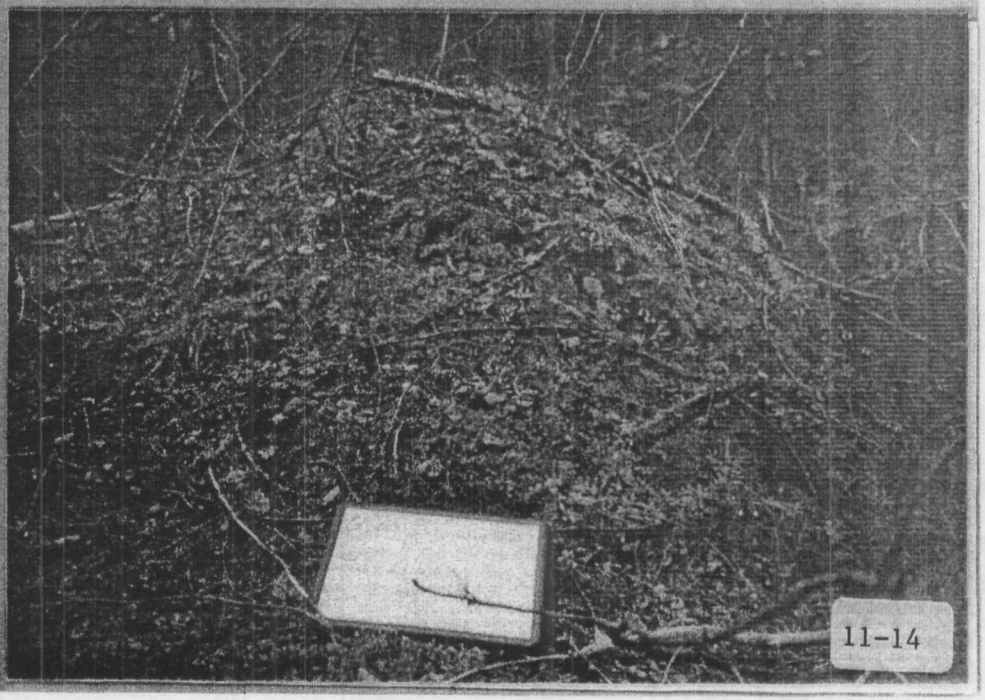

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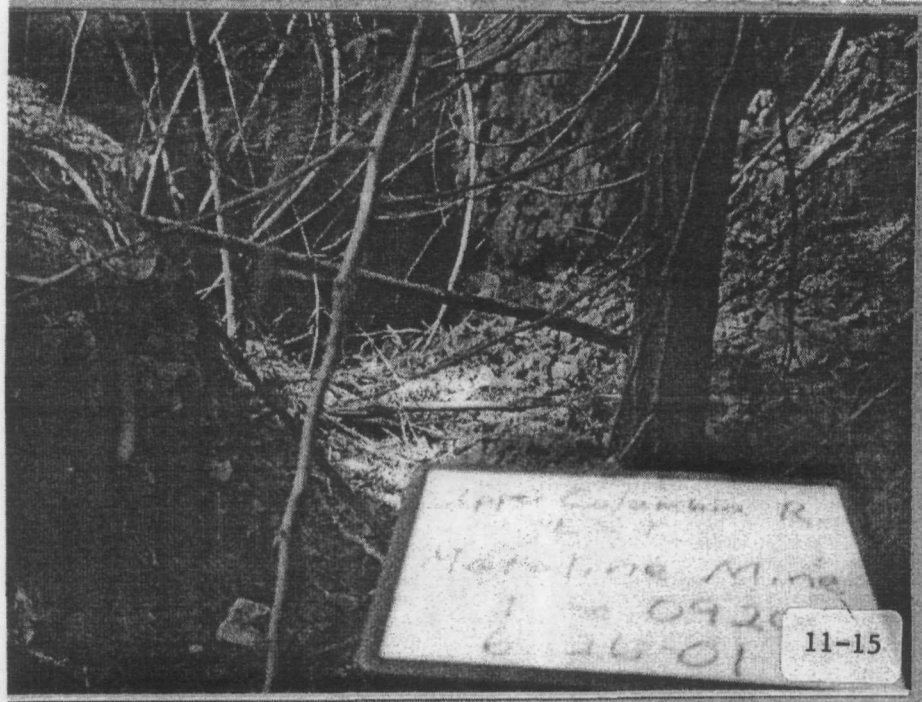

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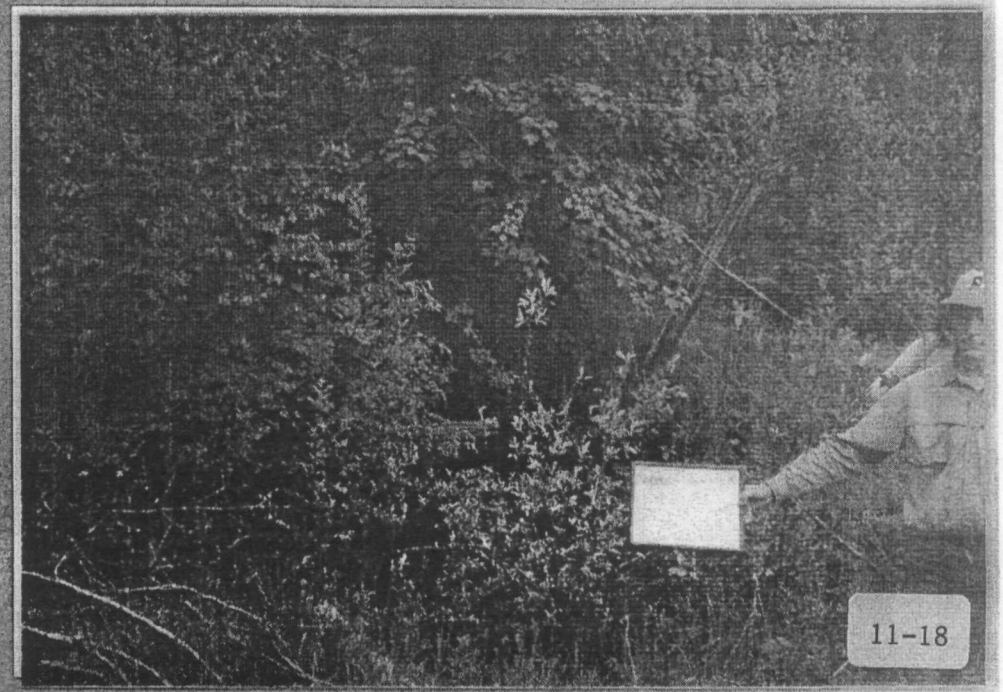

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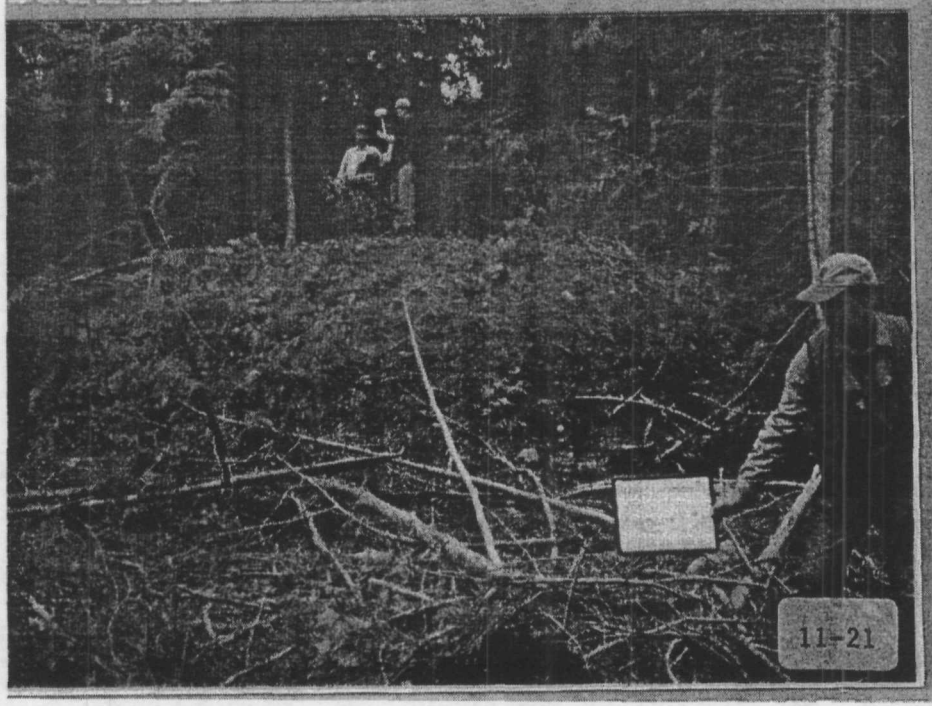

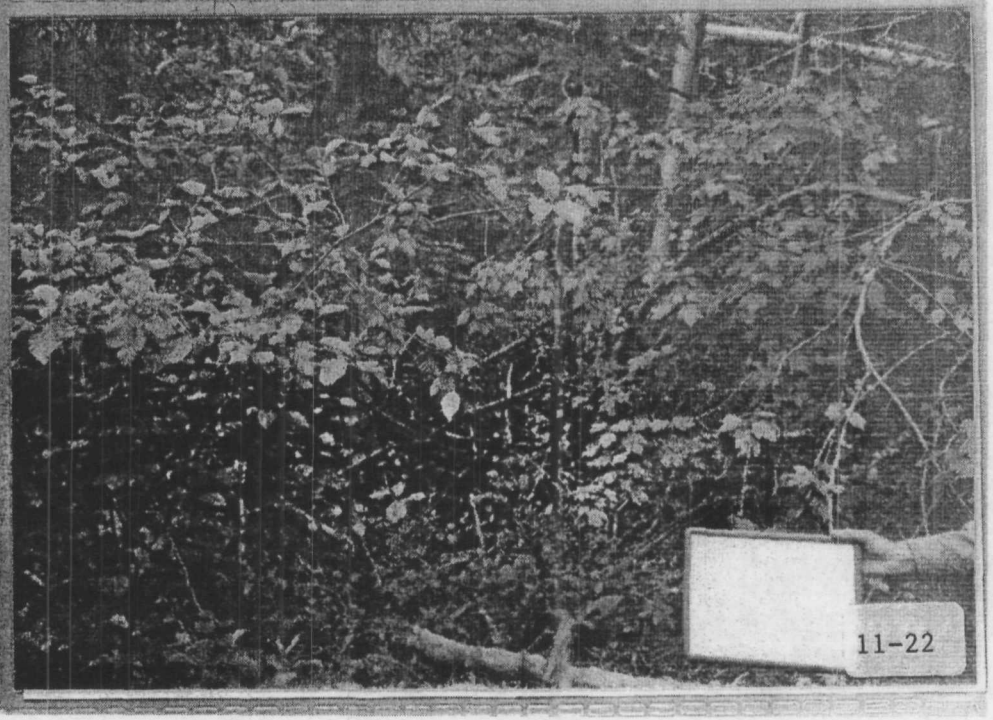

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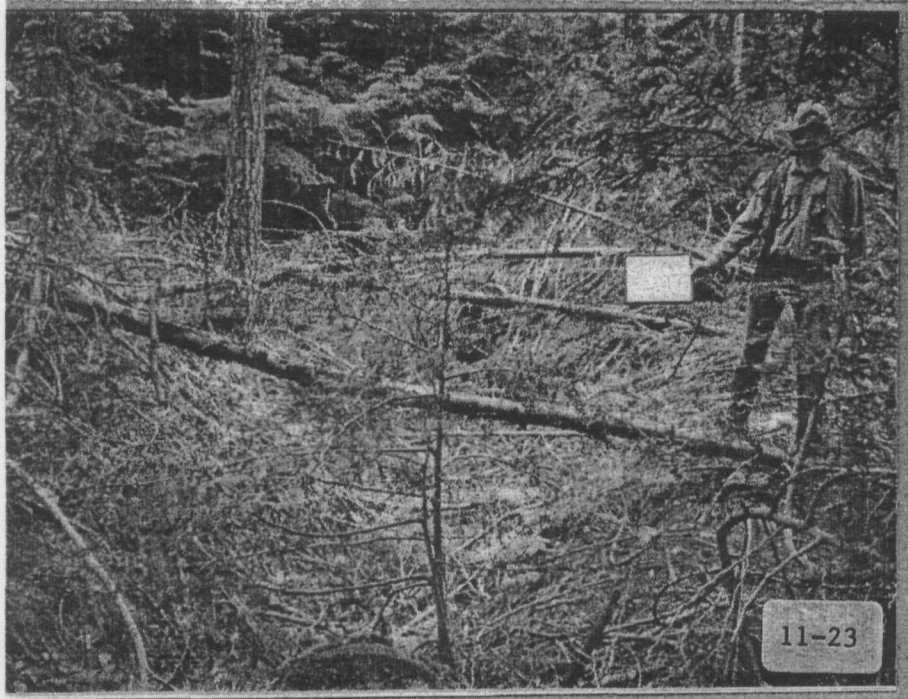

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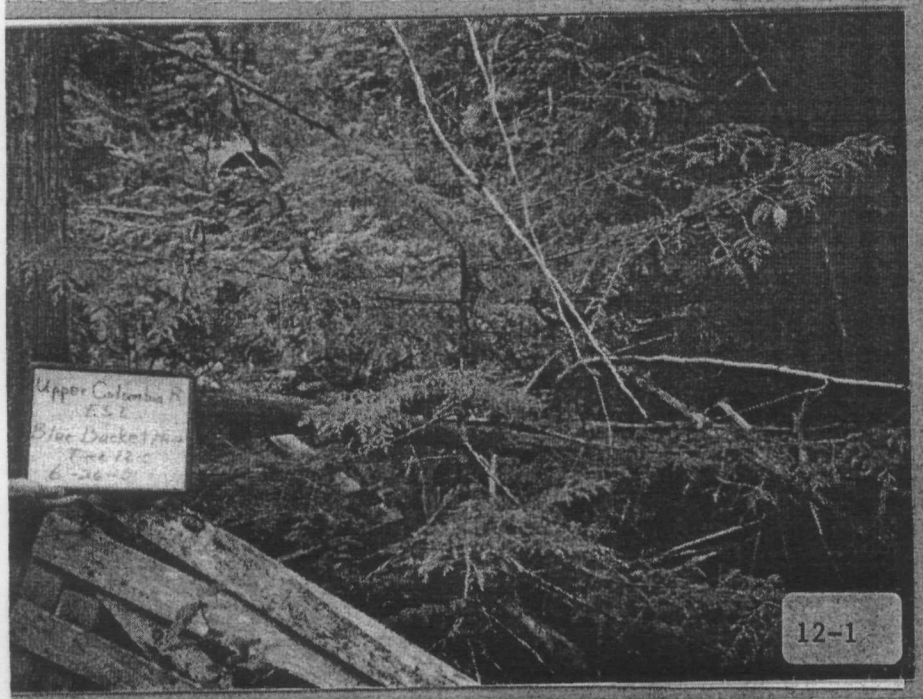

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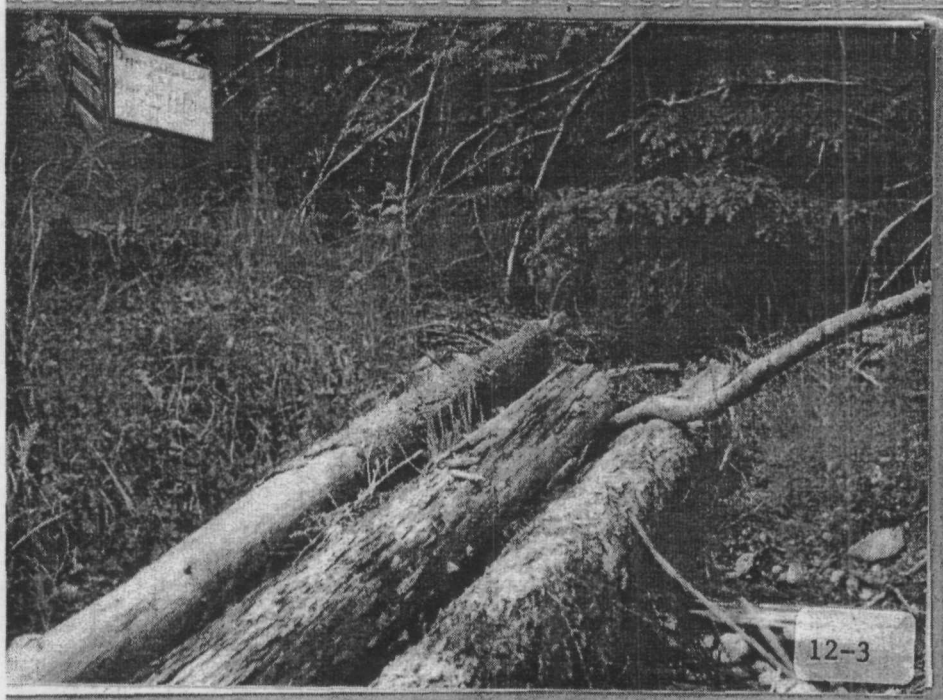
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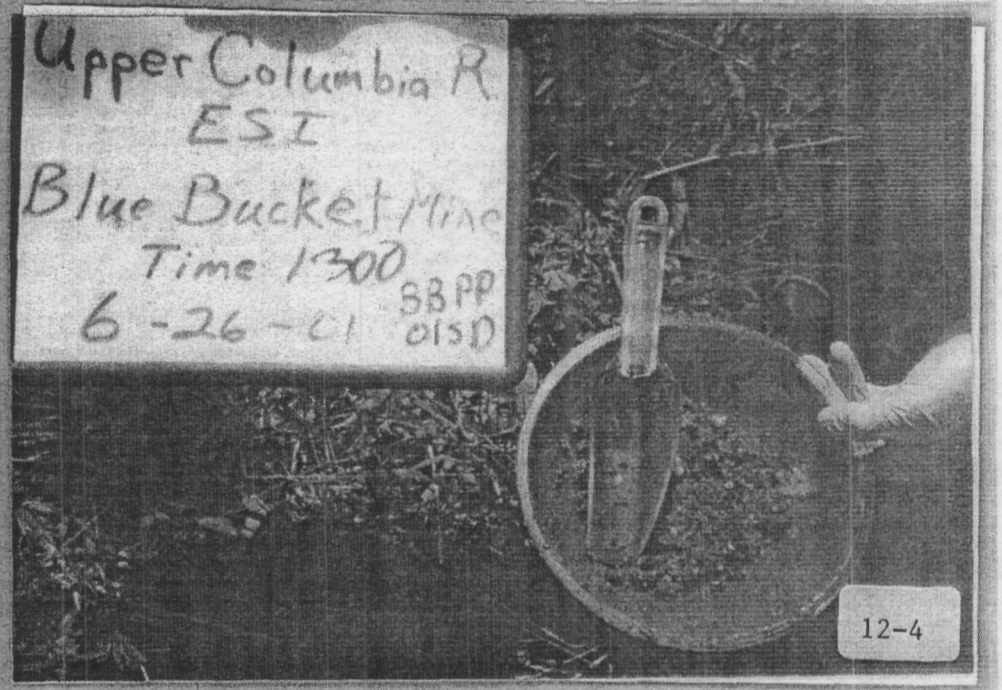
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Blue Bucket Mine
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6-26-01
BBPP
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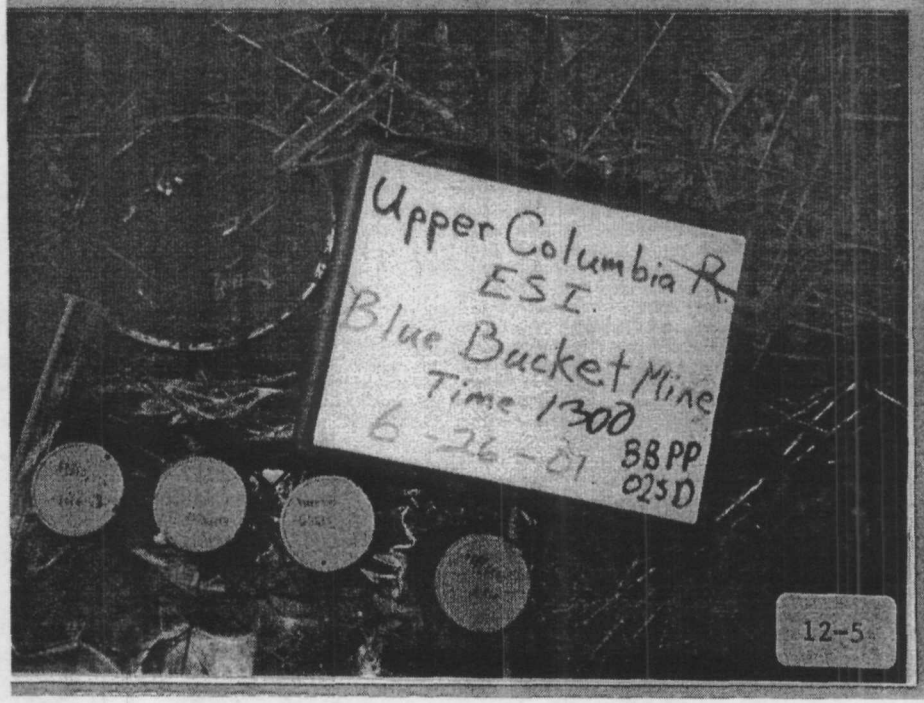
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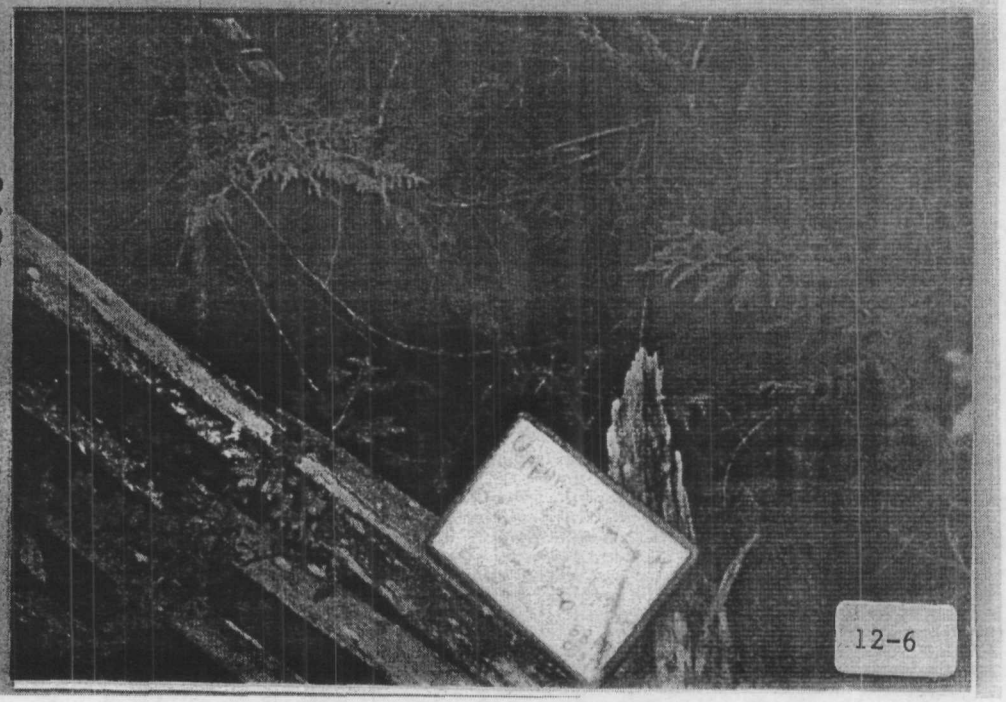
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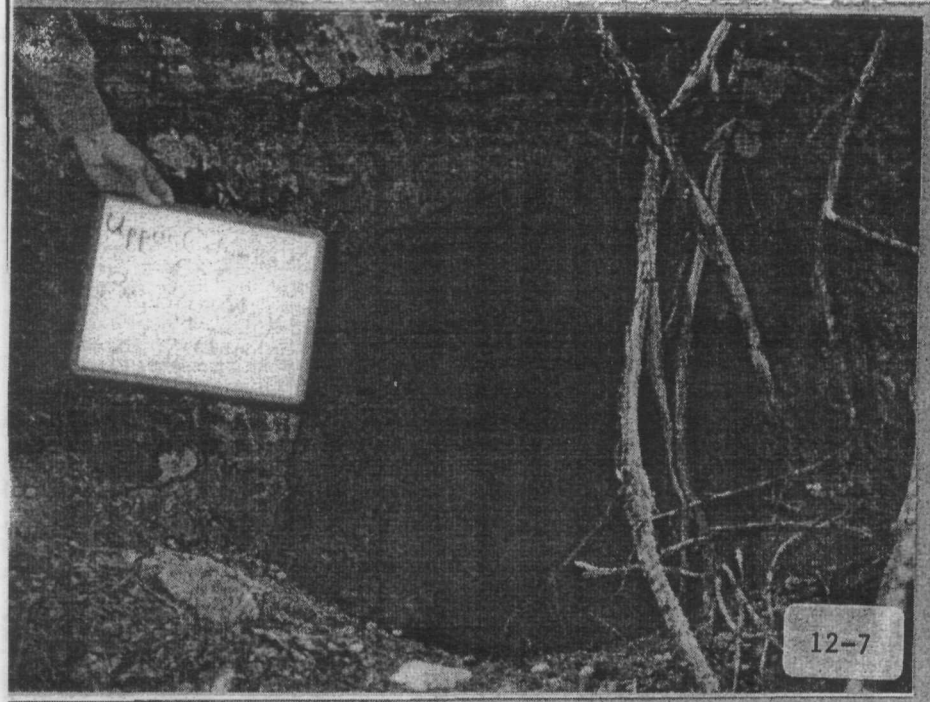

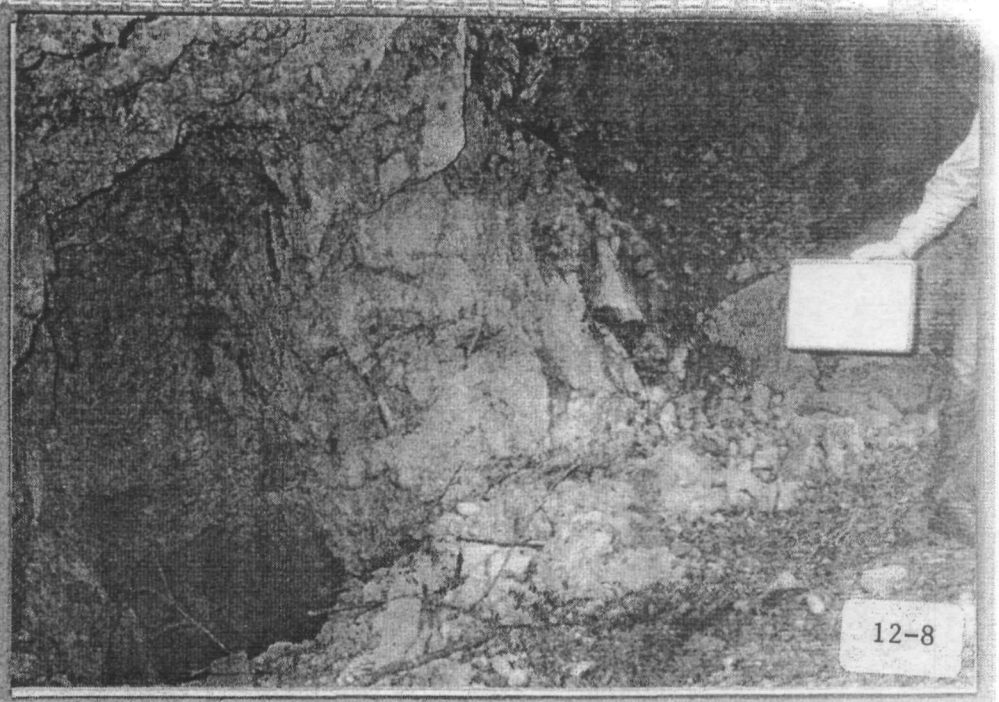

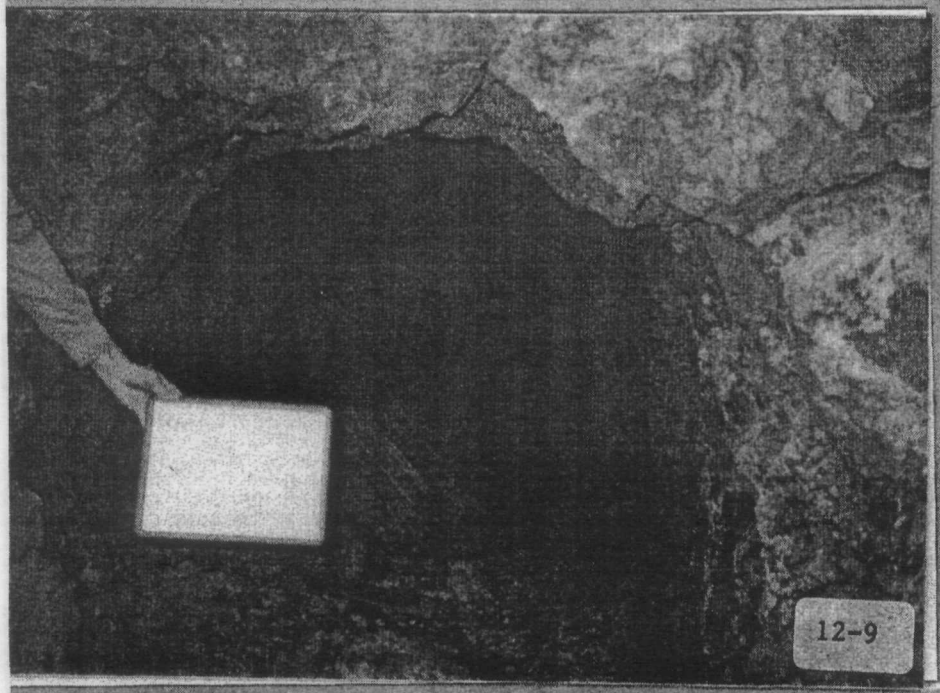

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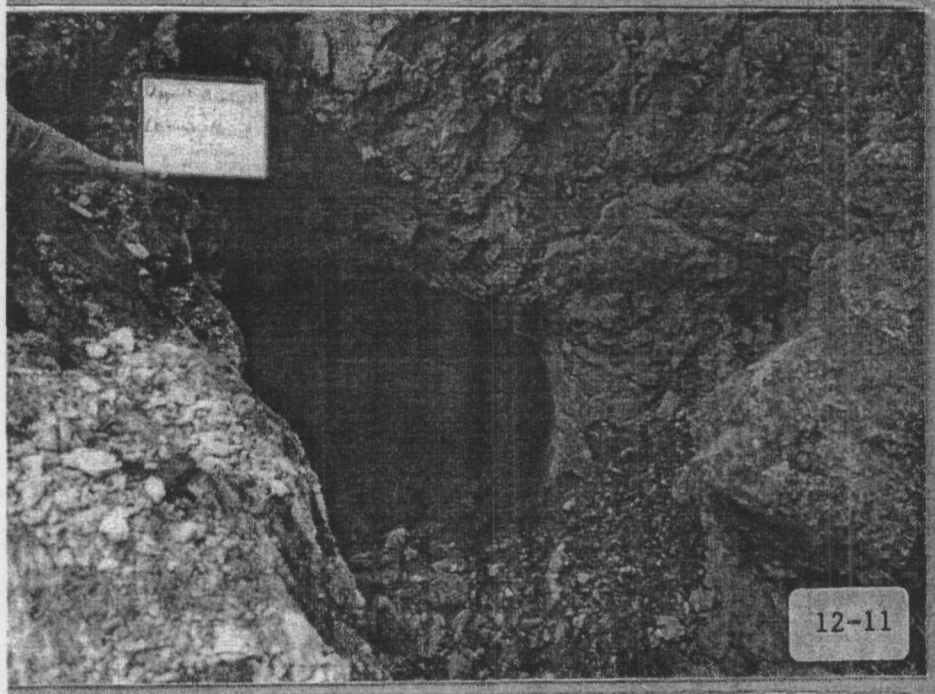

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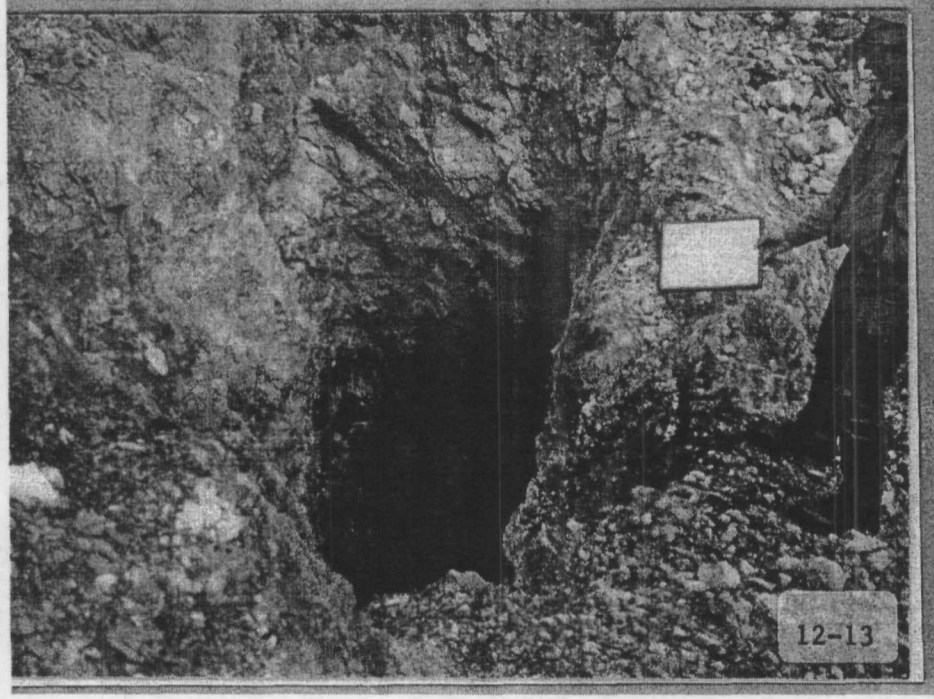

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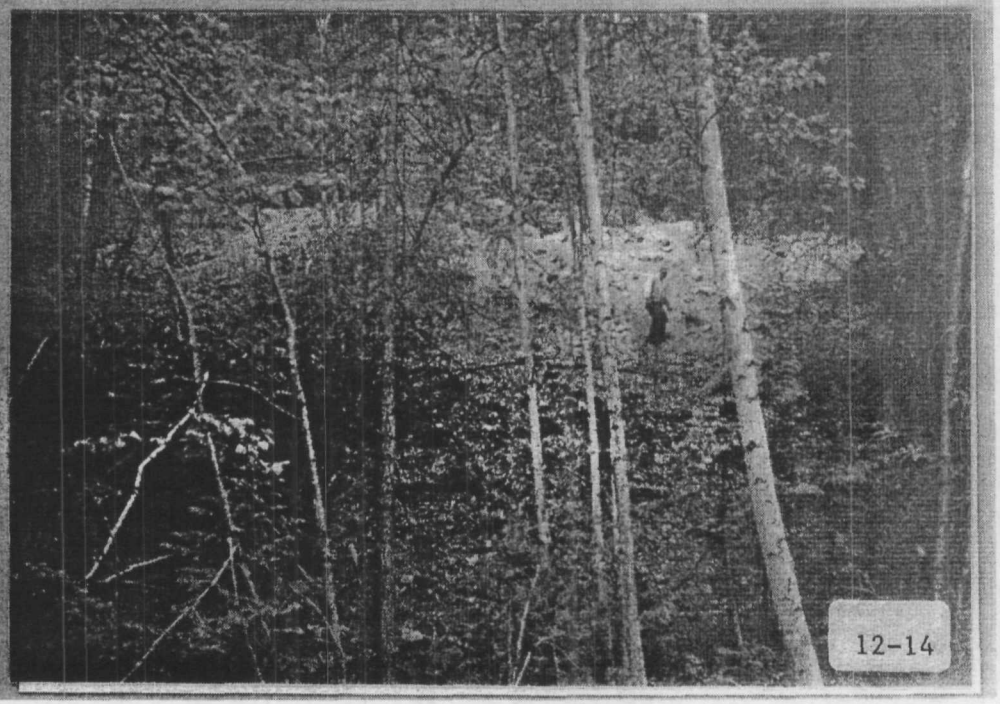

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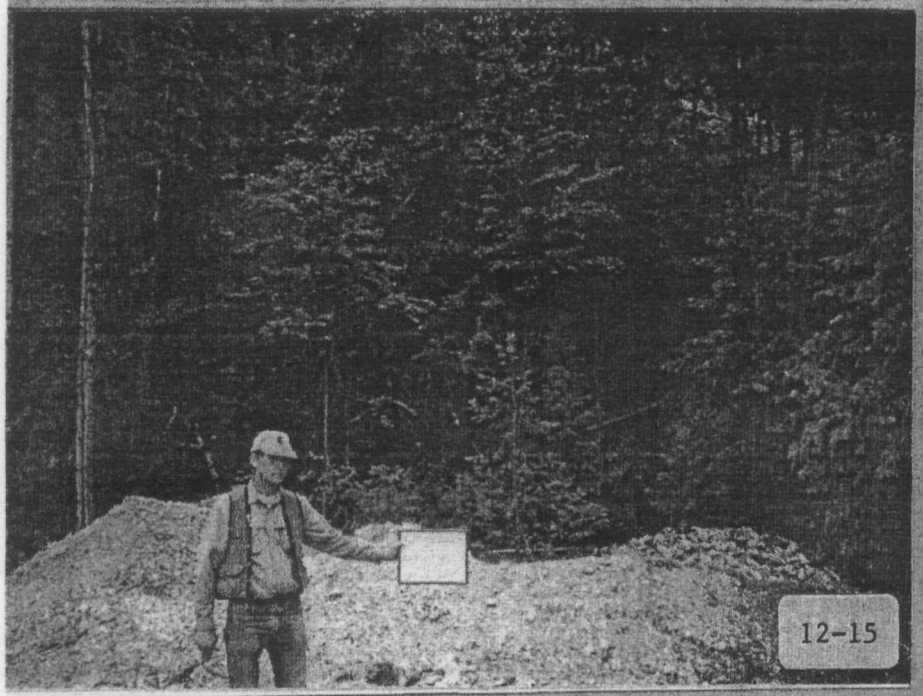

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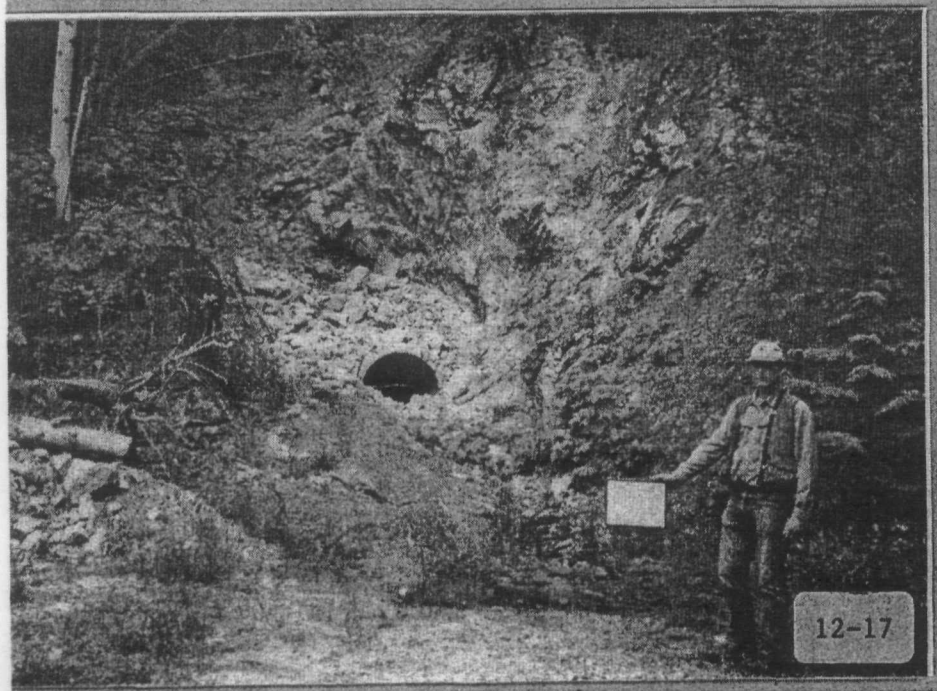

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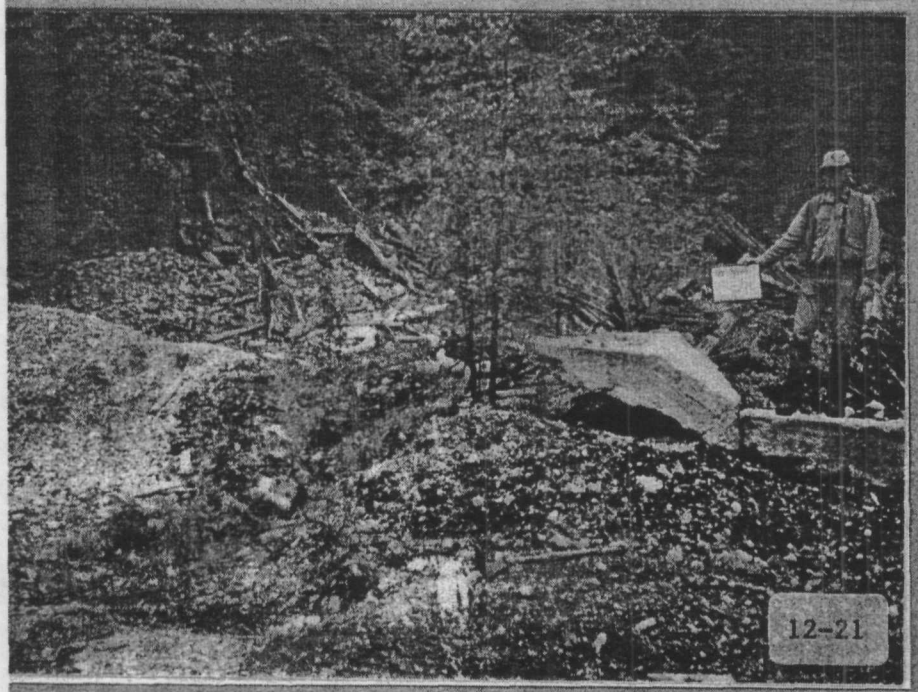

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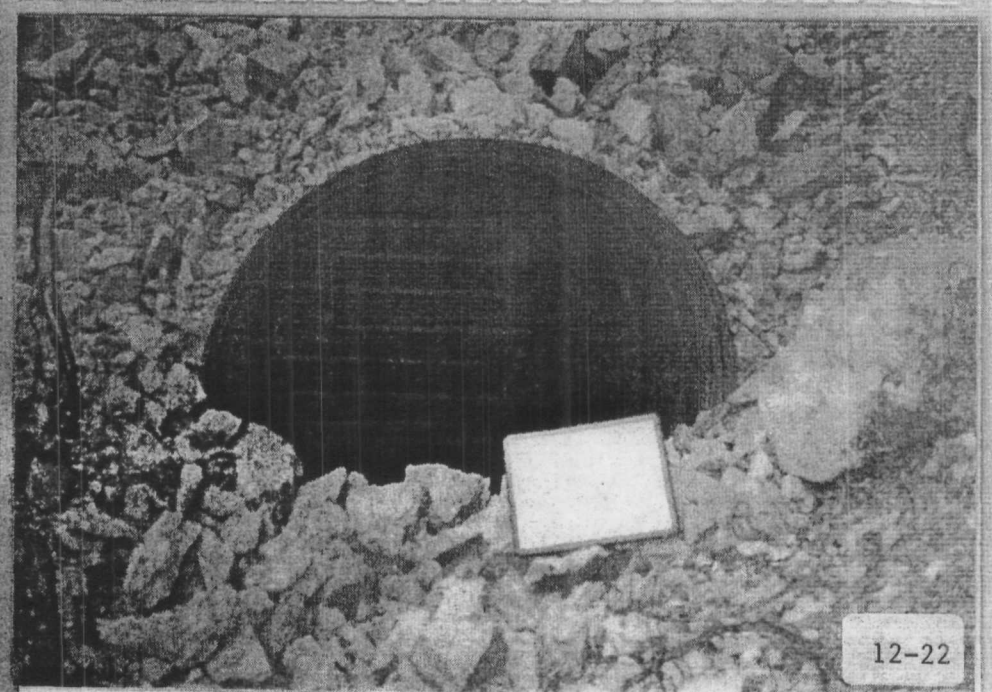

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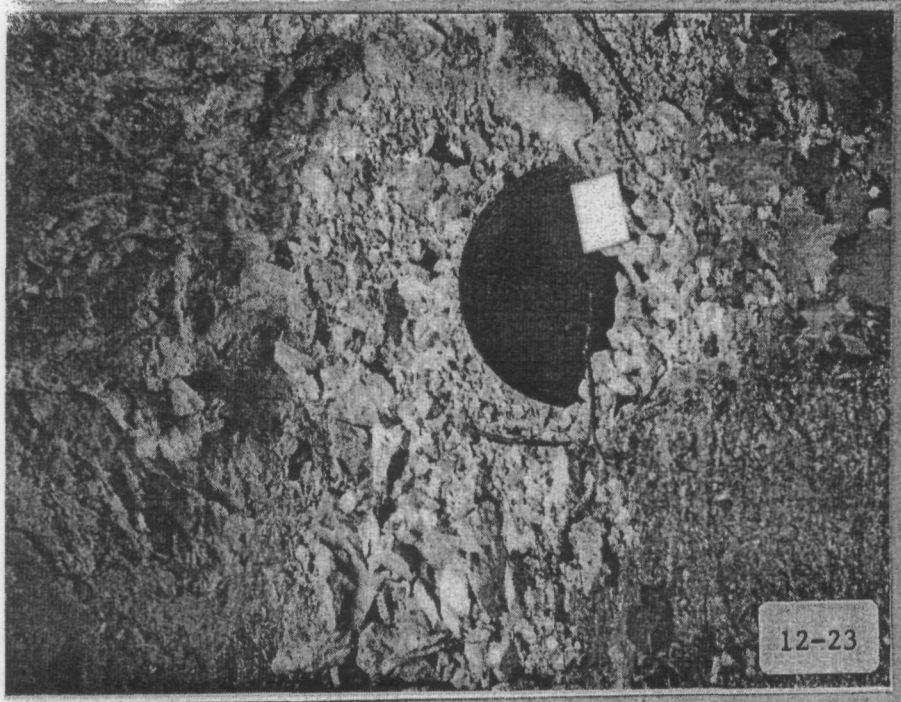

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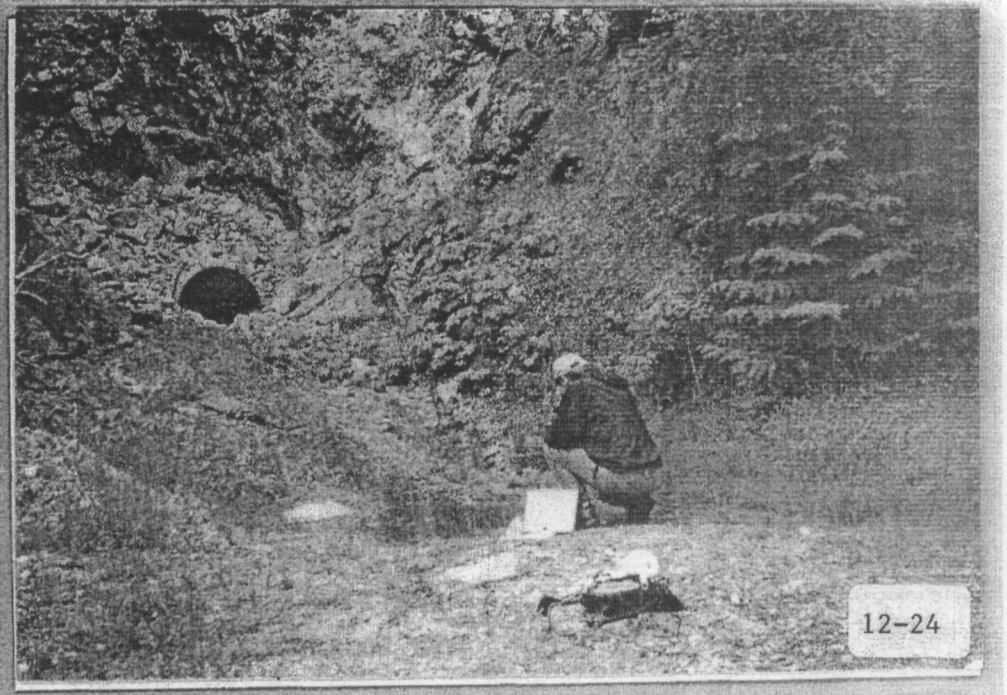

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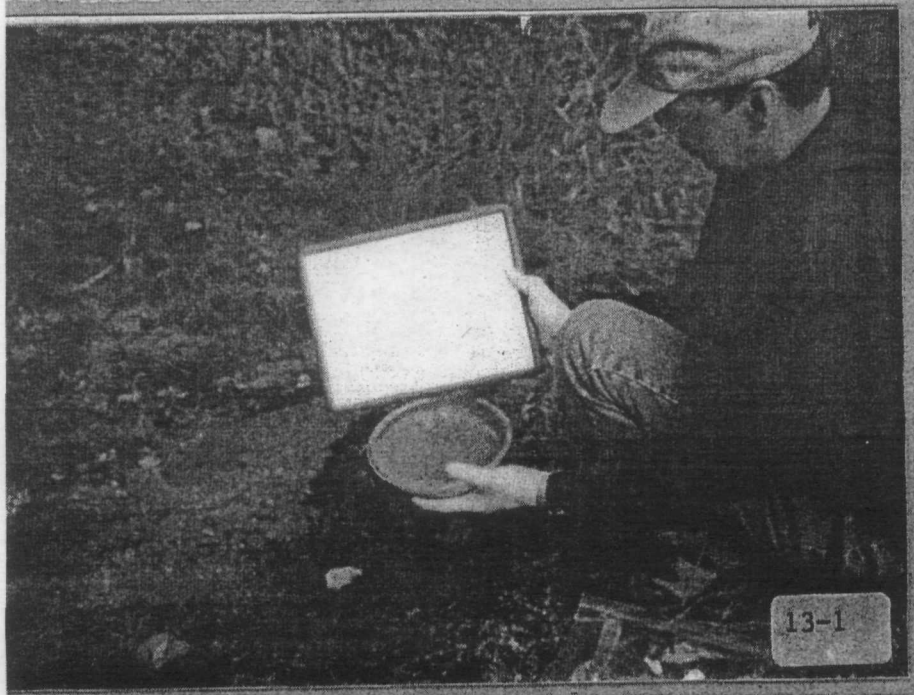

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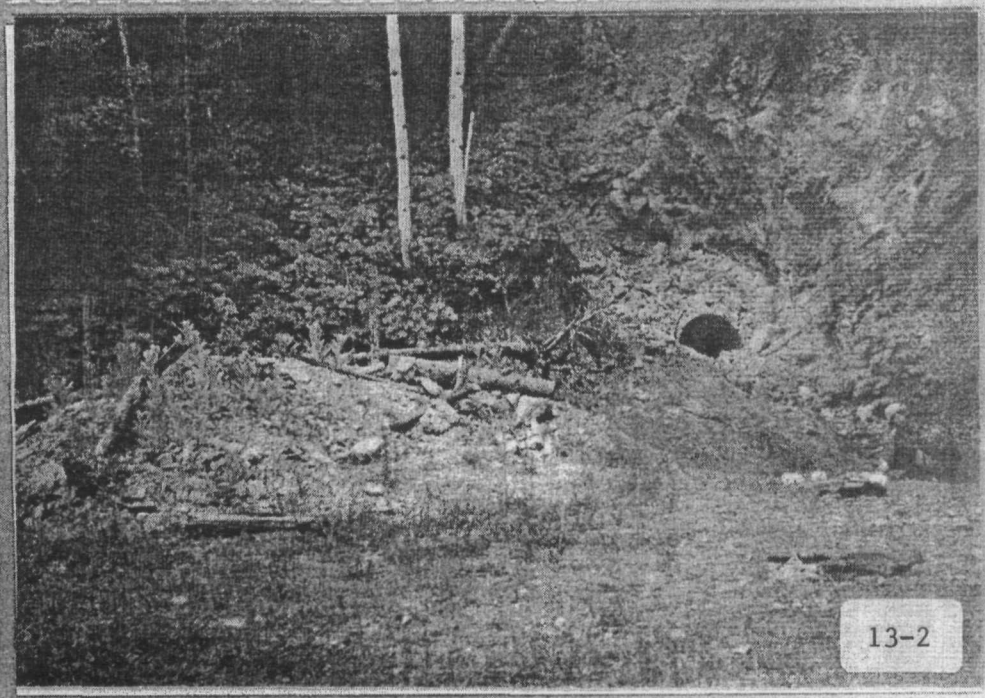

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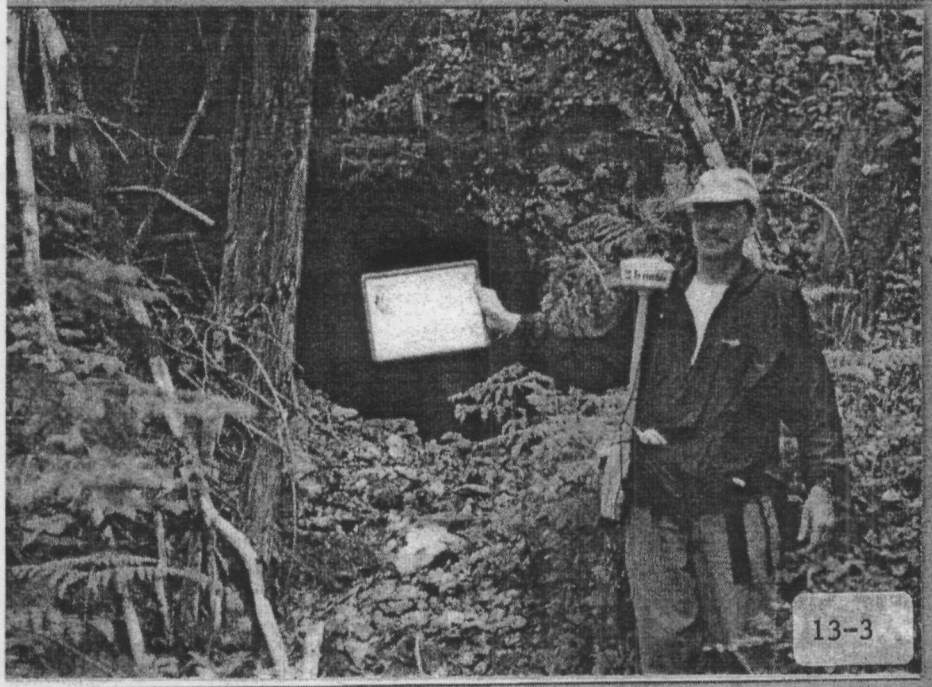

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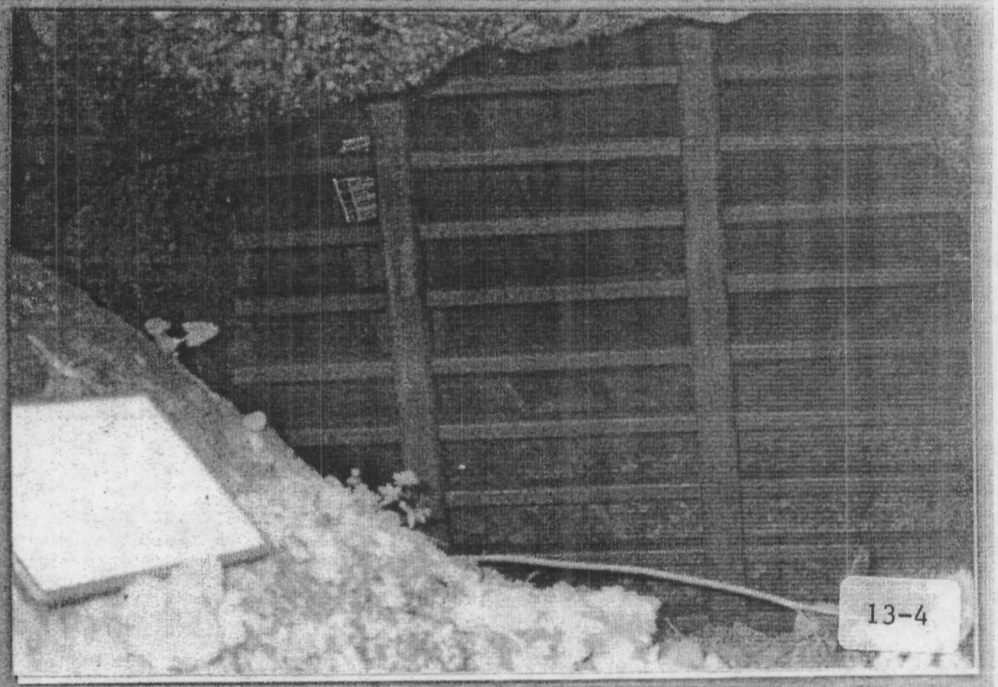

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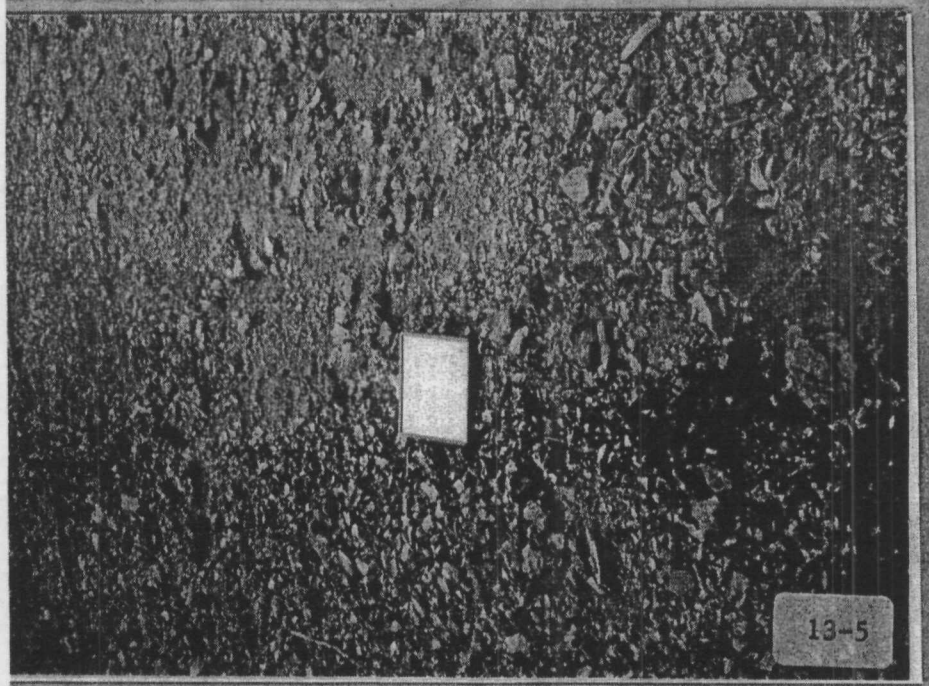

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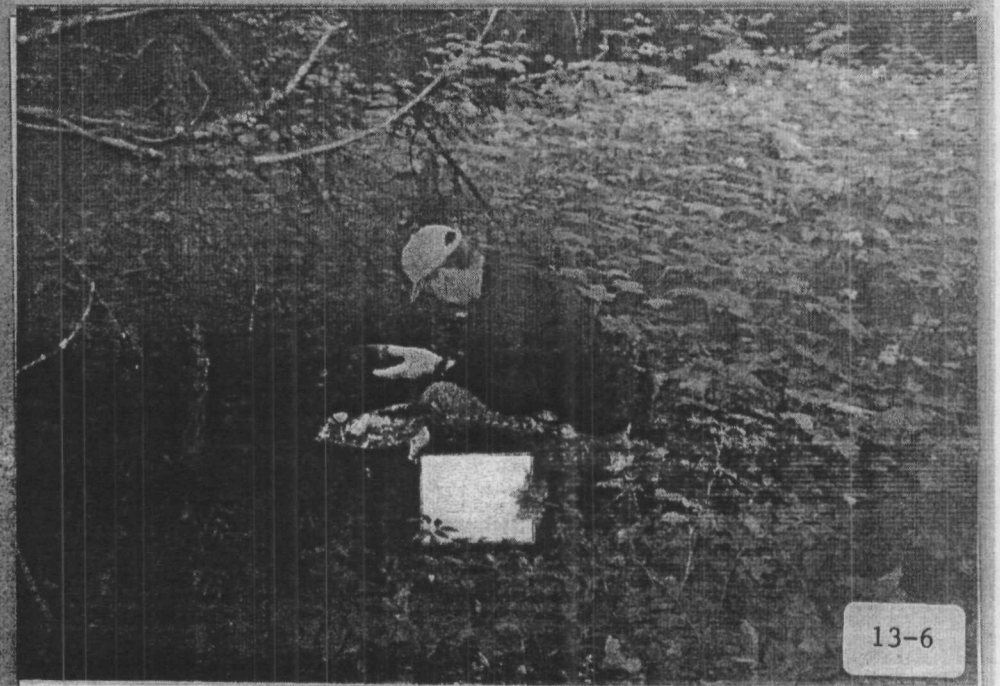

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APPENDIX B

START-2 LOGBOOKS

0207

ecology and environment, inc.

International Specialists in the Environment

Job Number 01-02-0028

Upper Columbia River/Mines
Stevens and Pend Oreille Counties
Washington

Project Area Documentation Logbook #3

Team # 1

E & E Job Number _____

Telephone Code Number 12810073

Site Name Upper Columbia River Mines
Stevens and Ferd Orille Counties

City/State Washington

TDD 01-02-0028

PAN 001281.0073.01.SR

SSID _____

Start / Finish Date _____ / _____

Book 3 of _____

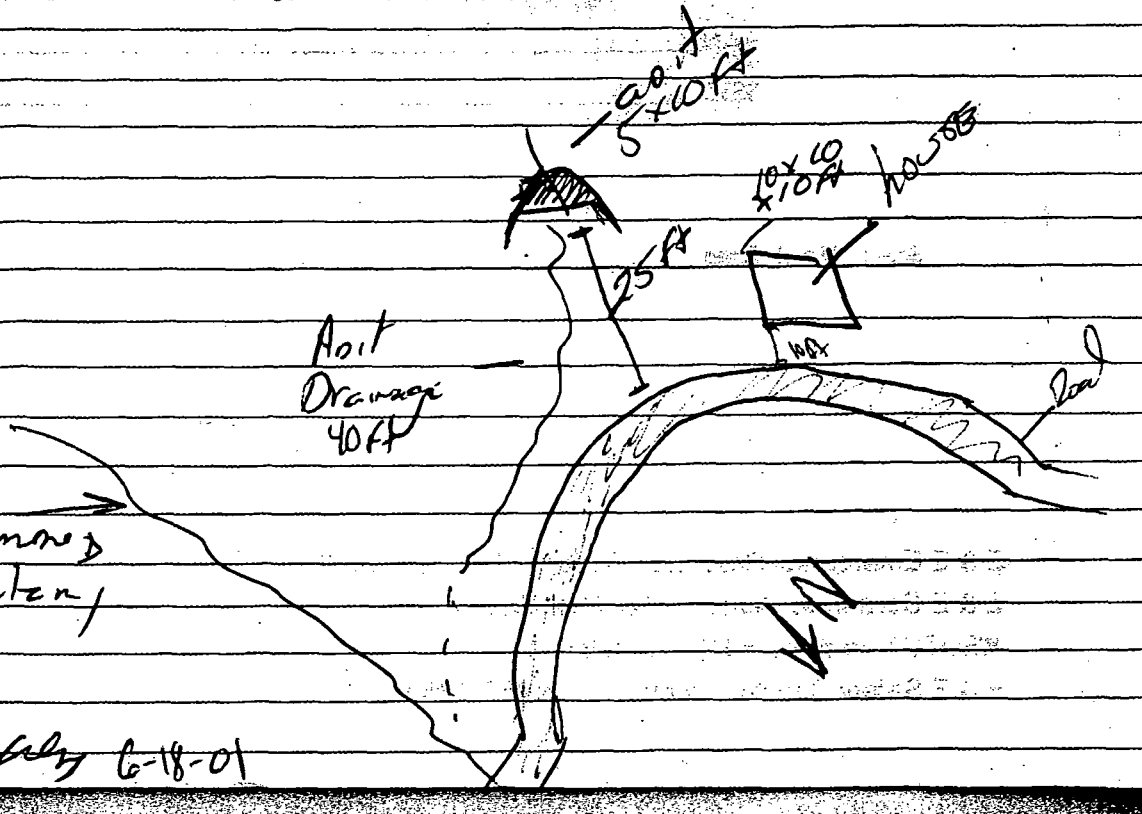
E & E Emergency Response Center: (716) 684-8940
E & E Corporate Center: (716) 684-8060
MEDTOX Hotline: (501) 370-8263
E & E Safety Director (Home): (716) 655-1260

2 01-02-0028 Upper Columbia River Team 1

6-8-01 0910 DW and NA arrive Northport and Do some SCON work before meeting Trent Lang from Vaggon Bros.

1045 Meet Trent Lang with Vaggon Bros Lumber and Go to Melrose Mine.

1145 Arrive at Melrose Mine to Sample. This site has an adit which is draining into a unnamed tributary to Tom Bush Creek. The flow is estimated at less than 1GPM. There is NO waste rock piles. It appears that any piles may have been spread to make road. There is a small building that has test core samples in it. We did a Jerome Reading and it read .021 GPS point (collected) approx 10 ft N of PPE. Refer to sample logbook for Details. Access is unrestricted and there been runs. No GPS available for Adit Sample. Site location GPS point approx 15 ft S of adit.



[illegible] 6-18-01

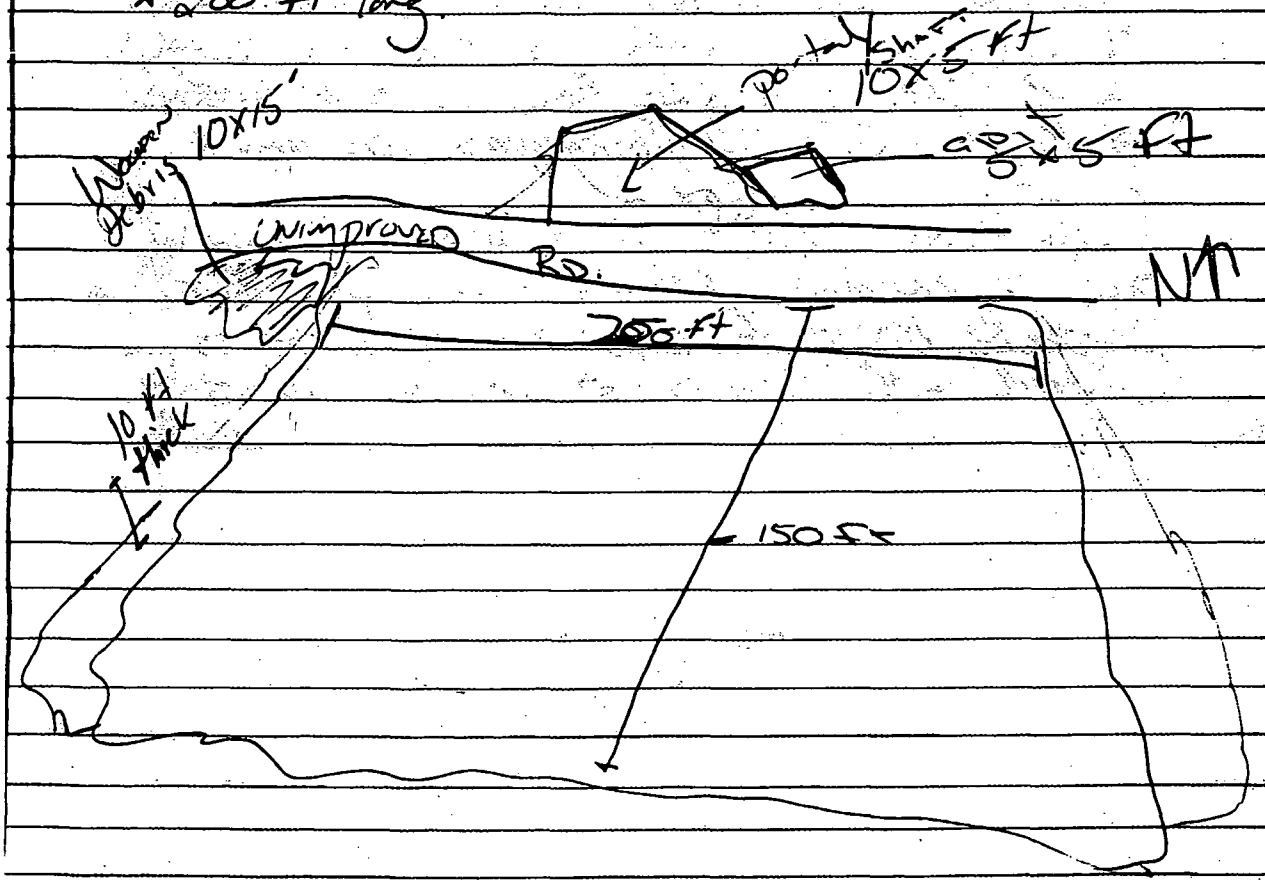
01-02-0028 Upper Columbia River Team 1 6/18/01

Lots of moss and algal growth near the mouth of the adit.

1240 Leave Melrose Mine

1440 DW, LO, NA and Trent Long searched the area in the vicinity of Copperking mine. Hillside is very overgrown, we found test-type pits but saw no piles or drainage adits. After an exhaustive search. 6 PSI points taken, no samples.

1530 Arrive by foot at Red top mine Stevens Co. NA begins XRF of waste rock, which is estimated to be approx 150 in height x 10 ft dep x 200 ft long.



Trent Long 6-18-01

4 6/18/01
001281.0073.01SR Upper Clarkson River Team 1 0211

No discharge was observed from either adit on the portal. No surface water observed near downstream so No PPE Samples. Three WR samples will be collected following XRF screening. 1800 DW and NA return to hotel. ~~Other~~ Prepare sample documentation

OVERVIEW OF DAY

- Drove past Black Rock Mine to assess
- Samples collected at Melrose Mine. One PPE sediment ML PP 01SD, and one NOT sample ML AD02SW.
- Sample team went to Copper King Mine, which was ~~other~~ near the Red Top Mine in Stevens County. This mine is not the one that was identified in the SQAP. There is no sources to be sampled at the site. GPS and photographs were taken to document.
- Sample team identified the remaining Vaggen Bros property mines although according to their property maps the Copper King Mine that is identified in the SQAP is not on their property.

6-18-01

01-02-0028 Upper Columbia River 6/18/01

ADDENDUM: OVERVIEW OF 6-18-01

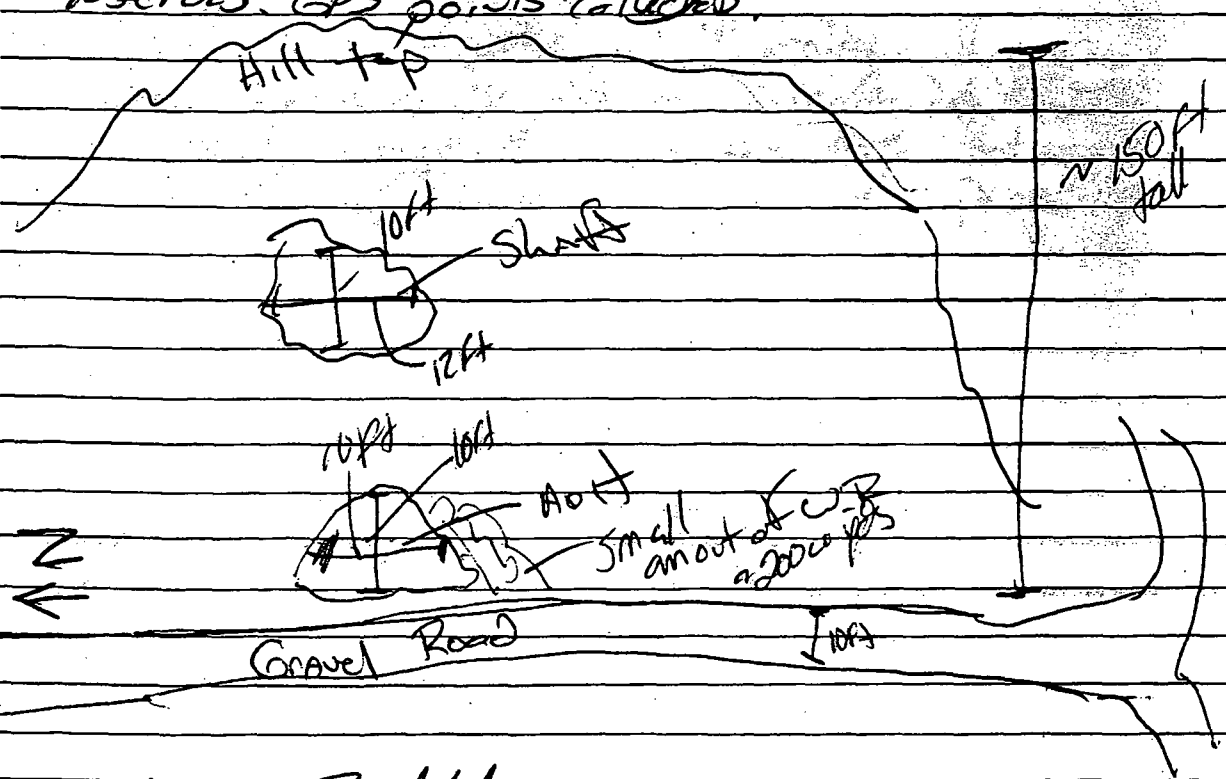
- Sample team went to Red Top in Stevens County
Three WASTE ROCK samples were collected.
RDWR01SS – RDWR03SS.

6-18-01

6

6-19-01 Upper Columbia River 01-02-0028

0830 DW, NA leave for sites.
0900 DW, NA Arrive at Farmer Mine
0930 After a recon of the mine we observed a shaft and an adit. The shaft has water in it but the water level is approx 20 feet from the mouth of the shaft. No water is observed to be flowing from either the adit or the shaft. There is no surface body immediately nearby and thus no PPE. Access to the site is restricted. Veggen Bros does log on the site. It appears that most waste rock that may have been present on site has been moved for logging road construction here and elsewhere. No significant piles of waste rock or tailings exist on site. No building features are observed. GPS points collected.



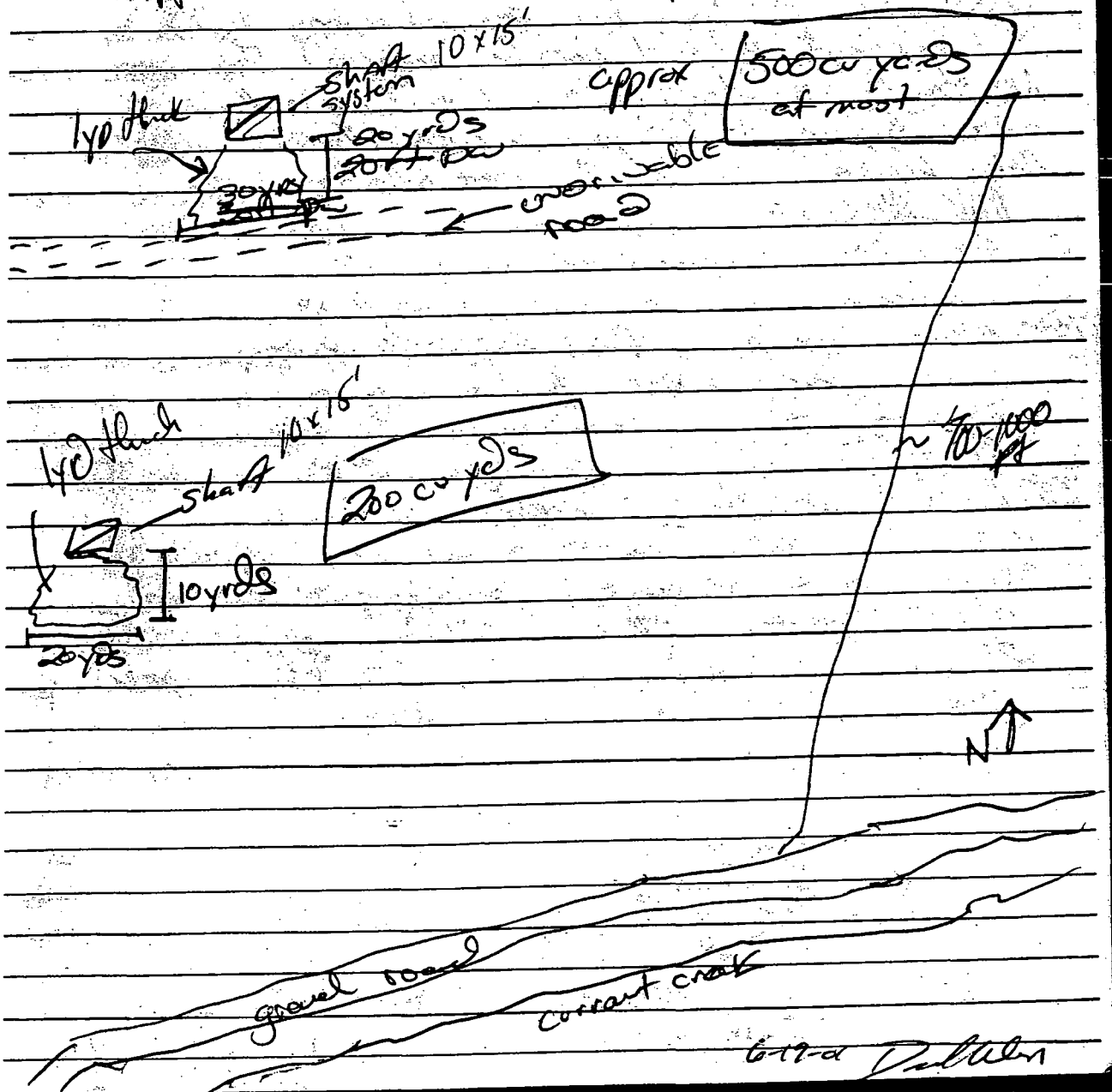
6-19-01 [signature]

01-DA-0028 Upper Columbia River

1000 Leave Farmer Mine.

1030 Arrive at area to begin searching for MAI.
Mine on Sat.

1130 Arrive at upper shaft system. It appears that there is 1 or 2 shafts. We could not check closely due to safety concerns. GPS points collected at upper mark. Waste rock appears to be



6-17-01

8 6-19-01 Upper Columbia River 01-02-0028

approximately 500 cu yds of mat. no water is draining from the upper shaft system and no PPES. Access is restricted from the lower road. It may be possible to gain public access from other areas on foot. The lower shaft appears to be filled into within 15 ft of the surface. There is no water in the shaft or draining anywhere on this hillside. Therefore no PPE is apparent and will not be sampled. There are no structures at either shaft and no milling seems apparent. GPS points were collected, called MAK. Lower. No samples were collected at the MAK. MINE site

1210 Arrive back at car. Break for lunch.

1240 End lunch. Leave for Copper King Mine

1330 Arrive Copper King Mine begin to assess area. Scan with Ferrone and get readings between 0 and 0.20 most of which were closer to zero.

1350 Arrived upper shaft to sample waste rock around shaft. Shaft approx 15-20 feet to standing water but none is flowing from shaft or near vicinity. Waste Rock pile is approximately 25 yards across top x 40 yards full x approx 2 yards thick on average = 2000 cu yards. We will take two surface soil samples based on XRF screening at upper area. GPS points will be collected at each sample point. Waste rock is a med fine orange-brown sandy material. Access is unrestricted and it appears that some logging has occured here. There is no evidence of a mill building or any former

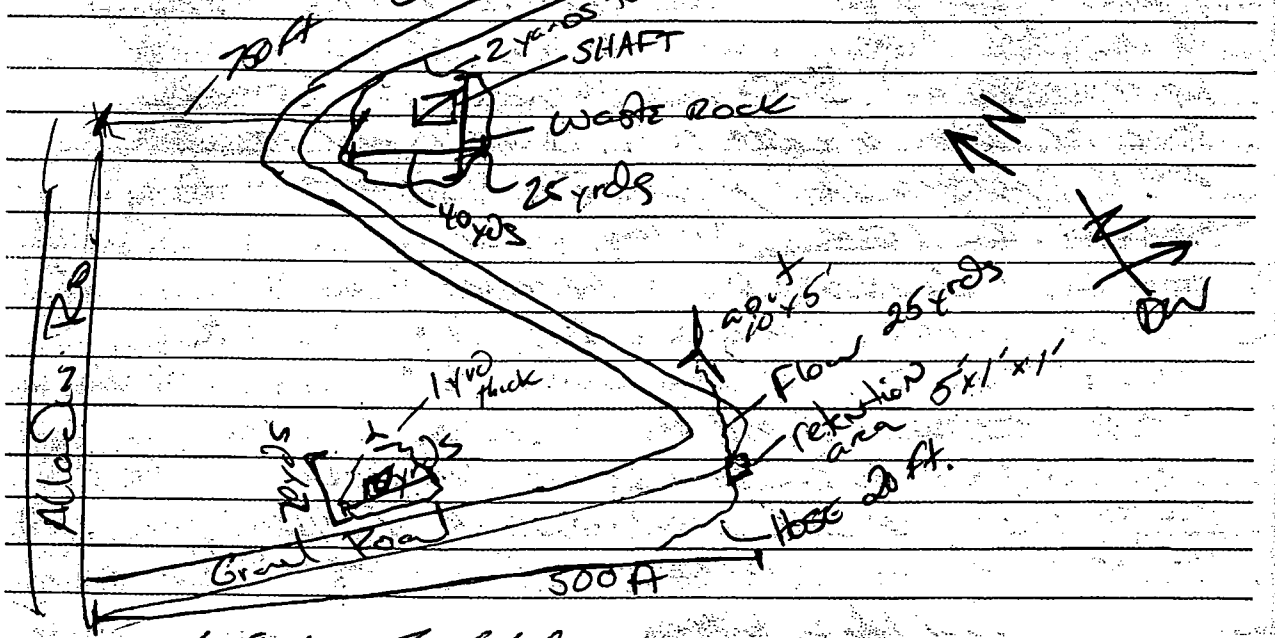
6-19-01 [signature]

01-02-0028 Upper Columbia River

Structures

1455 Arrive at lower adit. There is water trickling from the adit which flows approx 25 yards before it infiltrates the ground. During higher flow it may potentially reach Deep Creek so we will collect an adit and PPE sample. There are no significant amounts of WR here. It appears to have been spread around and potentially taken off-site for construction purposes. Flow of the adit water is just a trickle, much less than 1 GPM. There are no structures here or mills. At the PPE there is a sort-of collection area made with small logs and plastic sheeting which will retain at most 15 gal. The water will run over the top and flow downslope in small channels or sheet flow. There is an approximately 20 ft hose which runs downslope from the retention area. It will then

It appears that grazing has occurred on-site in the past.



6-19-01

10 6-19-01

Upper Columbia River 01-02-0028

Not accept all of the water in the retention area when it is in higher flows. There is a lowest adit with no water flowing that has a waste rock pile that is estimated to be 20 x 10 x 1 yards = 200 cubic yards. No samples are collected here and No flow or obvious drainage was observed.

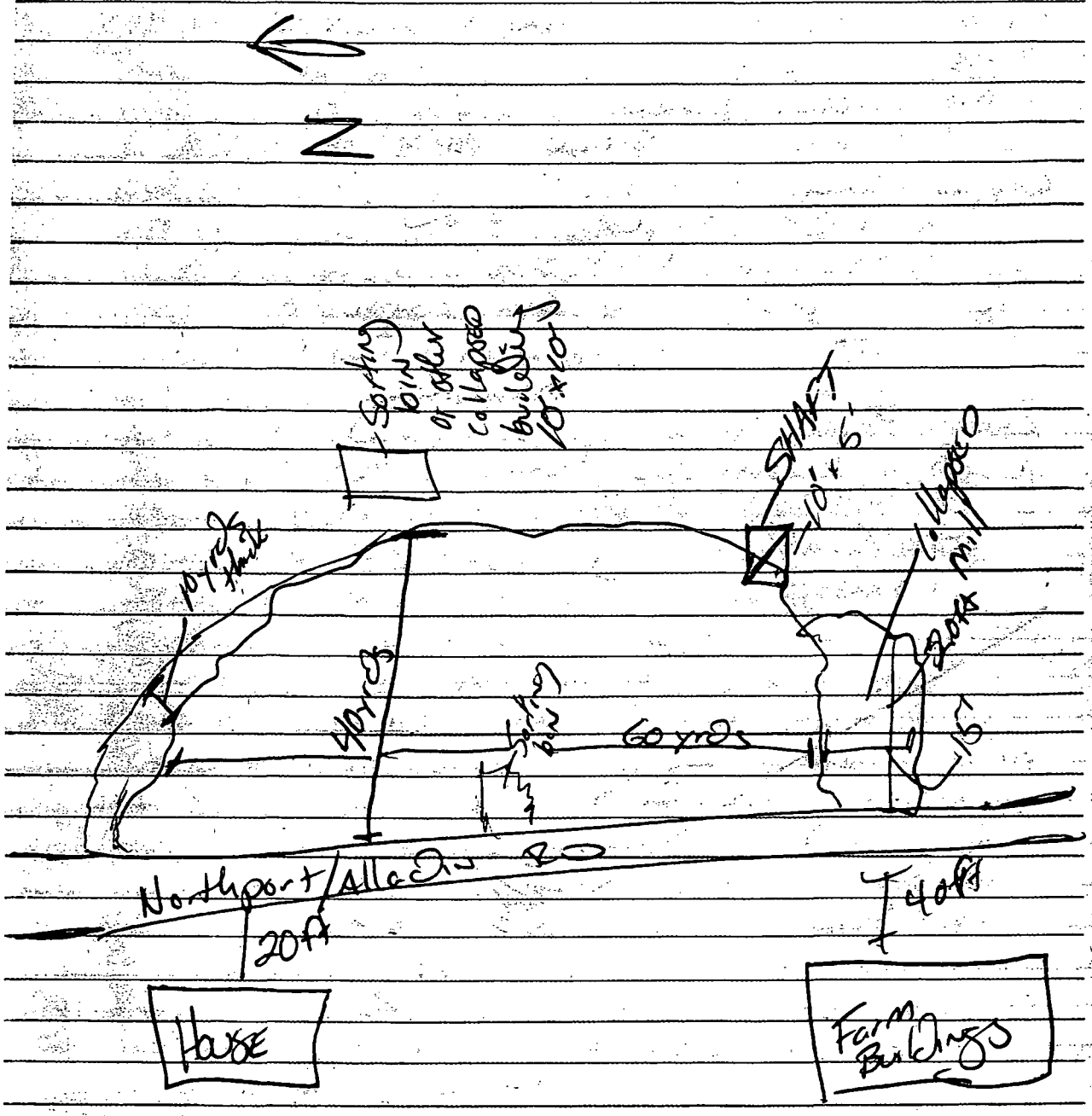
1540 Leave Copper King to go to Northport for ice and then to Black Rock Mine.

1610 Arrive in Northport, get sample ice

1640 Arrive Black Rock Mine. Site has one large tailing/W-R pile which measures approx 60 yards x 40 yards (tall) x 10 yards deep = 24,000 cu yards. There is the remains of a possible mill structure and 2 sorting bins. We will collect 3 surface soil samples from the waste rock. The mill is collapsed on top of itself. We spoke with a neighbor to the site who said his grandfather formed the mine in 1895 and did try some milling at the mine. There is a shaft on the site. It is not flowing any water nor is there a PPE from the mine to Deep Creek which is across Cliff Dr/Northport Rd and 300 yards through a field (check map for detail of distance). Access is not restricted and it appears that people have been removing some of the rock. No logging or grazing occurs at the mine. While we did the walk through with the Sperone, readings ranged from 0.0 to 0.03. GPS points taken at sample locations. Only 2 samples will be collected at the mill because there is very little sign across due to the mill being collapsed upon itself and the waste rock pile eroding into it. There is no evidence of transformers or a dump site at the mine.

Paul Ulus 6-19-01

01-02-0028 Upper Columbia River 6-19-01



Dave Allen 6-19-01

12 Upper Columbia River 01-02-0028 6-19-01

1815 Finish Sampling and return to hotel.
1850 Return to Hotel.

Overview of Day

DW and NA first went to the Farmer Mine
- No samples were taken.
- 1 shaft
- 1 adit
- small amount of W.R.

Mak'i Mine
- No samples taken
- 2-3 shafts
- small amount of W.R.

Copper King Mine
2 WR samples taken
- 1 PSE sampled ADIT sample
2 WR piles only one sampled
1 shaft 2 adits
1 of the adits was draining

Black Rock Mine
3 WR samples taken
2 mill soil samples taken
possible mill building
1 shaft

6-19-01

Upper Columbia River 01-02-0028 06-20-01
0900 Arrive at Last Chance mine to begin walking up to the workings.
0950 Arrive at Last Chance mill area. As described in the previous PA there is the remains of a mill building which is surrounded by tailings which are in and around the creek running through. There are PPES to the creek which will be sampled and samples will also be collected from the tailings and the mill area according to the SQAP and the SOPs. All the pertinent information on site remains as was described in the SQAP and PA. At the mill NO evidence of transformers is observed. Access to the site is unrestricted. When we arrived at the site we did a walk through with the Jerome and readings averaged 0.0 to 0.03 mg/m³ and the MiniRam II received a reading of 0.09 to 0.14. GPS points will be collected at all sample points unless mentioned specifically.
Sample LCPP04SD is the lower PPE at the mine, it is PPE 2 on the figure from SQAP.
Sample LCTP07SS is the soil interface
1200 Start hiking up to upper area of Last Chance mine
B10 Arrive at Upper mine area. As described in SQAP there is an adit which is flowing at about 16 Pm into the unnamed trib. There are two W.R piles 1 small, 1 very large. We will sample the adit and the PPE and then get 3 samples from the large WR pile. GPS of adit sample was collected approx 40 feet S of sample location.
1500 Arrive at car. Break for lunch
1520 END lunch go to look for Great Western Mine.
1700 Return to hotel

[signature] 6-20-01

Upper Columbia River 01-02-0028 6-20-01

OVERVIEW OF DAY:

DW and NA sampled at LAST CHANCE MINE

- 2 WR piles
- 1 tailings pile
- 1 flowing AMD
- 1 mill

3 mill samples
3 tailings samples
3 W.R. samples
2 PPE samples
1 AMD sample

[signature] 6-20-01

Upper Columbia River 01-02-0028 06-21-01

~~0900 Leave~~

0905 Arrive at Great Western Mine. Above the Knudsen Rd there are several shafts and adits with small piles associated with them. The uppermost area has a series of 3 shafts/adits within 30 feet of each other. They have ONE ore pile associated with them which measures 5 yards x 10 yards x 1 yard thick. There is NO water draining from any of them. This will be referred to as shaft 1. Just below shaft 1 system is SHAFT 2. It is a large hole which appears to have 3 different tunnels within it. There are no piles associated with Shaft 2 and no water draining from it. The shaft measures approx 15 feet across.

Aside: When we arrived on site readings were taken with the Geiger and values ranged from 0.00 to 0.02 the mini rem readings were 0.

Approx 30 feet below Shaft 2 is another shaft, no. 3 which has a pile which measures 5 yds x 10 yds x 1 yd thick. The shaft has 2 open holes associated with it and has no water draining from it. This shaft is approx 40 feet above the Knudsen Rd. The next hole down is an adit at the road level which is filled in. It has no pile directly associated with it and no drainage. This is adit #4. Below the road there is the remains of an adit house which has collapsed over the hole. This is adit #5. There is a pile here which measures 30 yards x 30 yards and is approx 1-2 yards deep ≈ 2000 cu yards. We will collect 2 ore samples from the pile based on XRF readings. There is no water draining from the lower area and thus no PPE or adit water samples are to be collected. Access to the site is unrestricted.

16 Upper Columbia River 01-02-0028 06-21-01

There is evidence that grading has occurred and logging was actually occuring within 0.25 mile of the mine. There is no evidence of transformers. GPS points taken at sample points.

1140 Finish at Great western mine head for Tyee mine

1240 Arrive in the vicinity of Tyee mine. No access has been granted so we will look for edge of the mine and take a GPS and photos. The mine workings were not located but a cabin nearby was observed. From the topo map USGS it appears that the adits were along the unnamed creek draining into Deep Lake. No mine workings located. Due to the small amount of production (approx 300 tons) of ore it is assumed that they would be hard to locate even with access. It is reported that this was an iron mine.

1300 Break for lunch

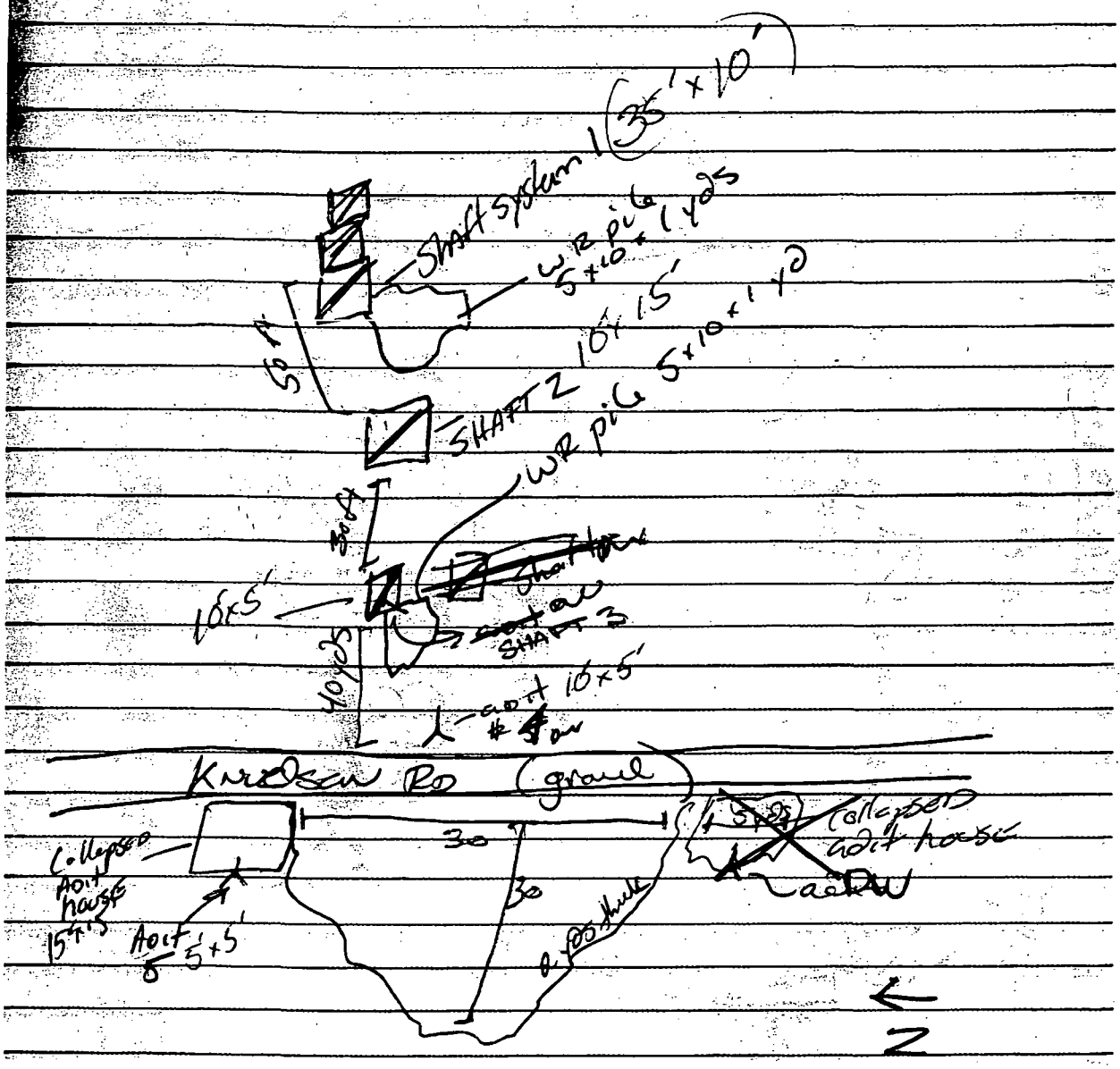
1320 Finish Lunch

1500 Arrive at Glacier mine. The mine has 3 shafts and 2 buildings. There is a tailings pile between the two buildings. One building is a loader and the other is potentially a mill although it is the size of a small cabin with no milling machinery present. We are assuming it to be a mill due to the tailings nearby. The shafts are located above the road. Shaft 1, furthest to the S ~~SE~~ has a small WR pile associated with it measuring 5 yards x 10 yards x 1 yard thick. Shaft 2 is approx 25 yards N of Shaft one. It has no discernable WR pile associated with it. Shaft 3 is approx 20 yards N of #2 and a bit lower and has no WR pile associated with it.

[illegible] 6-21-01

Upper Columbia River 01-02-0028 6-21-01

Great Western Mine



Paul Ulrich 6-21-01

18

Upper Columbia River 01-02-0028 6-21

David White 6-21-01

Upper Columbia River 6-21-01 01-02-00 28
Shaft 4 is located approx 20 ft N of Shaft 3. Both Shaft 3 and 4 are collapsed or filled in potentially with the WR since no real WR piles are associated with either mine shaft.
There is no water draining from the shafts or the site. Access is unrestricted. Some logging has occured here in the past. There is no evidence of transformers at the mill site.
No GPS available for GLTP01SS.
GPS points taken at GLTP02SS 10 ft E of sample point GLTP01SS. Sample GLTP03SS is at the soil interface.
1700 Finish at Gladstone mine and return to Astel

Overview of Day:
Great Western Mine
3 shafts 2 adits
3 WR piles 1 collapsed adit ~~shaft~~ house
2 WR samples
Tyee Mine - Photo and GPS nearby
Gladstone Mine
4 shafts
Potential mill - 3 samples
1 WR pile - no samples
1 tailing pile 3 samples

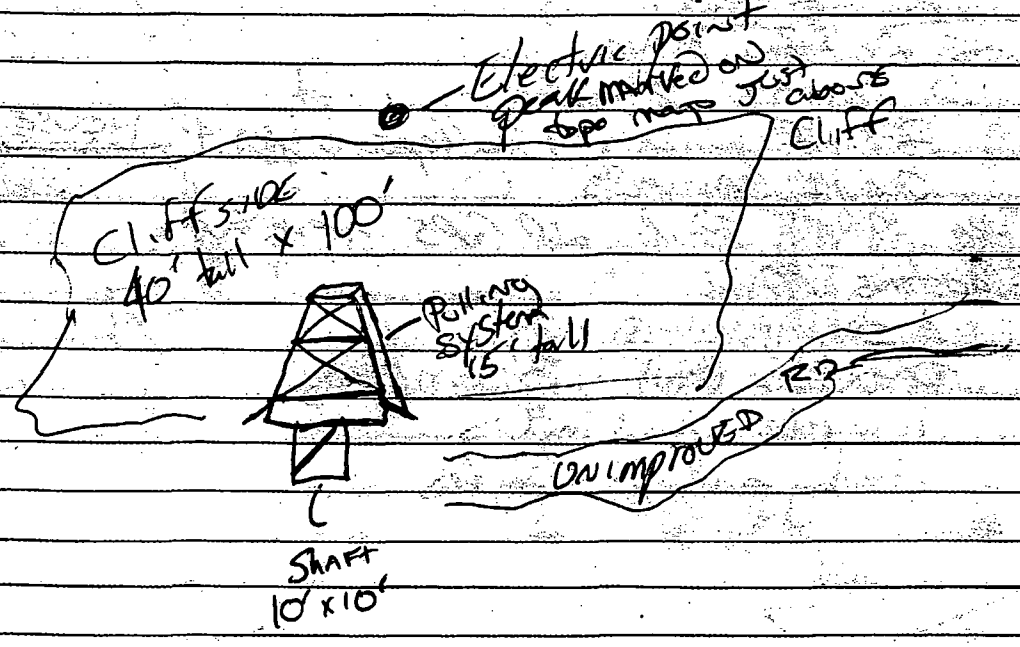
6-21-01

20

Upper Columbia River 6-22-01 01-02-0028

1040 Arrive at what we believe is the Lucky Fair Mine. It consists of a shaft with a crank or pulling system above it. There is no discernable waste rock or tailings present. There is no mill or other buildings besides the pulling system, therefore no transformers. There is no water draining from the mine. There will be no samples collected here. There is evidence of people at the site (beer cans) and access is unrestricted. GPS points taken 50' SW of shaft.

1100 Leave Lucky Fair Mine.



Rick Wilson 6-22-01

Upper Columbia River 6-22-01 01-02-0058

1245 Arrive at Electric point mine. Do site walkthru with the Jerome and get readings ranging from 0.00 to 0.04 and the mini-ram readings were 0.0 to 0.1. The site consists of one or two shafts at the upper area which are collapsed so can't tell how many exactly. There are two WR piles and a mill. There is also a loading bin and what appears to be a tailing pond. It has a berm around an area that contains tailings. The area is dry. There is no water discharging from any areas on the mine. Access is unrestricted. There is no signs of transformers or a dump. There are signs of people using the area (beer cans). The upper pile is estimated to be 50 x 100 x 2 yards = 10,000 cu yards. Three samples will be collected. Since there are no water drainage and no sediment nearby there are no PPE.

NOTE: In photo 6.16 white board says RTN 01254189 should say 01254185
Photo 6.18 says 01254190 should be 01254186
Photo 6.20 says 01254191 should be 01254187

1340 Break for lunch
1358 finish lunch.

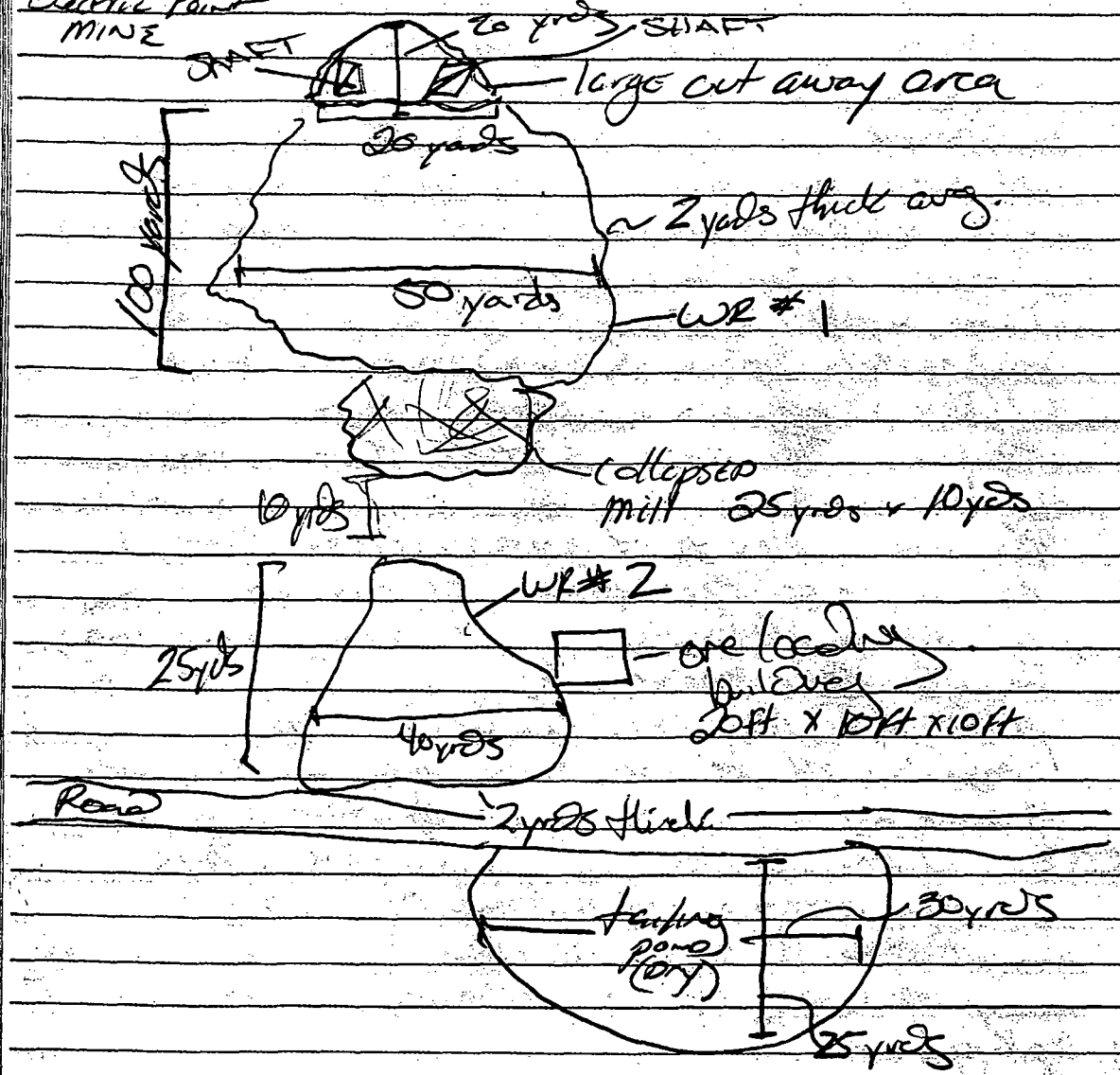
The tailings pond/impoundment measures 30 yards x 25 yards x 1 yard (or less thick). The lower WR pile #2 measures 25 yards x 40 yards x 2 yards thick = 2000 cu yards. We will take 2 samples in WR pile 2 and 3 in the tailing pond. The tailing pond has trees growing out of it and do not have any evidence of water in it. Sample EPTPLSS is the soil interface.

[signature] 6-22-01

22

Upper Columbia River 01-02-0028 6-22-01

Electric Point
MINE



N →

6-22-01

Upper Columbia River 01-02-0028 06-22-01

1500 Finish at electric point mine

1515 Arrive at road to Keystone mine area. Mine reportedly has no workings according to OSPS so it is unlikely we will locate the exact area. Photos and GPS taken.

1600 Arrive at what is assumed to be the lead trust mine. There is a large indentation in the ground measuring 10 x 10 yards. It is filled in and it is uncertain if this was an adit or shaft. We have searched all other roads in the area and have not located anything else to resemble a mine. There are no poles or structures. There is a small amount of scrap metal nearby but nothing else resembling a mine structure.

1700 Return to Hotel for paperwork

Overview of Day

- Lucky Four Mine - Ishaft w/ pulling system
  No samples
- Electric point
  2 ore piles - 5 samples
  1 tailing impoundment - 3 samples
  mill building - 3 samples
  ore loading structure
  No pipe or drainage
- Keystone - Did not locate - photo GPS
- Lead trust - photo + GPS if suspected site

[signature] 6-22-01

Upper Columbia River 01-02-0028 6-23-01

0800 Arrive at Van Stone mine Do Drive through WR pile to assess sample areas. Three XRF samples will be collected for each sample taken. We will collect 12 WR samples throughout the entire pile.

1030 On the piles to the E W of the blue lagoon we will take two samples. One on the upper tier and one on the lower tier. The lower tier is approx 75 ft below the upper. GPS points are taken at all sitewide sample locations unless noted.

1130 Return to main pile area on W side of lagoon and prepare to do three samples in the upper third above the mill and ASTs. Sample VSWR0SSS is at the upper most part. Sample VSWR04SS is to be collected approx 40 ft below the vicinity of sample VSWR0SSS. Sample VSWR05SS is below VSWR04SS just up from the AST area above the mill

1250 Complete sampling the upper 1/3 of main pile area break for lunch.

1320 End lunch

1325 Sample VSWR06SS is taken from WR around the mill building. There are several areas where WR has been piled and a sample will be collected based on XRF results

1346 Sample VSWR07 will be collected in the area just above the mill building based on XRF results. This is approx 40 ft above the approx location of sample VSWR06SS.

Sample ~~VRW~~ VSWR08SS is approx 75 yds W of the mill on the same approximate level.

Sample VSWR09SS is collected approx 50-75 yds W

David Weber 6-23-01

Upper Columbia River 01-02 0028 6-23-01

1400 of sample VSWR08SS, just east of the cliff down to the lagoon

1500 Sample VSWR10SS will be collected near the bottom of the WR pile closest to the lagoon.

1525 Sample VSWR11SS is to be taken approx 100 yards NE of sample VSWR10SS, along the lower tier.

1550 Sample VSWR12SS will be collected approx 75 yards NE of sample VSWR11SS

1600 Finish sampling for the day. Return to hotel for paperwork.

Overview of Day

Van Stone Mine

12 WR samples collected

[signature] 6-23-01

Upper Columbia River 01-02-0028

Addendum:

- Anaconda mine was searched for in the same section as Copper King mine on 6-18-01 and was not found. GPS and Photo taken for Copper King on 6-8-01
- TOC was not collected for sediments due to lack of direction from EPA
- Only three tailings samples were collected from Last Chance mine due to lack of access to area of tailings to sufficiently space the samples above three.

Paul Kelly 6-21-01

0234

ecology and environment, inc.

International Specialists in the Environment

Job Number 01-02-0028

Upper Columbia River/mines
Stevens and Pend Oreille Counties
Washington

Project Area Documentation Logbook # 6

Team #2

E & E Job Number _____

Telephone Code Number 12810073

Site Name Upper Columbia River/Mines
Stevens and Pend Oreille Counties

City/State Washington

TDD 01-02-0028

PAN 021281 0073.01.SR

SSID _____

Start / Finish Date 6-18-01 / _____

Book _____ of _____

E & E Emergency Response Center: (716) 684-8940
E & E Corporate Center: (716) 684-8060
MEDTOX Hotline: (501) 370-8263
E & E Safety Director (Home): (716) 655-1260

2

01-02-2028 6-18-01 Upper Columbia River

0815 After packing equipment, Mark Woodke and Cami Grandinetti, leave Colville for 15 mile Road, where 5 or 6 mines are located. None of the mines are exactly located on the map, so the team drives on several "road branches" also.

1100 48° 52' 09.296" = Lat/long readings at "Tree plant" 118° 03' 03.776" This is a possible former mine site location but also may be a small landslide. The team takes ~~Survey mark: 15 mph~~ 8-0 for pictures of this location but no samples as the size of the "waste rock" pile is much less than 1,000 cubic yards (yd^3). There was no sign of surface water running through or adjacent to the waste rock piles. A dry creek bed was found approximately 50-100 yards across the road; no water was noted here either. The team continued driving on various branches of the road to points on the map that were not accessible for the team ~~off~~ or that appeared to be past the point on the road of the listed mine site locations. The team also noted 2 buildings at a fork in the road - one of the buildings has a small (30' x 15' x 3') "rockpile" (rocks with much soil mixed in) in front of it; this may be a second mine location. Four pictures were taken at this location, but lat/long readings were not possible due to forest cover. The team then continued down the road, again checking most branch roads where the listed mines were likely to be - no other likely former mines were found.

1300 The field team then drove around looking for a road that would lead to Hubbard Mine; the most likely road to lead there was fenced off after approximately 1 mile, so any sign of a mine was not found. The crew then headed back to Northport and drove towards the Morning and Magma Mines.

Mark Woodke 6-18-01

01-02-0028 6-18-01 Upper Columbia River

The crew again drove approximately 2 miles east where the former mine sites appeared on the maps; there were no indications of mines on any of the roads attempted. The field crew was unable to use a cellular phone and communicate this information, so the crew headed back to the hotel to await the other teams.

Summary of the day's work:

Mine #	~~Name~~	Work Completed
196	Lottie	For all 8 mines, two locations ~~were~~ were sampled, but it is unclear which locations were sampled. The most likely locations are 191 & 19, 207, 198, + 196.
198	Minorca	
207	Antelope	
19	Homestake	
191	Hope + Twin Cabins	
164	Hubbard	
252	Morning	
282	Magma	

Mark Moodie 6-18-01

4

6-19-01 01-02-0028 Upper Columbia

0800 The Sampling team exits the hotel for Northport to pickup Mr. Joe McNamee, a local miner that is familiar with the area mines.

0915 The sampling team pickups Mr. McNamee + heads for the 15 mile road mine area.

1000 The sampling team arrives at a mine with a ≈ 10' * 10' shaft (surface dimensions). The shaft goes approximately 35 feet. Coordinates. R06W17A, SV 7/7, PDOP 2.8, R. The aboveground soil is << 1,100 yd³, therefore no samples were collected. The mine is believed to be the Jack by Mr. McNamee. No reading was on the mini-ram (0.00 mg/m³).

1050 The team arrives at Big Ham mine near the Jack. Coordinates SV = 5/6, PDOP 3, R, R06W17B. The waste rock pile is < 1,000 yd³, so no samples were collected. No reading (0.00 mg/m³) was obtained by the mini-ram.

1310 After driving in the alleged area of the Hubbard Mine for ≈ 1 hour, the team photodocuments a rock pile area adjacent to the road. Location SV 5/5, PDOP 4.2 R06W20B. No samples were collected. Air and Mercury readings were both 0.

1550 After making several attempts to find the mine, phone calls and personal contacts were made to find the Bullion mine. A photograph was taken, but no samples or monitoring readings were taken. Location 06W23A, PDOP = 4.2, SV 4/4, R. The size of the hole (overgrown) is ≈ 6' deep * 30' long * 10' wide; deposited wastes were ≈ 2 yd³. The site was reached by driving past Bull Hill Ranch. Directions were provided by the brother of the ranch owner, Dan Guglemino.

1610 The team then headed back towards Northport, then to the Deep Creek Mine. The gate was locked on

Mark Woodke 6-19-01

6-19-01 01-02-0028 Upper Columbia River

Site None At
Antelope
Minorca
Lottie
Homestake
Hope
Twin Cabins
Hubbard - Drove to the end of the most likely road - no sign of a mine.
Coyote - Drove on most likely roads - No indication of a mine.
Mountain View - "
Bullion - Collected photo + GPS information - no sample.

Repeat from yesterday - went with Joe McNamee to see if any of the mines he knew of were these mines.

arrival, but the team was able to walk around the gate and visit the property. The features listed in the SQAP were found and estimated numbers and types of samples to be collected from this property were approximated. The team then drove to the area of the Sierra Zinc mine to verify it's location for tomorrows sampling. The sampling team arrived at the hotel at 1830 and completed paperwork and equipment setup for tomorrow.

~~Jeff Creek~~

Mark Noble 6-19-01

6

6-20-01 Upper Columbia River 01-02-0028

Deep Creek/Mine	S/V	PPM
K0020214	8/6	2.6
	8/8	2.0
	7/8	2.8
	↓	2.6
	1/6	2.9
	↓	3.7
	↓	2.8
	↓	2.8
	5/6	3.2
	7/8	3.7
	7/8	3.8
	7/6	3.4
	↓	2.9
	8/8	2.9
DWW102	0/8	2.9
05	↓	2.8
06	↓	↓
DCW0755	↓	↓
		2.7
		3.3
	↓	3.7
	5/6	3.2

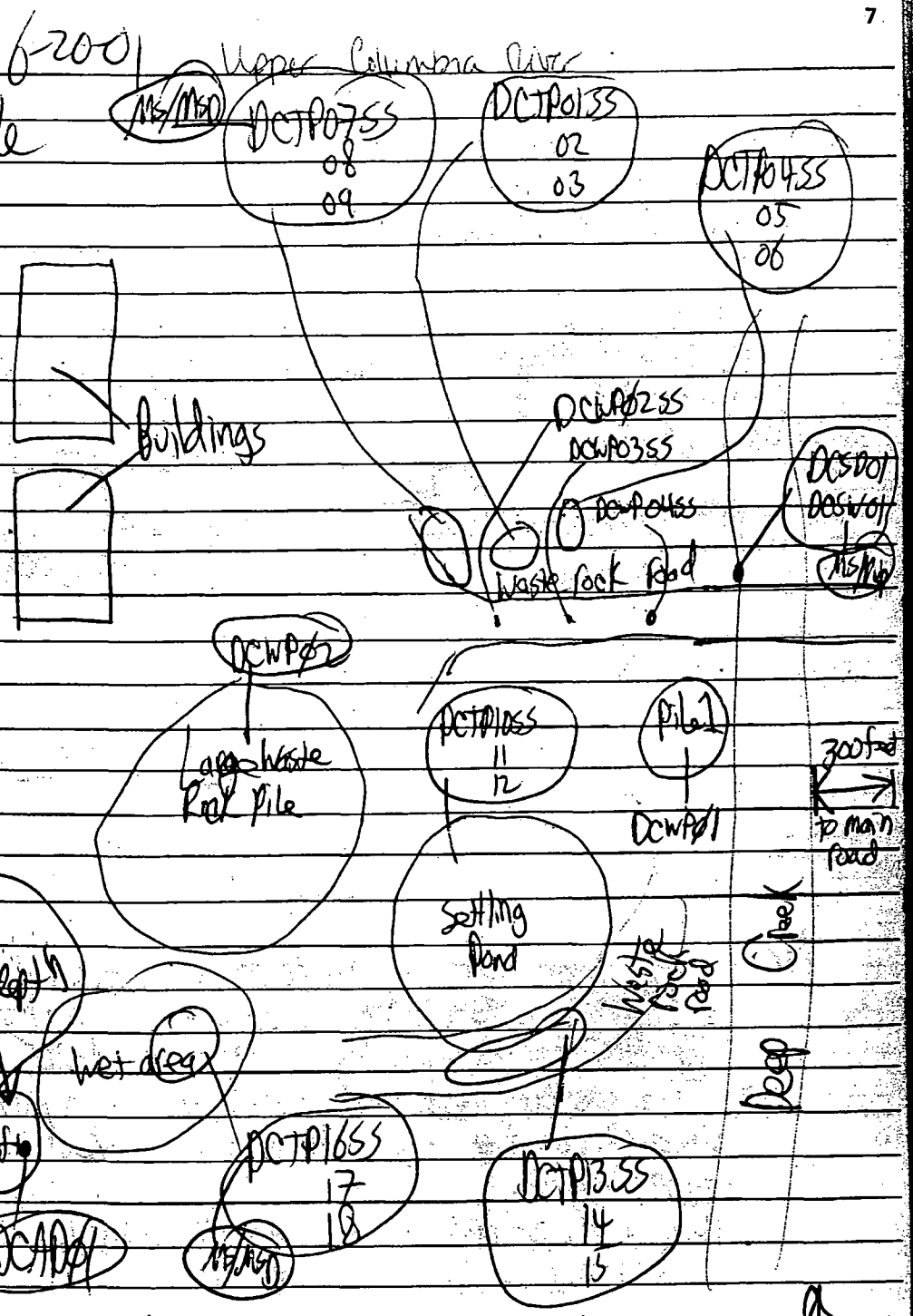
Readings were not obtained for all locations due to the proximity to the mills.

Late Notes: Mark Woodke and Cami Grandinetti arrive at the Deep Creek Mine property at ≈ 0900 and prepare for sampling activities. The crew walks through the property, Mark Woodke (MW) begins XRF calibration, then marks out sample locations in conjunction with Cami Grandinetti (CG). See the next page for sample locations. No signs of transformer leaks were noted, the transformers were located on concrete flooring. The pH for both water samples w/ ≈ 6. Jerome and Mini-Ram readings were all Non-detect.

Mark Woodke 6-20-01

01-02-0028 6-2001 Upper Columbia River

Not to scale



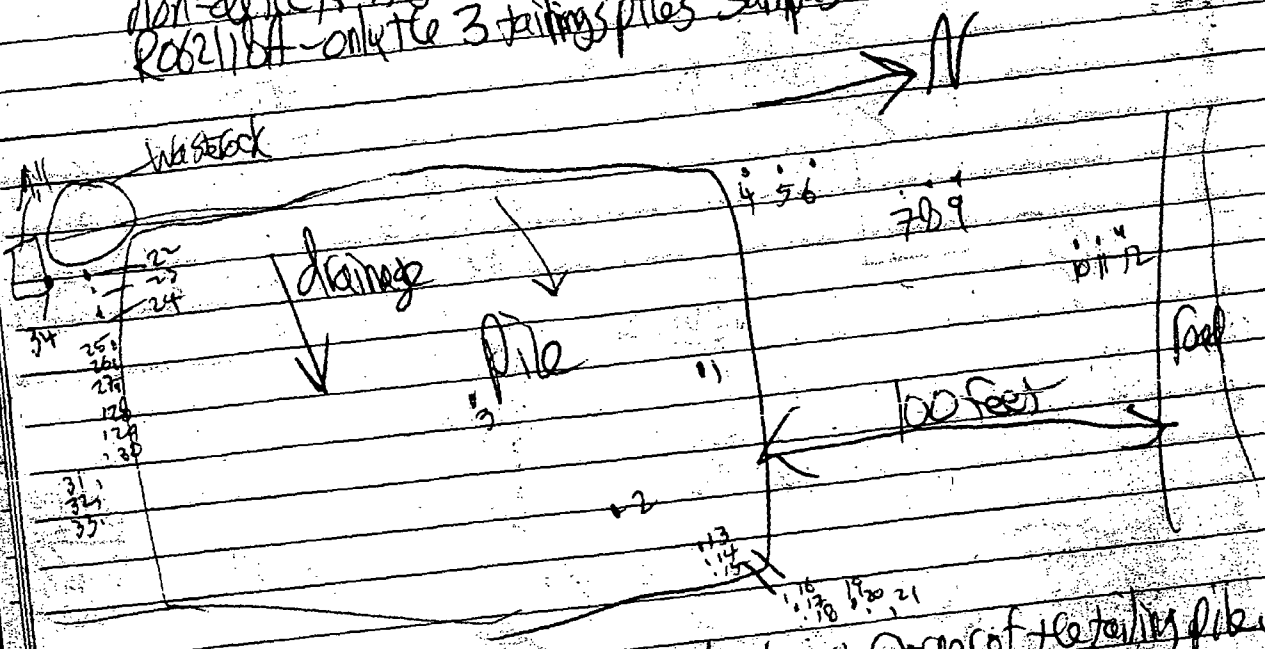
Water into shaft has a bluish tinge with many plants growing here!

Mark Noll 6-2001

01-02-0038

8 6-21-9 Upper Columbia River

0945 Mark Warlke (MW) and Guy Gregory (GG) of the Washington Department of Ecology arrive on site & set up at the Sierra Zinc Mine for the day's work. GG begins photodocumentation while MW calibrates the XRF Jerome and high-volume readings initially taken were all non-detect. A Jerome reading at 1015 was 0.002 R0021BA - only the 3 tailings piles samples were recorded.



1200 The team goes to the Northeast Corner of the tailing pile. R0021A is the file for GPS information in this area. The tailings pile is ≈ 2100' * 1000' * 20' ≈ 1,300,000 yd³.

1300 The sampling team heads for the Morning Mine area during lunch - the gate is again locked. The team finishes eating lunch & returns to the Sierra Zinc Mine. Mercury readings in the area were up to 0.009.

R0021A = GPS file for the area

The applicant owner of the mine (Mr. Higginbotham) gave Verbal Permission to collect samples from the mine. See the appropriate logbooks for photos and sample information. Discharge from the adit was estimated at 0.5 gallon/minute; the discharge went into the ground above the waste rock pile. The volume for the wastrock pile is estimated at ≈ 700-800 yd³ (100' * 50' * 5' depth). Mark Warlke of

01-02-0028 6-21-01 Upper Columbia River

1555 The team reaches the Burrus Mine. R06212B — Adit/Work
Waste Soil totals 25yd³ — No tailings or waste rock.
The nearest surface water is ≈ 720' North (across the road)
Map Section 8 T37N R41E

↓N ◯ Burrus Mine

Hg - 0.005
No Mini RAM reading

30' high * 25' across
*1' deep

Rocky Creek

Road is adjacent to the Burrus Mine

Brent Olson - owner of the Burrus Mine property if any follow up work is needed.

Late Notes for Sierra Zinc Mine

Samples 1, 2, + 3 were tailings, 4-33 were soils associated with the tailings pile and/or waste rock pile, and 34 was a mill area soil sample. A tractor was observed working on the mine tailings pile and deer prints were noted on the pile also. Areas around the ~~dump~~ tailings pile were built up, but there was a small (1+2') area in the northeast corner where water could exit; this "pathway" lead to a forested area. There was a fence around most of the accessible areas of the tailings pile. The nearest residence is ≈ 100' ~~southwest~~ southeast of the Mill Building.

Mark Moeller 6-21-01

6-22-01 Upper Columbia River 01-02-0028

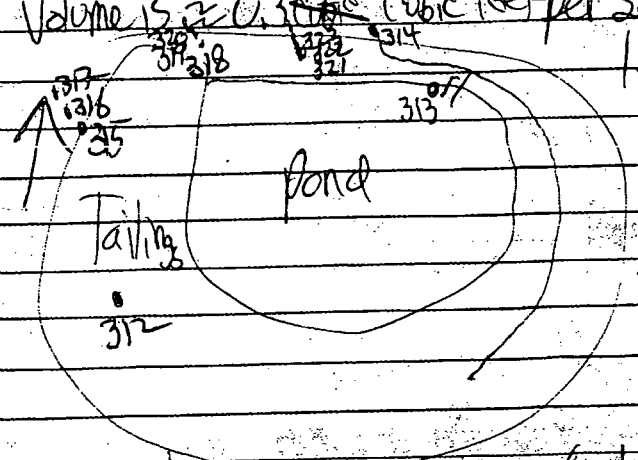
0900 Mark Noelle (MN) and Al Johnson (AJ - US Forest Service) arrive at the Vanstone Mine and get a tour (along with others) from Randy Mueller, the caretaker. Several tailings piles, buildings and other areas of concern were noted.

1115 The tour ends and the team (MN + AJ) set up sampling equipment.

1220 Sample 012543H is collected from the tailings pile.

1250 Sample 012543B is collected from the edge of the tailings pile (near drainage)

1325 Sample 012543LY is collected from the PPE into an unnamed creek on the north side of the tailings pond. The team made their best estimate as to the PPE location; the creek's volume is ≈ 0.3 cubic feet per second. The creek is ≈ 150 feet north of the tailings pond.



Dimensions for the Tailings Pile are GPS recorded. The pile is ≈ 10-20' high as an estimate

1410 The sampling team arrives at the bottom of the tailings pile to collect soil samples (after XRF analysis).

≈1445 After sample VSTP015S is collected, the XRF overheats and is turned off and recalibrated (using up ≈ 25 minutes). 06222A is the GPS file for these samples. The samplers then continued sample collection at the bottom of the tailings pile.

1640 The sampling team finishes sample collection at the bottom of the tailings pile, then heads up the hill to meet with Don Wolf to determine the scope of work for tomorrow.

1745 The sample crew departs to site for the hotel.

Mark Noelle 6-22-01

01-02-0028 6-23-01 Upper Columbia River

0845 The sample collection team (Mark Woodke and Al Johnson) arrives at the Van Stone Mine property and sets up for sampling.

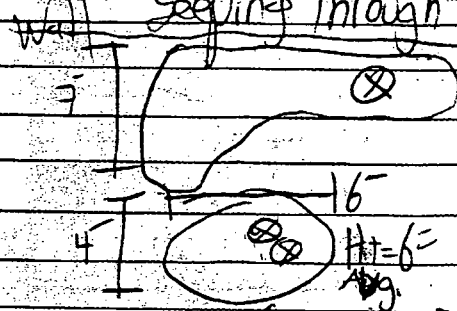
0920 Sample VSSS0155 is collected from the stained soil area (sheen on the water) near the LP tank and mill buildings. Mercury vapor readings = 0.010 in the area.

0940 Sample VSSS0255 is collected from an orange stained soil area near the old mill buildings and elevated transformers.

1010 Sample VSSS0355 is collected from the "out fall" area of an AST in lined secondary containment. A petroleum odor is noted in the area.

1045 Sample VSSS0455 is collected from a transformer storage area on a concrete pad.

1047 Sample VSSS0555 is collected from the same transformer storage area as sample VSSS0455. The concrete pad (thickness unknown) is not impervious, as there was water noted seeping through the side walls and floor. Pile dimensions



Transformer information - All 3: Westinghouse Askarel Transformer

Individual Serial #	Style	
487/591	EMT 8595	2400/460 V
487/595	EMT 8595	240/480
487/593	EMT 8595	

GPS File R0623 16A

Associated samples - (15 waypoints)
VSSS0155, VSSS0255, VSSS0355, VSSS0455, VSSS0555, VSSS0655, VSSS0755, total samples collected from the Van Stone Mine on 6-23-01 by this sample collection team.

Mark Woodke 6-23-01

12

6-23-01 01-02-0028

1130 ~~1041~~ Sample VSSS0655 is collected from stained soil near potentially leaking drums. One apparent likely leaking drum is labeled "Transmission and Drive Train Oil, SAE 50" and also states that the product is not hazardous per Federal and/or State right to know laws.

1135 Sample VSSS0755 is collected from the low point in containment (onlined) for ≈ 5 AST's. The sample has some organic matter in it. There was a slight petroleum odor. Water had accumulated in the low point.

The sampling team then has lunch down at the bottom of Tailings Pile 1 (TP1), then heads to Tailings Pile 2 (TP2) to collect 9 samples from the area of TP2.

1335 Sample VSTP0155 is collected from Tailings pile 2 (upper with only partial armoring) at the interface.

1345 Sample VSTP1155 is collected downgradient (from soil) from VSTP0155.

1350 Sample VSTP1255 is collected downgradient from VSTP1155 (soil)

1400 Sample VSTP1355 is collected from Tailings Pile 2 downgradient of VSTP1255.

1405 Sample VSTP1455 is collected from " " VSTP1355.

~~1410~~ mu 1420 Sample VSTP1355 is collected from the interface of Tailings pile 2 and soil.

~~1415~~ mu 1425 Sample VSTP1455 is collected from downgradient of VSTP1355.

~~1500~~ mu 1440 Sample VSTP1655 is collected from the interface of Tailings Pile 2 and soil.

1445 Sample VSTP1755 is collected from ~~the interface~~ downgradient of VSTP1655.

1545 Sample VSTP1855 is collected from the same areas as VSTP0155 (for pet/PCB)

1545 Sample VSTP2055 is collected from the same areas VSTP0255 (for PCB)

The sample team finishes packing equipment and samples and exits the site for Colville.

Mark Noelle 6-23-01

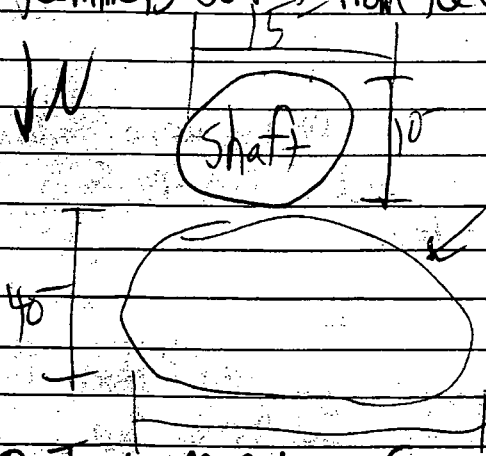
6-24-01 01-02-0028

0825 Mark Woodke and Al Johnson leave Colville after collecting BG0155 near the hotel at 0800.

0900 Mark Woodke and Al Johnson (the team) reach the Antelope Mine at the end of the road.

File 010624SA for all samples collected today by this team.

The mine is 50 feet from the end of the forest road



10 from surface to water

Waste pile = 40' x 40' x 2' = 3200 ft³ avg depth

No surface water was noted in the area of the shaft.

1130 The team returns from hiking and finding several Homestake mine shafts, pits, & rock. Total area ≈ 300' x 100'; waste rock ≈ 300' 40 yd³.

1145 The team reaches the Lottie Mine - this was the area reached on Monday, 6-18-01, with a structure on each side of the road at an intersection. Dimensions were recorded on 6-18-01. A lat/long reading was obtained from the road ≈ 40 east of the mine building. An upper area was found up the road ≈ 500' away from the buildings.

The first hole found is ≈ 5' x 10' x 25' deep and hole 2 is 5' x 10' x 10' deep. The largest waste rock pile is 60' x 30' x 10' high and the smaller is 15' x 15' x 4' high.

1310 The team hikes for ≈ 1 hour in the woods in the area of the Minerva mine - the mine was not found.

1530 The team finds one shaft of Hope & Twin Cabins after a 15 minute hike. The dimensions of the shaft are 15' x 15' x 30' to water. The waste rock volume is ≈ 100 yd³ based on dimensions of 25' x 35' x 4'

Mark Woodke 6-24-01

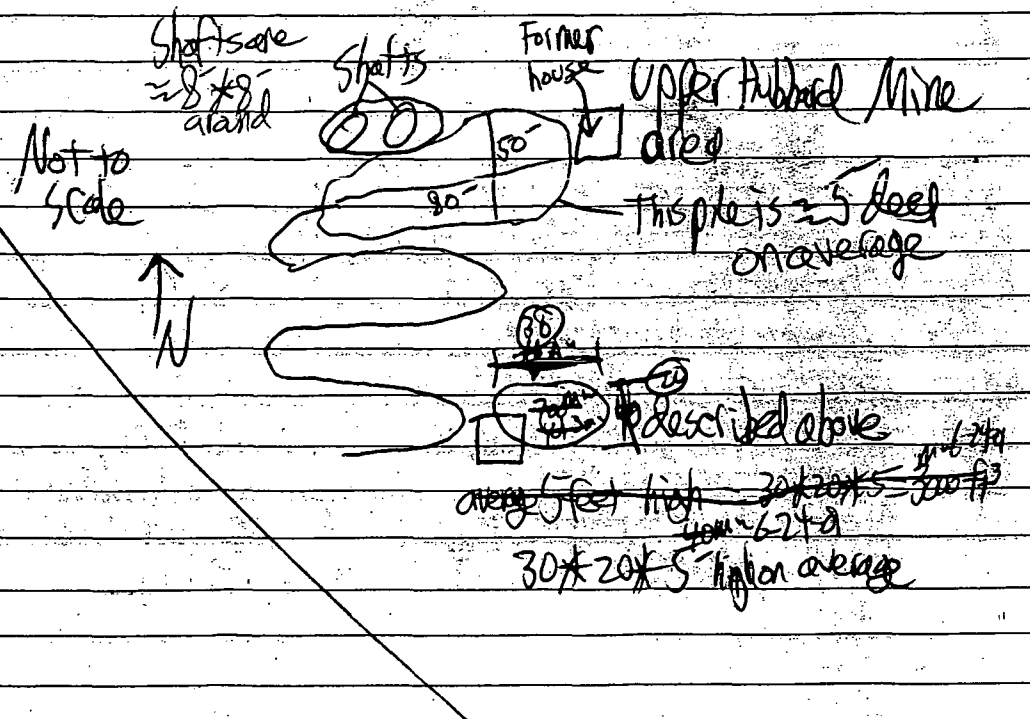
14

6-24-01 01-02-0028

1715 The team arrives at the Hubbard Mine. The most recent sign on the log building says "Proof of Labor, 5-19-200, Leo J. Bruce". Total waste at the mine area is ≈ 40*40*20 ≈ 700 yd³. No surface water is noted in this area. The purpose of the log building is unclear. See Route Map.

1830 The team reaches the back of Mine area - GPS recording didn't work in the area. Photos were taken, then the team headed towards Metaline Falls.

2000 The team reaches Metaline Falls.



Mark Moeller 6-24-01

6-25-01 01-02-0008

0800 The sample team (Mark Woodke, Al Johnson, and Neal Anick) drive at the Lend Oreille Mine for Safety Training. Then begin to label sample jars.

0935 The sample team collects POSP0150 from spring #1 along the edge of tailings pile #1. The sample was collected as a sediment from 0-6" below ground surface (bgs) by Al Johnson.

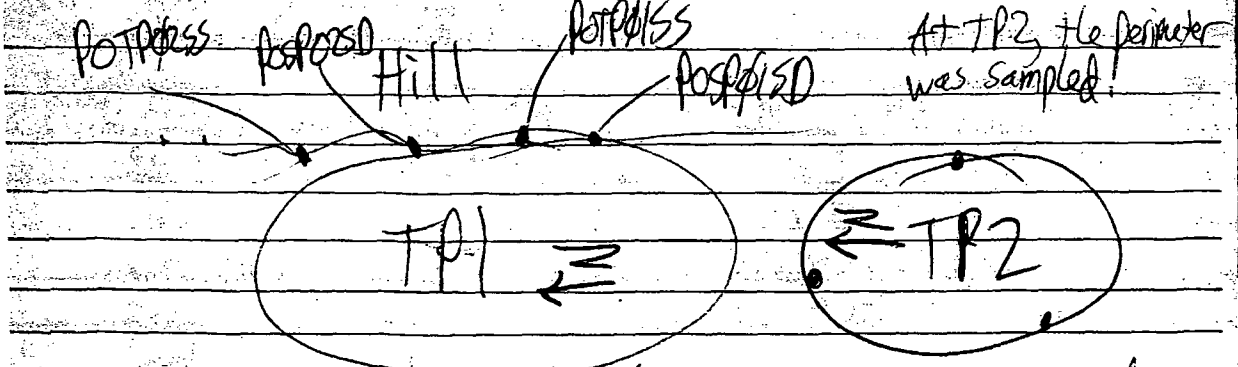
0950 The sample team collects sample POTP0155 from the Tailings pile/soil interface along the opposite side of the creek from the large pile.
Sample POSP0150 is collected as a sediment from near a spring leading down the hill near TP1 (Tailings pile).
Sample POTP0255 is collected from the interface of tailings and native soil near the drainage trench.

1045 Sample POTP0355 is collected from the native soil/tailings interface near Tailings pile 1.

1125 Sample POTP0450 is collected from the Tailings pile 2 area interface. The sample is a mix of sand & tailing (white & brown) with dry.

1145 Sample POTP0555 is collected from Tailings pile 2 area interface. The sample is darker soil and tailings than POTP0450.

1200 Sample POTP0655 is collected from Tailings pile 2. The soil is brown fine & with mixed tailings (gray, fine grain).



1230 The sampling team heads for lunch and phone calls at the hotel.
1330 End of lunch.

Mark Woodke 6-25-01

6-25-01 01-02-0028

1405 Sample ~~POTPOS55~~ POTPOS55 is collected from tailings pile 2.

1412 Sample ~~TOC~~ POTPOS55 is collected from tailings pile 2. The material is fine gray and brown sand + tailings.

1422 Sample POTPOS55 is collected from tailings pile 2 at the soil/tailings interface.

~~1415~~ 1550 Samples ~~POCRØ1SD~~ is collected from Creek (in mbsa) POBKØ1SD (sediment) and POBGØ1SW (water) are collected from the stream gauge area of (Creek (Threemile). The sediment is very large beige sandy material with larger black rocks. The GPS unit would not record the location of the sample - a reading was taken at the road intersection with Threemile Creek. ~~The~~ The sample was collected approximately 15 feet down stream from the stream gauge, which read ≈ 0.85 on the stick. The GPS ID for the intersection may have been deleted and therefore blank.

1628 Sample POCRØ1SD is collected from Creek (as listed in the SQAP). The sediment is dark sandy material. Stream flow is ≈ 20-30 gallons per minute.

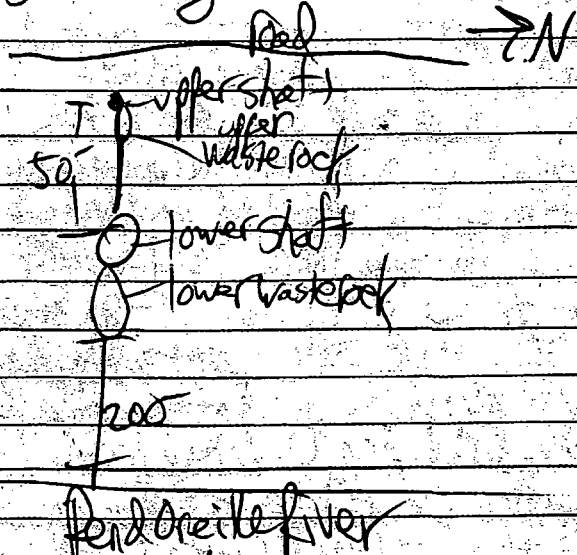
1700 The team exits the Red Cliff mine site for the day. Dave Gadowski, the environmental manager for the mining company, informs Mark Noelle that the ground water well on site does not have a spigot at the wellhead and that the stained soil from the ~~to~~ mill area ("copper stains") have been removed since last years' site work. The Ecology and Environment project manager was informed of this information. The team then exited the site for the day and prepared sample equipment for tomorrow.

Mark Noelle 6-25-01

6-21-01 01-02-0028

0830 The sample collection team (Mark Woelk, Al Johnson, Neal Amick) meet Ed Pomeranig a representative of the Riley Creek Lumber Company, in Metaline and head for the mine sites.

0915 The team reaches the Metaline mine hole. The upper shaft is ≈ 4' x 6' x unknown feet deep - it apparently connects with the other shaft ≈ 50' below. There is a waste rock pile ≈ 10' x 5' x 5' high at the upper shaft. The lower shaft is ≈ 6' x 6' x 3' deep & connects with the upper shaft ≈ 50' uphill. The waste rock pile at the lower shaft is ≈ 50' x 15' x 5' high. The nearest water is the Pend Oreille River ≈ 200' west. There is no obvious drainage route from the rock to the river.



No GPS reading was obtained here

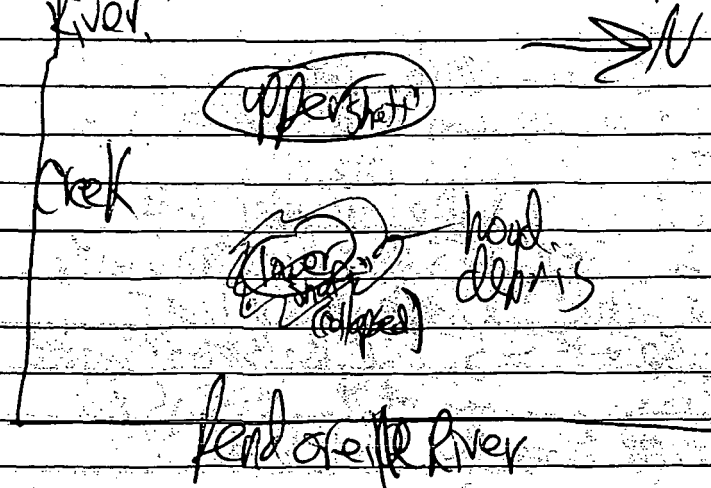
0940 The Sterling Mine area is reached ≈ 100 yards - 200 yards south of the Metaline Mine. There is approximately 30' x 20' x 20' deep of a cut into the hillside at the upper shaft. The lower area has some wood debris and a partial concrete foundation. There is no obvious waste rock, Ed believes that the rock was removed.

Mark Woelk 6-26-01

18

6-26-01 01-02-0028

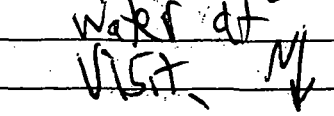
There is a running creek (≈60-80 gallons per minute) approximately 100 feet south of the mine. The mine is also ≈150' west of the Pend Oreille River.



The mine is in a low point, drainage would likely go to the southeast. The Metaline and Sterling mines were both ≈250' east of the highway. There were no GPS readings at either location. A reading on the highway was taken and called Metaline Mine. The reading at the cars was 48° 50.19.181 and 117-23.30.54 W.

1015 The team explored area of the entry point to the Metaline and Sterling Mines (≈200 yards south of the Mile 12 Marker) to head up Boulder Creek, the Cemetery Road, the Oriole Road (under power lines after ≈2 miles).

1030 The team reaches the first creek. The coordinates are 48.5 107.80 N & 117° 25 0.00 W. It has a small looped design on the GPS field. It is the West Contact Mine based on the map. The shaft is 10' x 10' x unknown depth. There is no visible waste around the shaft and no surface water at the time of the visit.

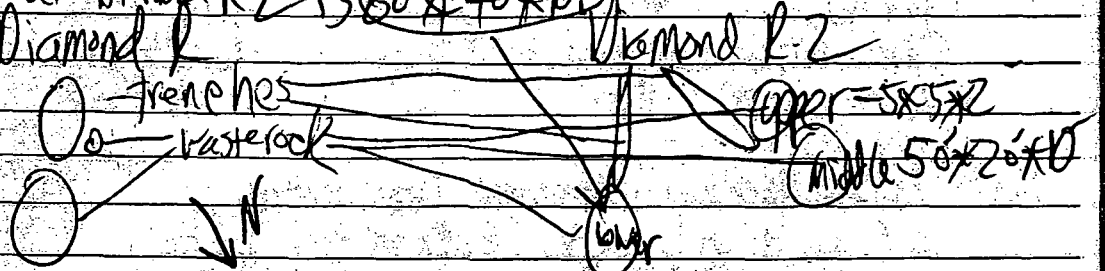


Mark Neelhob 6-26-01

6-26-01 01-02-020

~~1115~~ The team begins hiking to the Diamond R. mine. The shaft has been collapsed, the open area remaining is ≈ 60 x 10 wide x 15 average depth. There ~~area~~ is approximately an waste pile of rocks ≈ 10 x 8 x 2 deep. There is no surface water in the area. The lower waste rock area is mostly soil covered and is ≈ 40 x 30 x 10 deep. This mine is suspected to be the Diamond R.
(at 48 51 12.00) are the coordinates of our location.
long 117 25 18.6)

1120 The team reaches another "mine" - we'll call it Diamond R 2
(at 48 51 14.00) It is ≈ a 3 minute walk to this hole from
long 117 25 12.4) the "first" Diamond R. (Note: There is a team of 5 people working on finding the properties today with several maps - one of the 5 (Ed) knows the area and it's still unclear even with lat/long readings, which mine is which when they are relatively close to each other.)
Dimensions are 50 x 20 x 10 high. There is no surface water at either Diamond R. The lower waste pile at Diamond R 2 is 60 x 40 x 10.



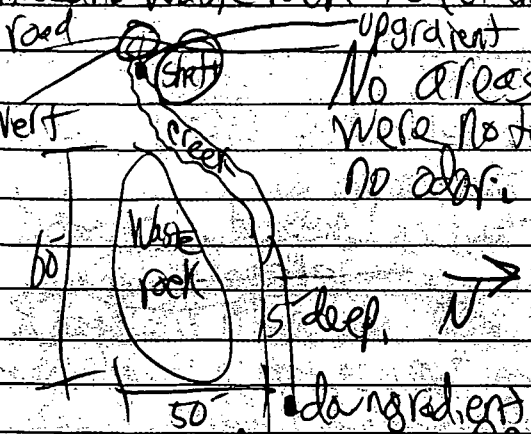
The more northerly trench at Diamond R. 2 is approximately the same dimensions as the first trench.

1200 The Blue bucket mine is reached just off a forest road. The mine shaft is again "blown out" with a "U" shaped excavated area approximately 15 x 15 x unknown depth. The creek flow is ≈ 20 gallons per minute. The waste rock pile is ≈ 250 yd³ (50' x 60' x 15') and is covered by native soil.
48° 50 48.60 N + 117° 24 24.30 West = location

Mark Noble 6-26-01

6-26-01 01-92-0028

(Blue Bucket continued). There is a culvert under the forest road that flows near the mine and waste rock - the culvert is zinc-coated.



No areas of staining were noted. The water was clear with no odor.

is deep.

Samples BBPØ1SD and BBPØ1SW were collected downgradient at a drainage area below the waste rock. The sediments are sandy and multicolored from downgradient.

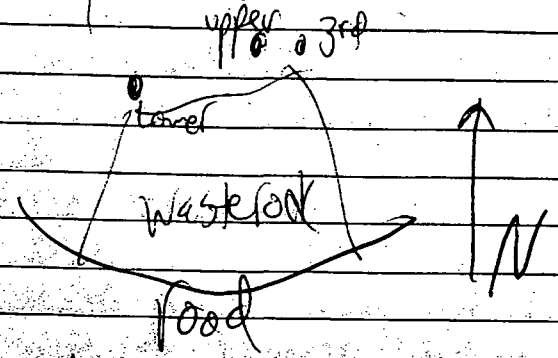
Samples BBPØ2SD and BBPØ2SW were collected upgradient from the shaft near the culvert. The sediments are gray and dark brown at the upgradient area (behind a small fenced area) and were fine grained. At the time of sample collection, there was no flow from the culvert.

1330 The Bella Mau mine is reached. The shaft is ~6'*6'* at least 30' deep (horizontal). The area was not ~~affect~~ marked a significant sign of waste rock (2000) and no water in the area. The upper shaft is 5'*5'*30' (at least vertical). The third shaft is ~5'*6'*50' horizontal and connects with the Lehigh Mine nearby. The waste rock pile is ~100'*50'*5', it spreads out in a triangle shape from the top to the bottom. No water is noted in the area, drainage is to the road.

Mark Mathile 6-28-01

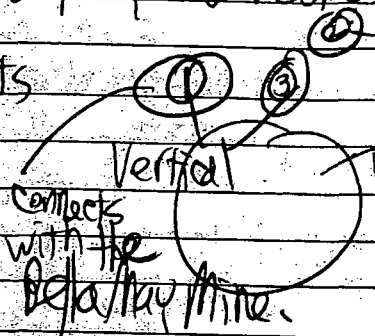
6-26-01 9-11-0028

Bella May Mine



1400 The team reaches the adjacent Lehigh Mine (No. 2). NO!
The shaft here connects with the Bella May Mine
≈ 100 yards west of the Lehigh Mine (No. 2).

Shafts



Waste rock (5' thick * 67' * 100'), ~~but mined due to~~

48° 50' 52.8" N and 117° 24' 20.2" West

The waste rock is very spread out and shallow. (Based by Ed), the pile is 67' down * 100' *

Shaft ① connects with Bella May - (15' * 15' * 100' deep)
② Horizontal (5' * 5' * 20')
③ Vertical (5' * 5' * 30')

Late note - the 1400 Mine is Lehigh No. 1.

1445 The Stella Mine is reached with the help of Ed Pomphrey. There is some timber remaining from a former structure at the lower area.

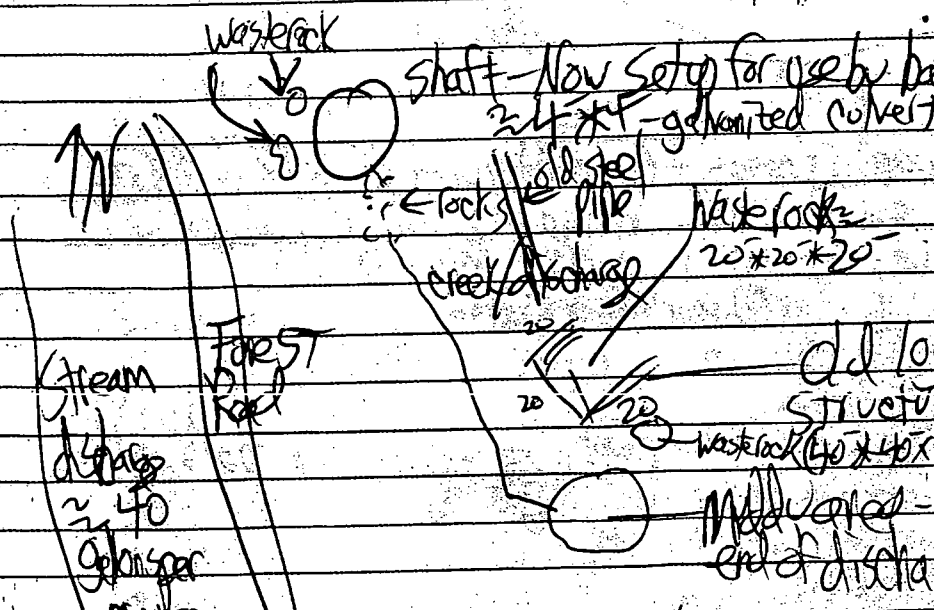
Note The upper area has a water discharge that goes

22

6-26-01 01-020028

Address Bob Beck, Riley Creek Lumber Company, P.O. Box 220, Lacede, ID 83841

through the area of the mine. Flow through the area is ≈ 15 gallons per minute; the waste rock piles up top total ≈ 10*20*3 and 10*15*3

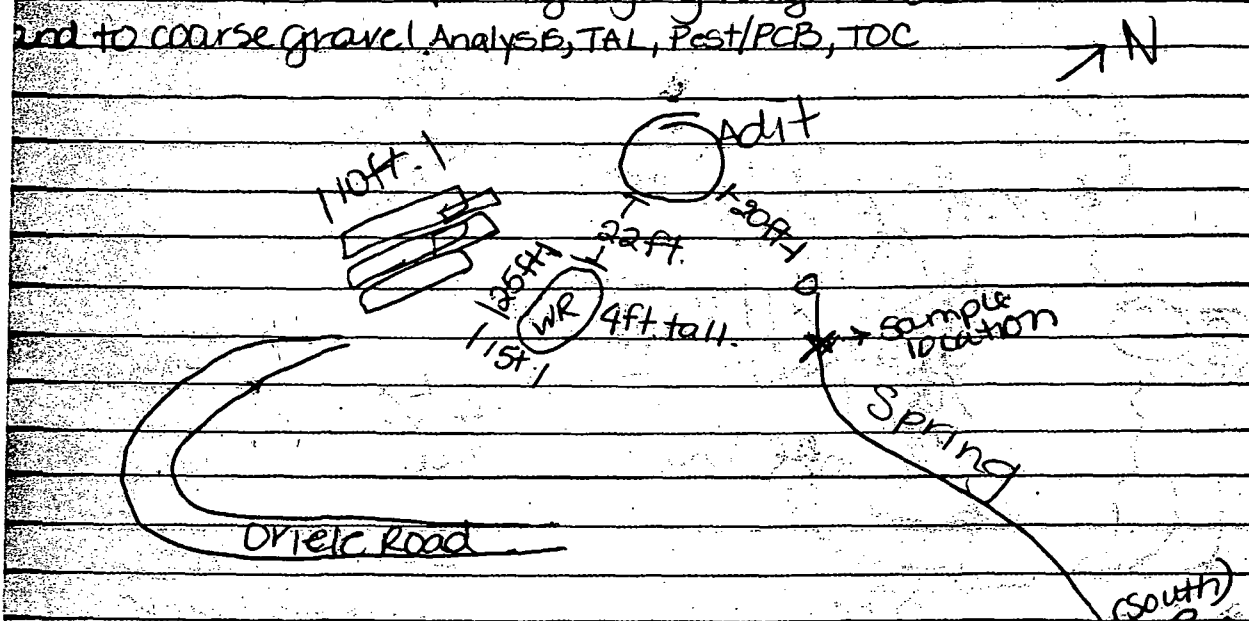


The water was clear and no odor was noted.

1715 The sample team reaches the Harley Mine area. The sample team walked around the boat launch area at the park near Boundary Dam using the GPS to attempt to determine the location of the Harley Mine; the unit quit working at ≈ 1745 even though new batteries were purchased on 6-25-01. The mine was not found, it may have been removed during dam construction in the area. The sample team left the mine site at 1800. 6-26-01

6-27-01 01-02-0028

NA & Renee Nordeen (RN) depart hotel to Oriole Mine.
NA & RN arrive at OR mine location consits of 1 adit
ion has been partially collapsed with a pipe added
pipe contains a gate approximately 15ft. from the opening
ious waste rock piles and a collapsed wooden structure.
es on the largest waste rock pile. pH at sample location 5
RSPOISW collected @ ~~1225~~ 1235 by NA The spring begins 20ft
m the shaft. The sample was collected approximately 13
from where the spring comes to ground due to a lack of sediment
the spring entrance. Stream flow estimated at ~~10~~ 30 gpm. The
eam flows approximately 75 ft. before coming into contact with
waste rock pile. ORSPOISD collected @ 1240 by NA in the same
ation as the SW sample - light gray to light brown
and to coarse gravel. Analysis, TAL, Pest/PCB, TOC



00 NA & RN look for background and discover another mine 350ft. ~~upgradient~~
pgradient of OR. The mine is suspected to be Lehigh No 2 This
ill be confirmed upon return to the hotel. The mine consists of
dry adit that has been gated approximately 5ft. into the adit.
dditionally a waste rock pile is located 50 ft. from the adit.
5ft. L x 50ft x 2-3ft d = 150 yd³ Therefore no samples will be taken
he GPS lat 48°51' 36.15 Long 117° 27' 55.03 Alt 883.5 m
B Nordeen 6/27/01

24

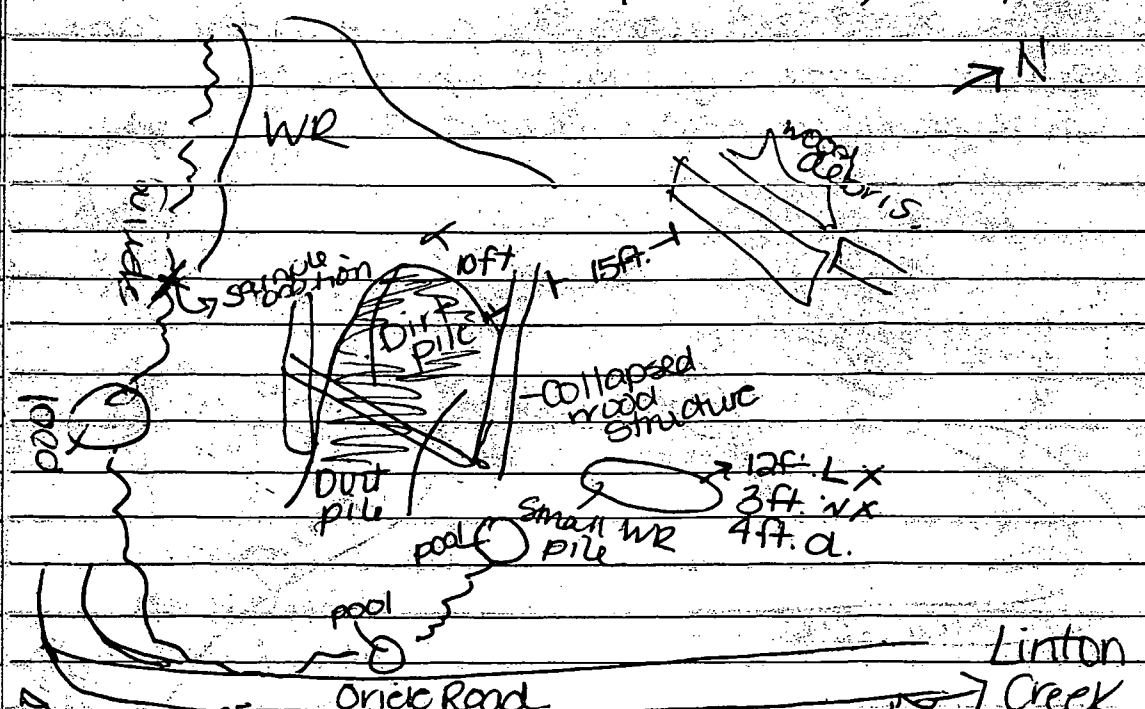
6/27/01 Upper Columbia River 01-02-0028

1320 RN & NA arrive at background location. which is ~300 ft South of Suspected Lehigh No.2 GPS location Lat 48°51' 34.84 Long 117°24' 56.77 Alt. 878.5 m. sample BK0355 collected at 1330 by NA. Analysis TAL metals only.

1340 RN & NA break.

1400 RN & NA arrive at lower waste rock. Since the stream contacts the waste rock pile, 1 sediment sample will be collected below the waste rock pile. The lower level of the Oriole Mine consists of 1 waste rock pile and a collapsed wooden structure. GPS collected Lat. 48°51' 36.48 Long 117° 24' 48.58 Alt. 84 = pH is 5

1405 NA collects ORSP01SD Analyze for TAL met, Pest/PCB, TOC



waste rock 35 ft. L x 55 x w. x 2-3 ft d = 192 yd³.

The pile of dirt ~~appears~~ RN atop the collapsed wood structure appears fresh. RN assumes it's dirt from the tunnel (piping) installation, therefore it is not included in the waste rock dimensions. wood structure appears to have been 12ft x 12ft.

1430 RN & NA depart for Oriole Mine.

~~1500 RN & NA return to hotel~~

RNodeen 6/27/01

6/27/01 Upper Columbia River 01-02-0028

Daily Overview

Oriole Mine - 1 surface water, 2 sediments collected.

Lehigh No. 2 - photos and GPS only

Background surface soil upgradient of Lehigh No. 2.

Noted domestic water supply at corner of Cemetary Rd and Oriole Rd.

Morrell 6/27/01

6-28-01 01-02-0028

0740 The background sample collection team (Mark Woodke and Neal Amick) go buy ice and gasoline for the background sample collection activities.

0805 The sample team meets with EPA and Weston personnel to confirm the sample locations.

Area	To be Collected
Deep Creek	2 Surface soils (each for metals only)
Sierra Zinc	1 " " "
Iroquois	1 " " "
Gladstone	1 " " "

0927 The Northport area is reached. Photographs of the Sterrett Mine area was taken from the north side of the Northport ~~bridge~~ 6-28-01 bridge of the Mine area; access had not been granted to this private mine.

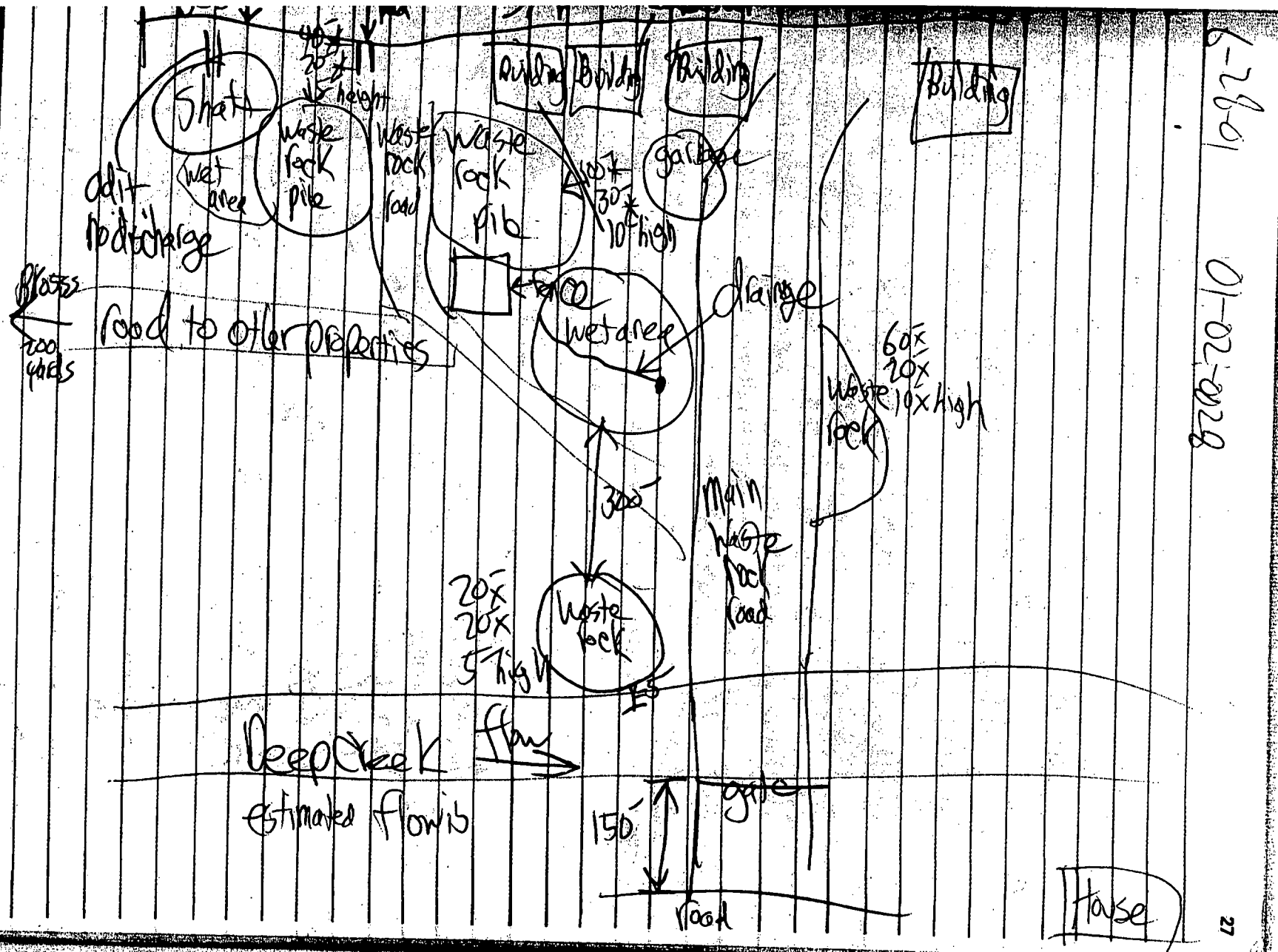
0935 A photograph of Silver Crown Mountain is taken from the road access had not been granted to this private mine. A GPS reading was from the point on the Aladdin Northport road (near the old highway intersection) ~~from~~ 6-28-01

1000 The team reaches the Scandia mine area; a no trespassing sign is right on the Aladdin Northport road; the team collects a GPS reading and a photograph. The sign lists "Fowler, 3237 ft Aladdin Road, 782-0425". The team heads up Black Canyon Road to look for a background soil sample location.

1010 Sample collection area BK0455 is reached approximately 2.2 miles up Black Canyon road. The GPS reading was obtained approximately 0.1 miles back down the road as no reading could be obtained at the sample site. No water or creeks were noted near the sample location.

1110 Deep Creek Mine is reached (see next page). BK0555 is collected off the road near Deep Creek Mine.

Mark Woodke 6-28-01

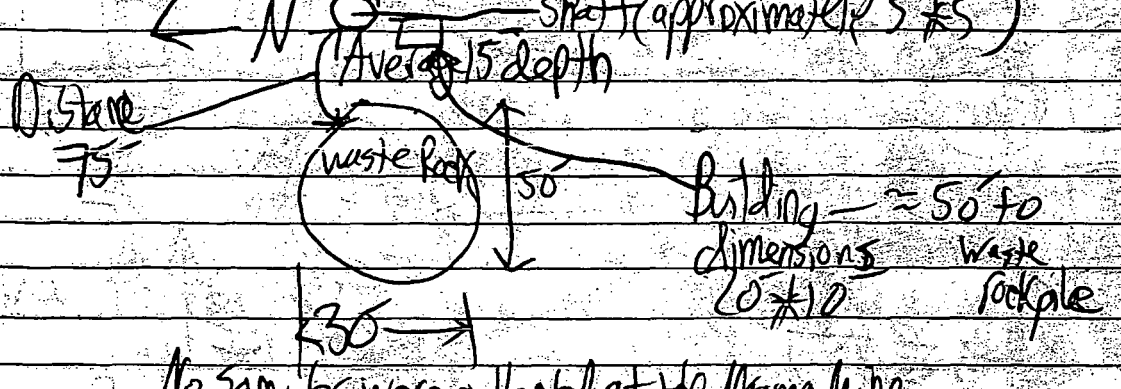

6-28-01
01-02-2028
Building
Building
Building
Building
Shaft
wet area
adit to discharge
waste rock pile
waste rock road
waste rock pile
garbage
10' high
drainage
wet area
road to other properties
200 yards
60x
20x
10x high
waste rock
300'
main waste rock road
20x
20x
5' high
waste rock
Deep Creek
flow
estimated flow is
150'
gate
road
house

6-2801 01-02-0028

The sediment in the creek is very fine, black + moist with some gold flecks noticeable in the sediment. BK0555 is fine brown dry soil with few organic or rocky material.

1210 The sample team heads to the Magma Mine area for photographs and GPS readings. The locked gate (with the lock) is photographed. The team heads towards the Magma Mine area.

1300 The Magma mine is reached via an old road. The shaft is collapsed and there are the remains of 2 buildings here. There is no surface water flowing in the area. The waste rock pile is overgrown with moss; some rocks have gold flecks.



No samples were collected at the Magma Mine

1340 The sample team exits the Magma mine area. The team goes to sample location BK0555 to collect a background sample (≈1.5 miles up the road from the Magma Mine). The sample is fine, brown, dry soil. The team then heads towards the Burns Mine (Burns Mine) area for confirmation.

1415 The Burns (Burns) Mine area is reached. The Mine is private with no access so only a photograph ~~of the~~ is taken. This area is ≈ 100 yards east of what was reported as the Burns Mine; this is the more likely area of the mine. No GPS was recorded due to lack of satellites in the area. The mine was not visible

6-28-01 01-02-0028

1145 The sample collection team heads to the Lone Star Mine area. Access was not obtained, so only a GPS and a photograph was obtained off of 16th part Aladdin Road. A road was seen on the west side of the river, but an area to access this mine was not found.

1300 The sample team heads up Silver Creek Road to collect sample BK0755. The soil is brown, slightly moist soil with some organic material and small pebbles.

1345 The sample team reaches BK0855 (background near the Treglown mine area) The sample is brown with some pebbles and organic material and is dry.

1415 The sample team reaches the Bentzland and Thompson mines area. Photographs of each area were taken from the Wilderness West resort across the road from the mine up the hill. The GPS reading was taken from the resort location. The sample team then headed back towards Metaline Falls.

Sample Summary
5 background surface soil samples.

Mark Noble 6-28-01

4/21/01 GB

22 1400 Gallon sand 6"

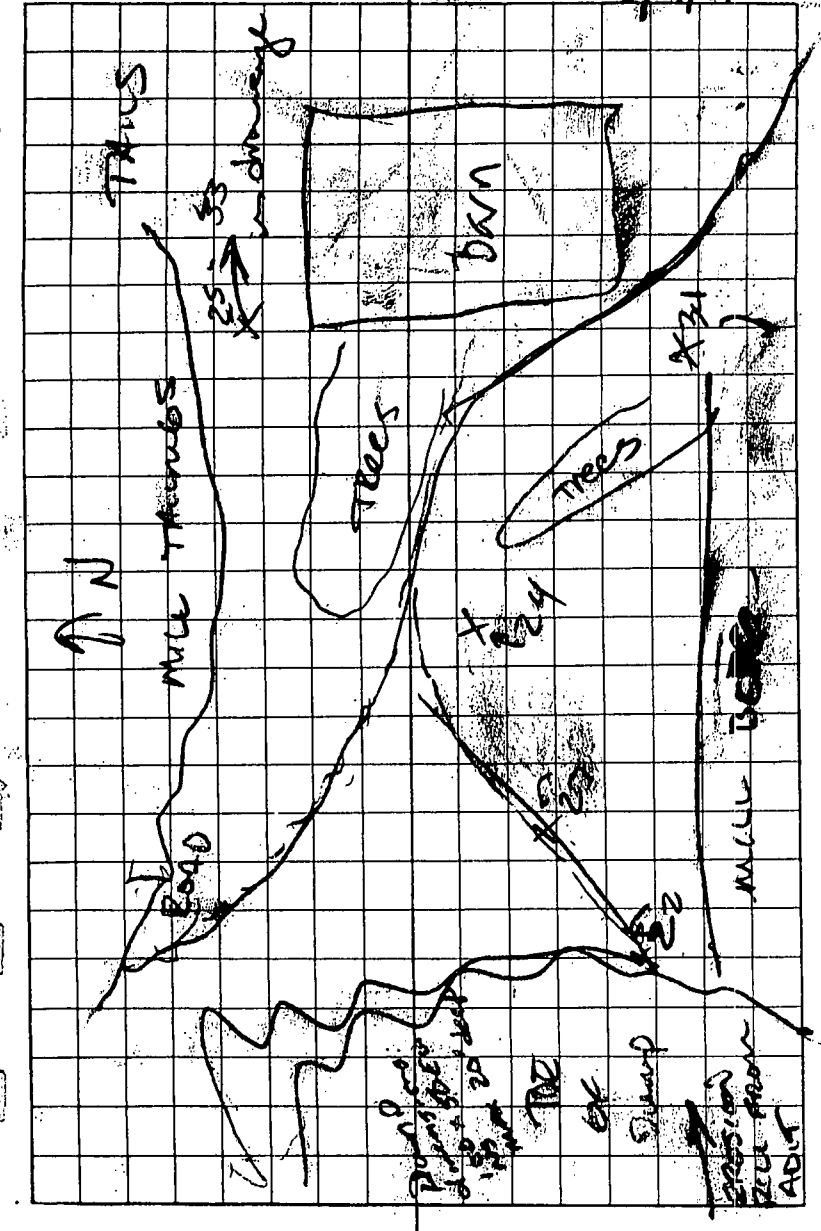
23 1405 Gallon sand w/ woody debris 6"

24 1410 Tan sand + silt w/ woody debris 6"

Samples taken on W side of mill in cat track at base of adit dump.

Prior to accessing mill area, discussed access w/ neighbors claims to own the mill. Said most tailings came from mine "down" the road, plausible as mine dump is at or slightly less than 1000 yd³.

4/21/01 GB



6/21/01 GJG

25	1422	Gray sand -6"
26	1425	TAN SAND TACS. -6"
27	1428	TAN SAND -6"
28	1433	TAN/GR SAND -6"
29	1436	TAN GR SAND -6
30	1439	TAN SAND -6
31	1444	TAN SAND w/organics -6"
32	1447	Gray sand -6"
33	1450	Gray/tan w/organics sand -6"
34	1455	Gray sand, sl. petrol odor 6"

Sign on house "Higginbotham Bros. Since 1851"

out 1540

Sierra Zeus 8/21/01
Blue Ridge
[illegible] Zulu
Nuntius - Bioremed →

1 - 1030 black/grey silty tailings -6"

2. 1035 white sand tailings -6"

3 1040 beige fine sand tails - -6"

4 1050 brn/blk silty sand -6"

5 1054 brn blk silty sand -6"

6 1056 brn/blk silty sand -6"

7 1058 tan sand -6"

8 1100 pale grey sand, -6"

9 1104 tan brn silt -6"

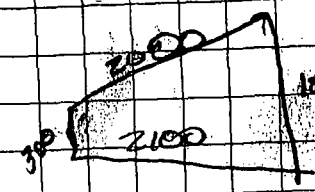
6/21/01 GJC

10 1111 Brn still sandy clay - -6"

11 1113 brn/grey sandy clay -6"

12 1116 brn/grey sandy clay -6"

Est Tails volume



2100
700

= 2100 x 300 = 630,000 ft²

+ 1/2 700 x 2100 = 735,000 ft²

1,365,000

est depth avg = 20'

= 27,300,000 ft³

= 1 mi³

0266

6/21/01 GSC

13	1224	Gray stiff clayey silt 6"
14	1227	Gray stiff clayey silt 6"
15	1229	Gray stiff clayey silt 6"
16	1233	beige/tan clayey silt 6"
17	1235	beige/tan clayey silt 6"
18	1237	beige clayey silt, 6"
19	1241	beige/tan clayey silt 6"
20	1243	tan silty clay, 6"
21	1245	tan/tan silty clay 6"

0268

ecology and environment, inc.

International Specialists in the Environment

Job Number 01-02-0028

Upper Columbia River/Mines
Stevens and Pend Oreille Counties
Washington

Project Area Documentation Logbook # 9

Team #3

0269

E & E Job Number _____

Telephone Code Number 1281 0073

Site Name Upper Columbia River/Mines
Stevens and Pend Oreille Counties

City/State Washington

TDD 01-02-0028

PAN 001281 0073 01SR

SSID _____

Start / Finish Date _____ / _____

Book 9 of _____

E & E Emergency Response Center: (716) 684-8940
E & E Corporate Center: (716) 684-8060
MEDTOX Hotline: (501) 370-8263
E & E Safety Director (Home): (716) 655-1260

210

WITCO U.P.R. Columbia Energy/Mines 01-00-0000

Week one : Case # 29440

organics : Envirosystems Inc (Envsys)
J0FJ0 (J, K, L, M, N, P, Q, R, S, T, W, X, Y, Z)
J0FT00 (0, A, B, C, D)

inorganics: Sentinel Inc (Sentin)
MJ0FJ0 (J, K, L, M, N, P, Q, R, S, T, W, X, Y, Z)
MJ0G00 (0, A, B, C, D)

RTN: 0125435I - 0125449

RVordeen
6/17/01

0271 01-01-0028

6/18/01 Upper Columbia ~~River~~ 01-01-0028

0815 Tara Karamas (TK), Renee Nordeen (RN) and Leith Dahlhoff (LD) depart from hotel to Springdale to meet Jake Jakobsky (JJ) of ~~USFS~~ BLM and visit Cleveland Mine Site

0930 TK, RN leave → Springdale with Jake en route to Cleveland Mine.

1000 Arrive Cleveland Mine

Jake showed us former tailings (heap) pile location. It has been covered with topsoil. BLM diverted stream to the far side of tailings heap (stream used to flow through tailings). BLM installed a settling pond in the stream. BLM installed concrete w/wire to help runoff flow into stream + prevent flooding.

Mill burned in 1994; tailings dumped in creek below mill(s); mine shafts w/adit water; open pits

Second stop - property line. operational until 40s. BLM removed tailings from stream below property line. 200-300 miners when operational. Tailings present on private portion of stream.

Third stop - mill building - delapidated over stream. waste rock pile. Flume present which deposited tailings into stream. Creek appears to flow over top edge of waste rock pile.

1030 Met Mr. Bakey. He signed access letter.

RN/TK looked at Adit #1 pH = 6.0. Took picture. Adit ~~&~~ water flows through a rock bridge. Adit approx 150' to road (see page 4 Drawing)

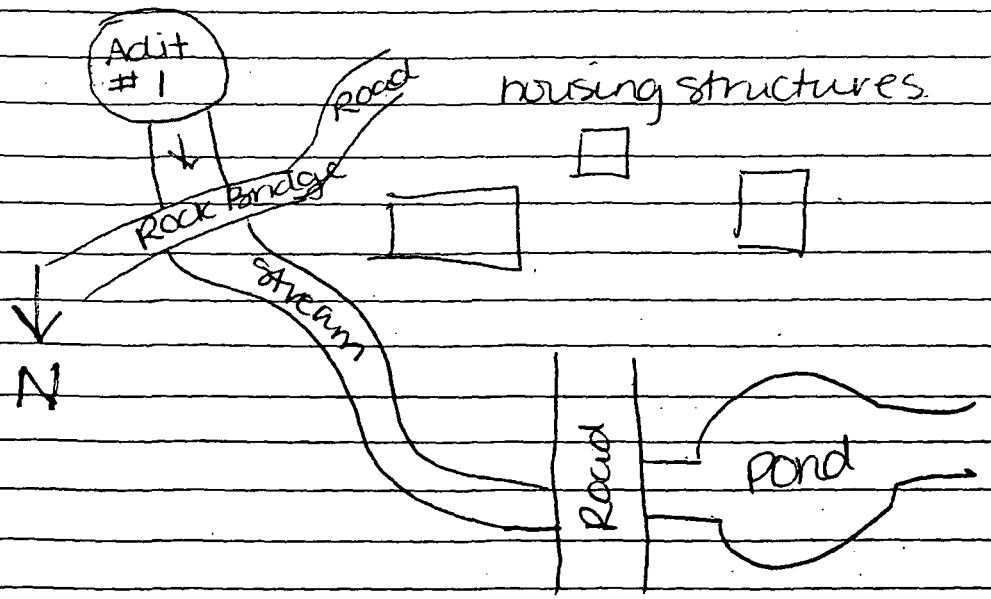
1100 Arrive at open pit, waste rock, tailings area. TK takes Jerome and Miniram readings around perimeter. Readings on Jerome are Ø readings on mini-ram are Ø

1135 TK to collect background Cleveland surface soil sample. Sample location is approximately 0.25 mi from waste rock/tailings piles. GPS collected ≈5' from sample loc. lat. 48° 7' 5.325" long. 118° 01' 22.708" Alt. 3542.22

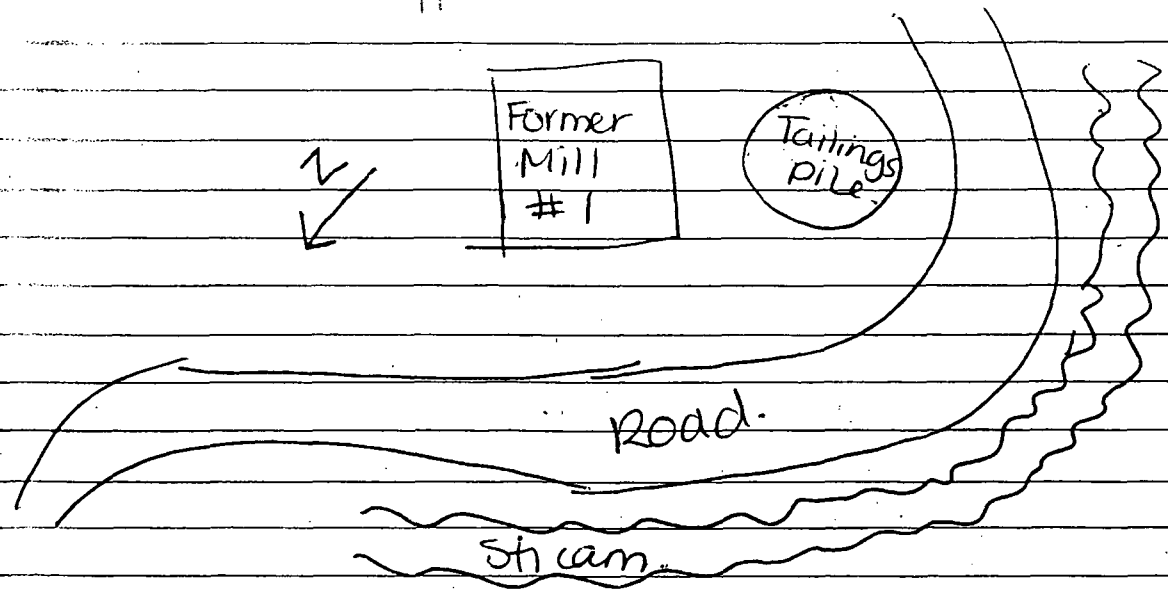
6/18/01 BV

6/18/01 Upper Columbia River 0272 RV 01-CR-0028

Adit 1 Area



1205 - CMTP01SS location approximately the center of the large pit
See photos 1-7 thru 1-13. GPS location collected lat: 48°06' 59.567
long: 118°01' 27.217 Alt: 3409.46
1220 - CMTP02SS location. South of shaft see photo 1-14
GPS location collected lat: 48°06'58.116
long: 118°01' 29.352 Alt: 3392.71
1230 TK & RN take a lunch break
1300 TK & RN resume work at Cleveland Mine - Former Mill #1
TK collects Jerome and Miniram readings. readings are all Ø
All that remains of this building is minimal stonework and burnt wood - JT indicated the property owners burned the structure in the 1990s
sample CMTP03SS will be collected from tailings pile to the SE of the mill
1310 RN collects sample CMTPØ3SS. Pile is 47 feet tall, as measured with a tape measure.
GPS location collected lat: 48°06'56.789"
long: 118°01'35.284" Alt: 3318.88
Pile is 362 feet along base next to mill.

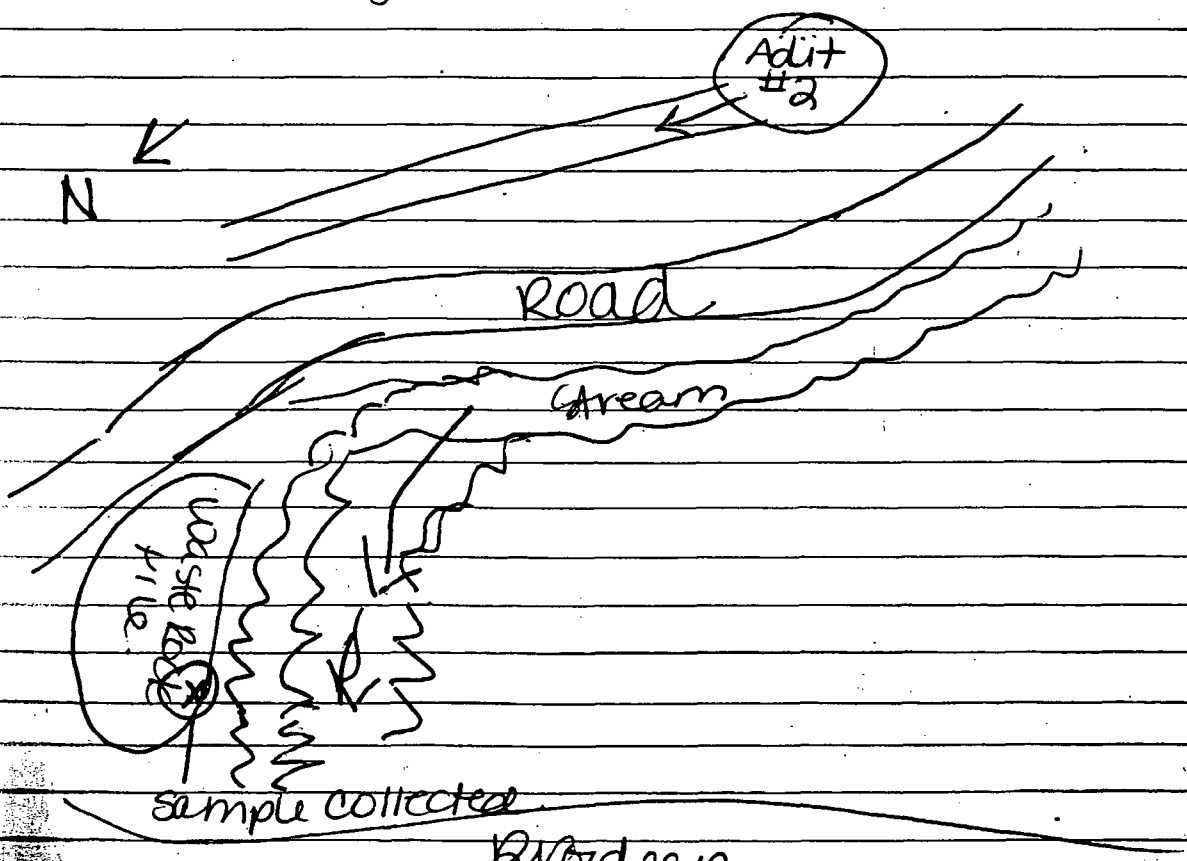


1320 Adit #2 drainage photos taken

e large pit
x07

o L 1-14

Mill #1
are all Ø
d burnt
re in the 1990s
SE of the mill
17 feet



R Nordeen 6/18/01

6/18/01 Upper Columbia River 0274 2 RV 01-01-0035

1333 Arrive Mill Bldg #2. pile to SE of former building appears to be waste rock not tailings. Estimate size to be 150 ft long, 50 ft wide & 8-10 ft high. The creek flows over the waste rock pile and then down adjacent to the former mill building. TK determined that due to the presence of the stream flowing over the waste rock pile the pile should be sampled. lat: 48° 07' 01.390" long 118° 01' 43.610" Alt. 3223.45 ft.

1405 TK + RN return to Mr. Bakey's summer home to provide him with the receipt for samples.

1410 TK + RN begin to leave Cleveland Mine. Stop to talk to Dale - got directions to Gold Bar.

1430 TK + RN leave ~~Cleveland Mine~~ Cleaveland Mine

1530 Turned off Rt 25 to unnamed road in search for Gold Bar mine. Top of road - found nothing - no signs of mining activities. "Federal Mining Claim" sign: ~~Claim name~~ Phenomanamaly Mining Claims #2, 3, 4, 5, 6,
Claimant: Rocky Rhod Mining + Exploration LLC
1301 N Hwy 25 PB 712 Marcus WA 99151-0712
ORMC 154763, 154764, 154765, 154766, 154767, 154768; These signs are posted on both sides of the road from
Road forks (2nd time) to right - signs continue then change to Dead Horse Mine #1, Rocky Rhod Mining + Expl. LLC, Same address
Ser. # ORMC 154228
1st fork in road, still mining claims.
heavy forestation; took 2 pictures for location documentation.

1530 Determine best path to New Leadville, KJ, + Uncle Sam mines and leave current site (where Gold Bar should be.
~~MAO~~ Can not find locations of New Leadville or others near site. Topo map indicates sites should be adjacent to the Clugston Creek Onion Creek Road. No sign is of mining

TKD 6/18/01

activities in the vicinity. TK and RN drive road 3 times attempting to find a pathway to the mine locations. No pathways were located.

1540 TK & RN leave area for hotel to complete sample doc.

1715 TK & RN arrive at hotel.

- RN & TK visited Cleveland Mine and collected 1 background, 3 tailings piles and 1 waste rock pile samples.
- RN & TK attempted to locate Gold Bar Mine. All roads in the area were marked on both sides by Federal Mining Claim signs of different names. Photos were taken of the location
- RN & TK attempted to locate New Leadville, A & C, Uncle Sam mines. Could not find access from the Clugston Creek Onion Creek Re

RNodelin 6/18/01

[redacted]

6/19/01 Upper Columbia River 01-02-0028

0745 RN left message with Jake Jakobosky to get assistance locating New Leadville. (509-536-1621)

0840 RN, TK, & LD depart gas station heading to Frisco Standard Mine to meet Charles Shaw (CS).

1140 TK, LD, & RN arrive at Frisco Standard & meet w/ Mr. Charles Shaw. Mr. Shaw showed a ~~USG~~ (RN) Wa. Geo Survey Bulletin No 23 from 1919 that contained information regarding the mine claim.

1200 TK, LD, RN searched and found 2 potential adits/shafts and 1 possible exploration tunnel.

Mr. Shaw said he bought mine last year and this was his first visit to mine.

1210 RN collecting altitude reading on top of tailings pile. FSWP01 - station # in GPS. GPS location:
lat: 48° 59' 35.725" long 117° 26' 40.211"
alt: 3771.76 ft

1215 GPS locations at bottom of the waste pile:
~~3650~~ TK 3718.81 feet alt
63 feet tall × 75 feet wide × 3 feet deep

1220 There are no pathways present at this location. Therefore no impact can be attributed, therefore, no samples were collected at Frisco Standard Mine. None of the possible adit/shafts were flowing. WR pile is approx. to the SE of the Jubilee ~~stream~~ (RN) creek or unamed trib

1345 Stop for lunch.

1410 TK + RN search of Myeerah mine.

1420 TK/RN at Myeerah Mine. Only presence of mine is a dilapidated housing structure and one waste rock pile across the (TK) road from building structure. (~~South~~ North (TK) from structure)
GPS collected: lat 48°59'26.308" long 117°27'16.160"
Alt: 3835.67 ft.
GPS collected on top of waste rock pile.

RNOrcleen 6/19/01

waste rock pile = 20 ft wide, 20 feet tall, 2 feet deep (estimated from top of pile).

Collapsed adit located inside shed. Another waste rock pile observed to the west of the shed. 2 Signs on shed "Danger" → forest service abandoned mine hazard sign (P61-23). Sign on Shed "Keep out Pure Luck Mining Claim". Beneath this sign is a small wooden sign "Work- Current, Aug 1992, Aug 1996, Aug 1997."

1435 TK + RN leave Myeerah Mine. Attempt to find United Treasure mine.

1455 United Treasure possible adit. Structure is collapsed and RN climbs hill and determine structure could be an adit. Photos and GPS location taken. C Lat 48° 59' 24.966' Long 117° 27' 099. Alt. 3825.57.

1455 TK/RN leave to locate Roosevelt Mine and Clara Mine.

1505 Note: Adit in shed at Myeerah Mine was not flowing.

1540 TK + RN turn onto Garvey Road to look for Roosevelt Mine. No roads led to mine from what was seen on map. All roads off Garvey were private. No attempt was made to continue down any private road. No GPS or pictures were taken because the location of the mine appeared to be mile(s) away from car location.

1550 TK + RN leave to locate Admiral Mine + Mill.

1725 RN + TK arrive at Lakeview Mine. The area is heavily forested with no signs of mining activity. Approximately 0.25 mi N of the location the land has been clearcut. GPS collected. Lat 48° 57' 51.967 Long 117° 32' 46.607" Alt 3792.45.

1750 TK + RN attempted to locate ~~Alt~~ Lucile Mine which should have been on FS road 910; however this road is impassable. Because no mine was located due to adverse road conditions, no

6/19/01 RNodeen

~~photograph~~ photographs or GPS were collected.
1751 TK + RN going to Gold Bar mine to collect GPS.
1900 RN+TK arrive at Gold Bar Mine location. photographs were taken on 6/18/01. Only GPS (GB01) not collected too few SVs
~~loc~~ Site is 0.5 mi. South of Evans campground entrance ~~+~~ 500ft. E. of road.
1916 TK+RN return to hotel.

Daily Overview
- RN, TK, LD go to Frisco Standard Mine, meet with owner Charles Shaw. 2 possible adit/shafts located, 1 possible exploratory adit/shaft located. Waste Rock Pile estimated at 1,400 yd^3. Samples were not collected due to lack of receptors.
- RN, TK locate Myeerun Mine. Location currently consists of 1 collapsed dry adit located inside a metal shed, and 2 small waste rock piles. Samples were not collected because size requirements were not met. Outside of shaft labeled Pure Luck Mining Claim.
- RN, TK located United Treasure. Location approximately 0.25 east of Myrecan Mine.
- Attempt to locate Roosevelt Mine. All roads in vicinity marked "Private" "No trespassing"
- Lakeview Mine: area heavily forested, north of the ~~site~~ RN location is a heavily logged area.
- Lucile Mine - could not ascertain location because road was heavily forested.
- Gold Bar Mine - attempted collect GPS.

R Rodeen
6/19/01

6/20/01 Upper Columbia River 01-02-0028

0800 TK + RN leave motel en route to locate A+C, Uncle Sam, and New Leadville, and R Jmine.

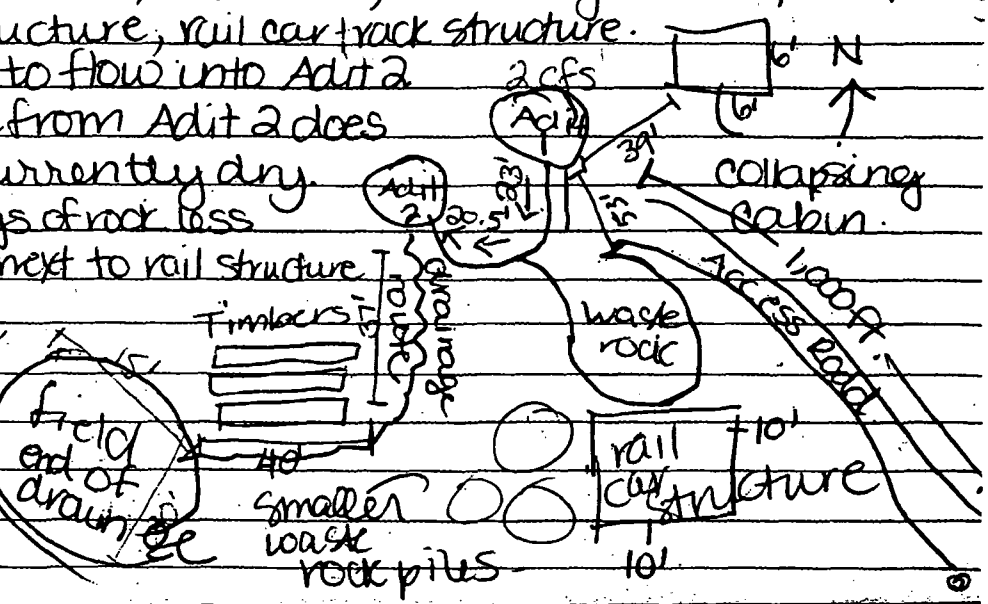
Note: on 6/19/01 from 2100 - 2230 TK, RN, LD met with Rod from USFS to discuss mines on forest service land. TK + RN discovered that the mine located on 6/19 as United Treasure was not the actual location of United Treasure. Rod located the mine on the map + described how to access it. TK + RN will search for United Treasure Mine today. TK + RN assume that the 6/19 location called United Treasure is part of Myeerah Mine.

0910 Arrive at possible A&C location. Collecting GPS to determine exact location.

0955 RN TK explore possible locations. GPS coordinates most similar to a possible hole in an open field. Hole has been filled in but remnants of waste rock surround area. GPS collected. lat. 48°44' 30.322" Long. 117° 51' 22.180" Alt. 3120.75 photograph also taken

1015 RN + TK depart and head to Uncle Sam site site not to

1052 RN + TK arrive at New Leadville Mine. on first inspection 2 shafts, waste rock, building debris, collapsing cabin type structure, rail car track structure. Adit 1 appears to flow into Adit 2. Drainage route from Adit 2 does exist but is currently dry. smaller groupings of rock less than 1' height next to rail structure.



Worden 6/20/01

6/20/01 Upper Columbia River 01-OR-0028

1115 Above Adits 1 & 2 (NE) dispersement of waste rock of minimal proportion. Also, remains of rail lines. pH of water discharching from Adit #1 is 6. TK determine that due to pH level, and that discharge from Adit #1 is flowing to Adit #2, no water samples should be collected. waste rock estimated 40w X 25h X 5dp.

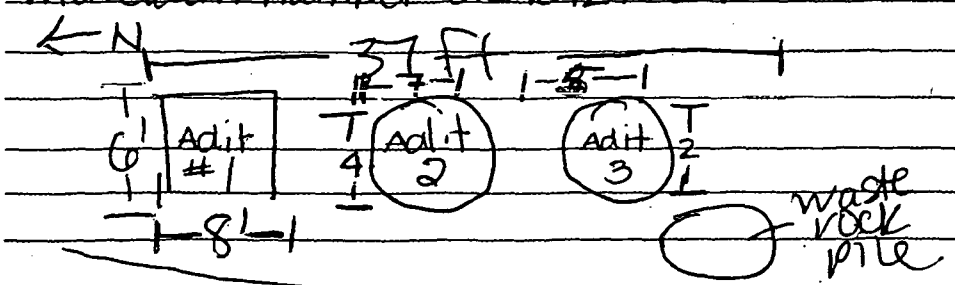
1125. Although pile is estimated at 1,666 yd³ due to a lack of targets TK directs no samples should be take

1135 GPS collected on the waste rock pile. Lat 48°43' 59.480" long 117° 52' 40.730 Alt. 3034.67 ft.

1155 RN + TK break for lunch.

1225 RN + TK depart from location. Head towards United Treasure.

1352 TK & RN arrive at United Treasure Mine. Location Lat 48° 59' 22.391 Long 117° 27' 57.066" Alt. 3642.89 Mine consists of 3 dry adits and 1 waste rock pile 5'w x 2'L x 1'd. Photos and GPS collected. 1 adit marked with claim number ORMC 129483.



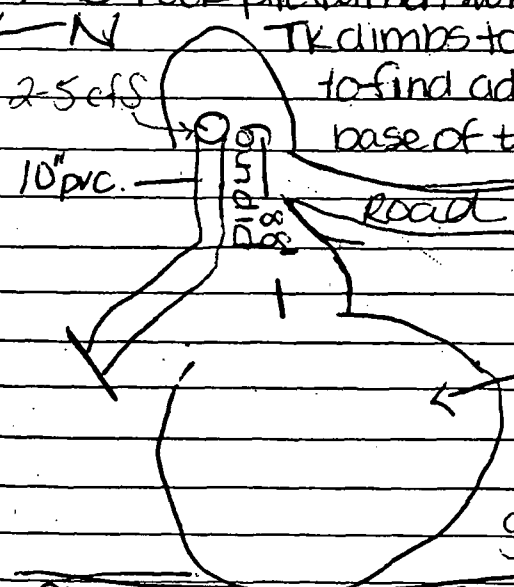
closed forest service road.

R. Morgan
6/20/01

6/20/01 Upper Columbia River

1430 Attempted Line generic from UT adits up FS 6270-210 labeled "UT FSRD" RN, TK depart location.

1604 RN & TK arrive at RJ Mine. location consits of 1 flowing adit, ~~tailings pile~~ (RN) waste rock pile. Inside of adit, spray paint sign indicating "Eureka Surprise ORMC 154465" Since ownership of this claim is unknown, LD directed RN and TK to photograph and collect GPS readings but do not sample. lat 48° 43' 48.741" Long 117° 52' 40.699" Alt. 3025.27 ft. Adit water is being drained by PVC piping. Adit to waste rock = 88 n waste rock pile dimensions 410' t x 90' w x 20' d. (estimate



TK climbs to bottom of waste rock pile in attempt to find adit discharge pathway area at the base of the waste rock pile is dry. PVC pipe runs approximately 50' then ends abruptly. discharge then flows another ~150 ft. before going underground. Vegetation is growing on the waste rock pile. Distance to main road 0.10

waste rock pile

Clugston Creek - Onion Creek Rd.

1650 TK & RN head back to Colville to hotel to prepare for sample shipment.

Daily Overview

- A3C Mine - collected GPS points, took photographs.
- New Leadville Mine - due to lack of targets no samples taken. GPS collected, photographs taken.
- United Treasure - no water, waste rock, or tailings present, no samples taken, GPS collected, photograms Taken
- A&C Mine - possible ownership change so, no samples taken GPS collected, photographs taken

Problem 6/20/01

01-08-0028 Upper Columbia 6/21/01

0700 JK to take Cami Grandusetti to Spokane, ship samples and pick-up Al Johnson. RN with LD conducting background research refer LD logbook Daily Overview for activities.

- No mines visited today

R Vordum 6/21/01

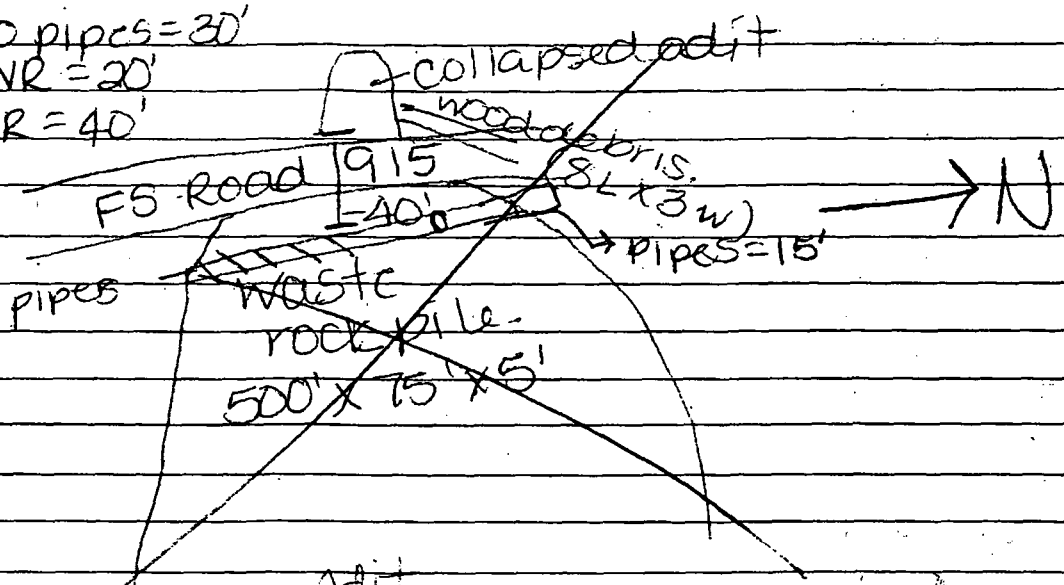
6/22/01 Upper Columbia River 01-02-002

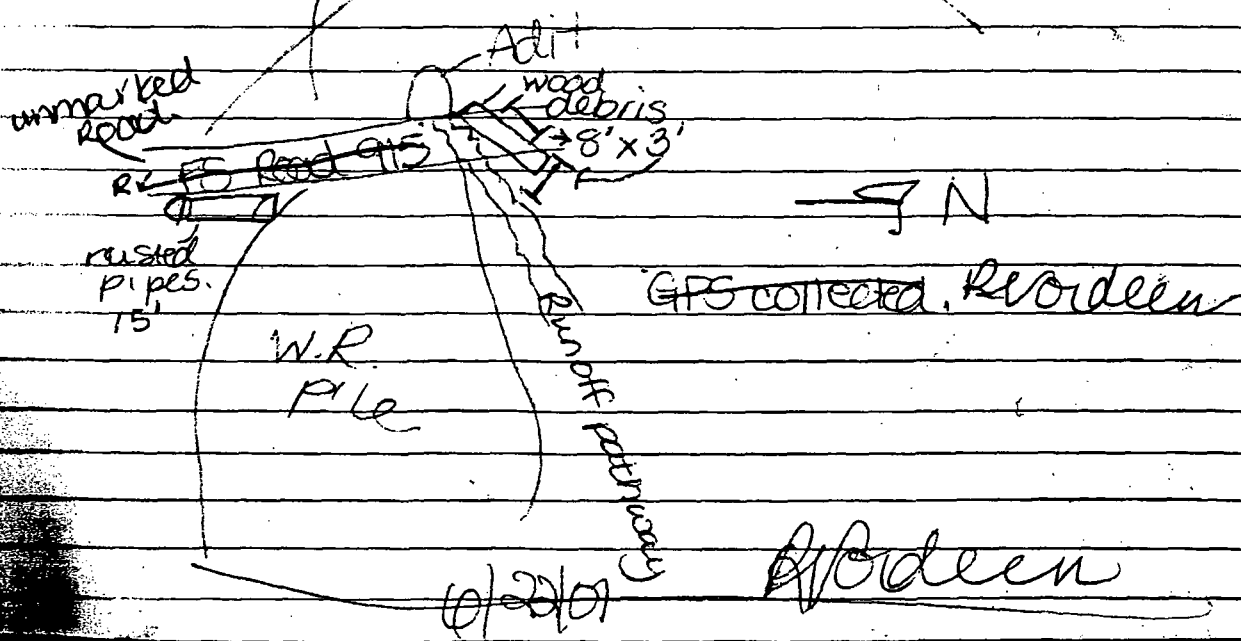
0830 RN & TK depart Colville for Lucille and Admiral Mines

1107 RN & TK arrive @ Lucille Mine. Mine consists of 1 collapsed dry adit, 1 waste rock pile. Mine is located on FS Road 915, some wood debris also exists. Estimated waste rock pile at 500' x 75 x 5'. 6,210 yd³ estimated. Due to H₂S concerns regarding the steepness of the hill, RN determines it is unsafe to sample at this location. Further due to lack of targets, TK determines not to sample

measurements:

Fr. Adit to pipes = 30'
pipes to WR = 20'
Adit to WR = 40'





GPS corrected. RWordeen

RWordeen

6/22/01

6/22/01 Upper Columbia River 01-024

1130 GPS coordinates collected: Lat 48° 57' 01.550" Long 117° 33' 17.763" Alt 3896.4 ft. Line generic from adit to FS Road 915. (labeled LU FS915) @ intersection of unnamed road and FS 915. ~~(RN)~~ (RN) Line generic "LU915" ~~to~~ (RN) from FS 915 to FS912 intersection.

1155 TK & RN leave location towards Admiral Mine & Mill

1214 TK + RN arrive at the gate of Admiral Mine & Mill. Due to a lack of access, GPS and a photograph were collected at the gate which has a "No trespassing" sign next to it.
GPS coordinates: Lat 48°55'29.245" long: 117°34'32.665"
Alt: 2335.38

1220 TK + RN leave to call Mr. Green, TK owner of Inquois Mine.

1225 RN called William Green to inform him that TK & RN would be going to Inquois today, but were unsure if we would sample. Mr. Green requested that a fax be sent to him indicating what samples had been collected.

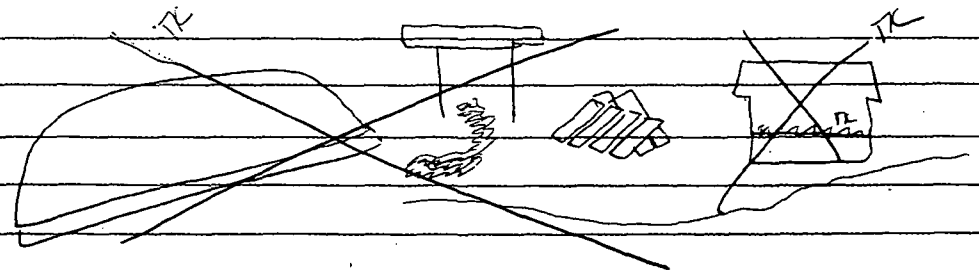
1245 RN & TK arrive at Inquois Mine and break for lunch.

1315 RN + TK begin ~~site~~ recon. Observe 1 adit discharging water, then flow goes underground. Across the road (unnamed), a pipe is discharging water — this is assumed to be adit water. The water flows down a hillside next to ~~tai~~ waste rock pile. Three metal buildings exist on site. Adit → waste rock is 66 feet. Adit to corner of closest building #2 is 14 feet. Bldg #1 to #2 is 43 feet. Bldg #2 is 49.5 feet long and 20.5 feet wide. Bldg #2 is metal and sits on top of a cement/concrete foundation. Bldg #2 is collapsed in the middle. Adit proceeds 10 feet back from opening and is then collapsed. Flow of adit before it goes underground is estimated at 10 gpm, 27 secs to fill 1L

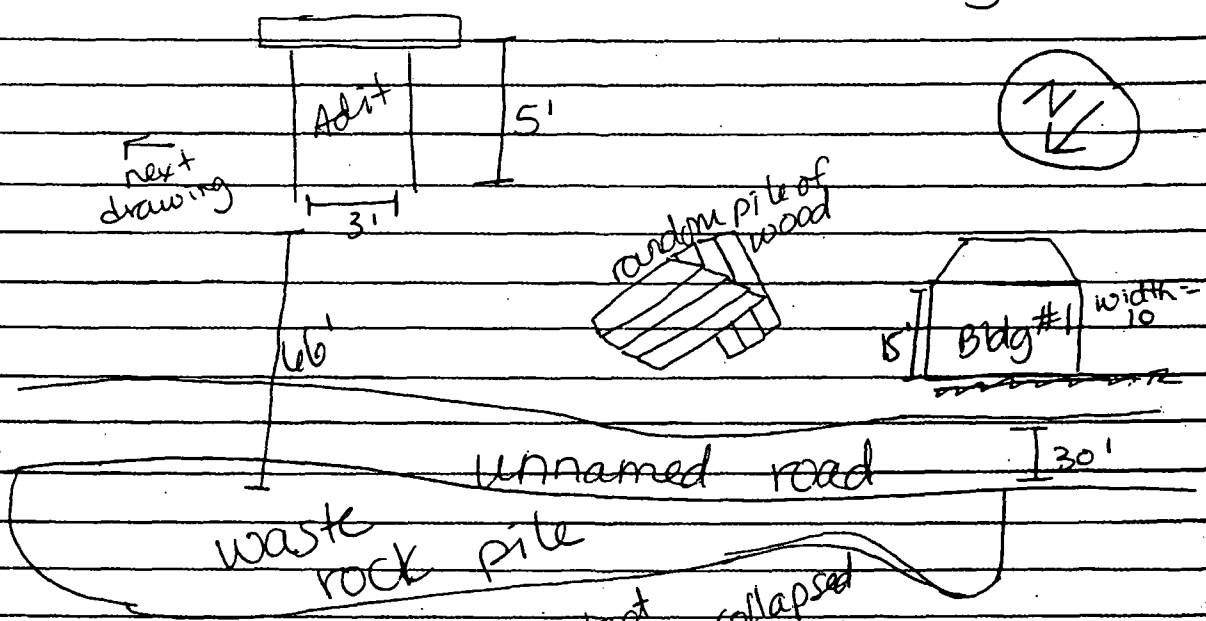
TKaramas 6/22/01

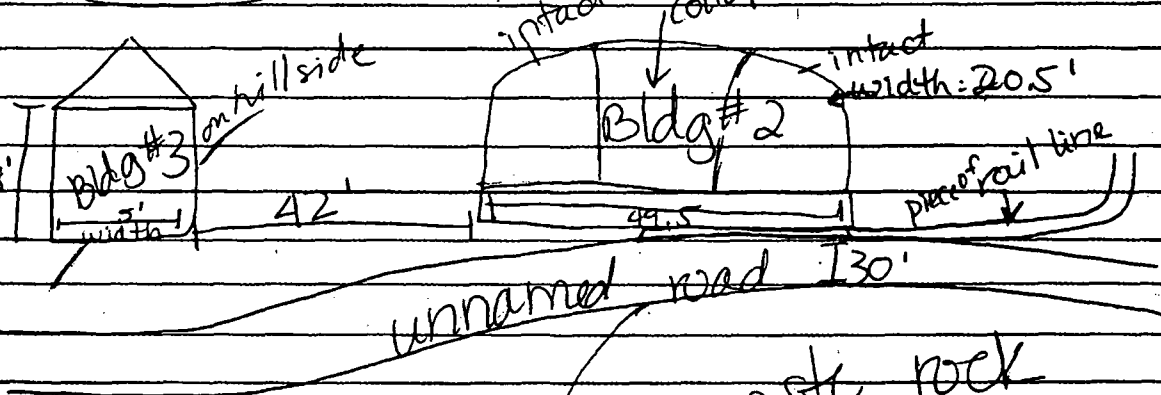
6/22/01 Upper Columbia River 01-02-0028

Adit is approximately 5 feet tall by 3 feet wide.



Adit → Bldg #2 = 14'





[illegible] width waste rock = 82'

JKaramas 6/22/01

6/22/01 Upper Columbia River 01-02-0028

1410 Sample IRAØ1SW lat: 48°57'05.854"
long: 117°32'25.715" Alt: 2818.88 ft
GPS collected.

1425 RN collected sample IRAØ2SW. Flow rate is estimated at 40 gpm. It took 10 secs to fill a 1-L poly. GPS coordinates collected
lat: 48°57'05.536" long: 117°32'26.310"
Alt: 2824.39 ft.

1445 GPS collected for sample IRWPØ1SS
lat: 48°57'06.775" long: 117°32'25.632"
Alt: 2809.82 ft.

1451 Frogs observed in discharge water at the bottom of the waste rock pile.

1457 GPS collected for sample IRWPØ2SS.
lat: 48°57'05.825" long: 117°32'26.879"
Alt: 2791.60 ft

1505 Bottom altitude of waste pile is 2793.63. Waste pile is 82 feet at top; 170 feet across bottom; 30-40 feet tall, max 9

1525 TK + RN leave Iriquois to find Silver Trail mine.

1645 TK + RN spoke with Leatta who indicated that sampling at Van Stone mine will take longer than expected. Therefore TK + RN turned around ~~and~~ TK en route to the motel to pack TK samples and complete sample doc.

1715 RN + TK return to motel.

TKaramoo 6/22/01

6/22/01 Upper Columbia River 01-02-0028

OVERVIEW 6/22/01:

- TK, RN locate Lucille Mine which consists of 1 collapsed dry adit and 1 waste rock pile (6,210 yd. Due to h+s concerns regarding steepness of pile, RN determined it was unsafe to collect samples.
- TK, RN GPS + take photo at the gate to Admiral Mine. Due to lack of access, no further recon was appropriate.
- TK, RN called owner of Iriquois Mine and then proceeded to the mine. Mine consisted of 1 adit (flowing) 3 buildings (empty), and 1 waste rock pile (approx 1,000 yd 2 samples were collected from the waste rock pile in areas where it appeared drainage/runoff occurs. 2 samples were collected from the adit discharge; 1 as the water discharged in front of the adit; and 1 after the water flowed underground and discharged via a pipe on the other side of the road. Only 2 samples were collected from the waste rock pile because the size was barely over 1,000 yd^3 - depending on which depth measurement was used, size of total pile ranged from under 1,000 yd^3 to just over 1,000 yd. To be conservative, since there were apparent areas where discharge/runoff likely occurs, 2 samples were collected in these areas. In addition, all flow/runoff ends in the field below the site.

Tara Laramee
6/22/01

6/23/01 Upper Columbia River 01-02-0028

0745 TK+RN departed motel to go to Van Stone Mine. First stopping to buy stress drinks.

0830 Arrive at Van Stone mine. Leatta Dahlhoff gave TK + RN tour and tasks for day (to collect PPE samples and overland scrutes (possibly).

0950 TK + RN arrive at a spring (unnamed) which originates from a waste rock pile (NE). The spring flows across dirt road and into the waste rock pile on the opposite side of road (NW). Spring from origin to road is 150 feet. Area along the road an spring is wet and/or contains pools of water. Distance of road to other waste rock pile (NW) is 38 feet. Observed 2 PVC pipes in/along other waste rock pile (NW). One ~~hose~~ TK pipe TK extends approx. 150 feet. The other extends 50 feet. No water was observed.

1050 RN collects SW sample. Recon for sed sample but no sediments were present - all moss and/or wet waste rock (closer to road). SW sample collected instead to characterize what SW is comprised of exiting the NE waste rock pile. Sample collected approx 20 feet from origin TK of spring. It took 36 secs to fill 1L poly.

GPS: lat 48° 45' 49.618" long: 117° 45' 31.941"
Alt. 3688.94 ft

Flow rate is 144 gpm.

1104 TK+ RN arrive at water hole and unnamed creek. PPE samples recon completed downstream of where water hole discharges to creek.

1125 GPS collected: lat: 48° 45' 36.296" long 117° 45' 46.
Alt. 3519.41 feet. Flow of creek estimated at
Sample collected approx. 25~~30~~ TK feet from discharge
980 1/16

6/23/01 Upper Columbia River 01-02-0028

1135 TK + RN on shore of mine pond/lake/water hole.
1140 RN collects water sample. 30 secs to fill 1L poly. Only TAL metals water sample collected only.

1145 RN collects sediment samples.
GPS collected for VSMWØ1SD/SW: lat: 48°45'36.072" long: 117°45'42.607" Alt: 3536.56 ft.
1150 TK + RN walk to background/attribution location for unnamed creek.
1155 TK & RN determined that an upstream sample from the PPE would not be beneficial as the unamed creek flows through the waste rock pile past a safe place to again access the creek.
1215 ~~1200~~ TK + RN stopped for lunch.
1245 TK + RN search for PPE6 - near second tailings pond.
1310 TK + RN do line generic on GPS VSTPØ2_LNL for line generic on lower TPØ2.
1315 TK + RN recon any PPES.
1345 TK + RN arrive at PPE6 at SW portion of lower tailings pond. Unnamed creek has pH of 5.
1350 RN collects VSPPØ6SD.
GPS collected: lat - 48°45'34.463" long - 117°46'38.766 Alt - 3146.25 feet.
1410 TK + RN leave lower tailings pond. Perimeter of lower tailings pond by car was 0.3 mile.
1503 GPS collected of unnamed creek which potentially could be a PPE but due to lack of access, no sample collected.
VSPPBCØ1 Lat: 48°45'54.912"
Long: 117°46'10.650" Alt: 3246.43
Boise Cascade
Next unnamed creek, again potential PPE or at least drains part of the mine. VSPPBCØ2. No sample due to lack of access
lat: 48°45'53.895" long: 117°46'10.169" 3239.21
SMO 1/16/02

6/23/01 Upper Columbia River 0290 01-02-0028

~~1510 TK GPS portion of upper tailings pond~~ TK

1520 After more driving, TK + RN determined not to GPS the upper tailings pond due to lack of interior roads.

1550 House count from entrance of Van Stone
1/2 mile = 5 houses
1/2 - 1 = 5 houses + 1 "age house" not occupied yet (still under construction).

1600 TK + RN leave Van Stone Mine and head back to motel to package samples and complete sample doc.

Overview: TK, RN sampled at Van Stone Mine.
1 SW sample was collected from a spring which originated in a waste rock pile. Sediments were not collected due to the lack of sediments - substrate was moss or wet waste rock pile material.
- 1 sed sample was collected appox 25 feet downstream of PPE (no fine seds available at PPE) from mine water hole/pond.
- 1 SW sample and 1 sed sample was collected from the mine water pond.
- 1 sed sample was collected from another PPE located below the lower tailings pond area.
- GPS/photo were collected of other potential drainage creeks which TK + RN did not have access to. These creeks potentially drain portions of the site. Upstream PPEs on these creeks were not accessibly located.
- House count w/in 1 mile driving distance of Van Stone Mine entrance is 10. (0-1/2 mile = 5 houses) (1/2-1 mile = 5 houses)

TKaranas
6/23/01

6/24/01 Upper Columbia River 01-0200

0930 TK & RN meet in hotel to work on sample doc and preparations for shipping.

1030 RN call Ron Matney (509-681-0876) for access & meeting at Jackson Mine. Left message.

1300 RN + TK ~~R~~ RM depart Colville in Budget Truck for Metaline Falls Circle Motel.

1415 Arrive at hotel in Metaline Falls TK, RM, & LD

Continue work on sample shipment preparations.

1800 Break for dinner. for remainder of day refer to LD project management logbook

New RTNs for week 6/25/01 to 6/30/01 01264351 to 101264400. Electronic CLP numbers to remain the same.

R Moreden
6/24/01

6/25/01 Upper Columbia River 01-02-0028

0800 Pend Oreille Mine safety meeting

0830 ~~dep~~ (RN) TK + RN depart Pend Oreille Mine & head back to Cleveland Mine for further sampling as requested by Monica Tond.

0845 RN spoke with Ron Matney (509-684-0876) He will me RN & TK @ Cedar Lake @ 1400 today to perform visit @ Jack Mine. TK & RN depart Circle Motel to head for Cleveland M

1000 RN + TK stop @ Don's Printery job for Van Stone Mine report not completed. RN + TK will return later in the da RN + TK depart Colville for Cleveland Mine.

1140 RN + TK arrive at "Cleaveland Mine Rd". Upon discuss BLM further sample locations request, it was realized background sediment and surface water samples would need to be collected, because the team does not have access topographic map(s) of the area, the team could not chose a appropriate background location within the time constra of meeting Mr. Matney, the requested additional samples were not collected. TK + RN depart location & return to Colville to Dons Printery

1250 - RN calls Mr Matney @ home (509-684-0876) + on his cell phone (509-675-1485) to inform him that TK + RN were approaching Colville but had to stop + might be about 1/2 hr. late. no answer @ either number, left messages at both

1300 Stop at Don's Printery to pick up Van Stone reports.

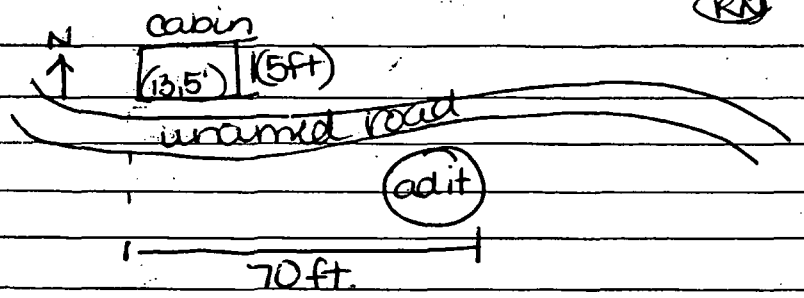
1320 TK & RN depart from Colville to meet Mr. Matney at cedar lake.

1415 Met. Mr. Matney at the Cedar Lake boat launch. He then lead TK + RN to Jackson mine.

1430 TK, RN, + Ron Matney (RM) arrive at Jackson Mine. According to RM, the land had previously been the family homestead. The area surround the mine has been partially logged. RM stated he was logging because of the bears in the area. A small cabin is also located

RNodeen 6/25/01

on the site. RM stated the cabin was built by his grand
to be used when working the claim. RM also stated that Bi
owned the property adjacent to Jackson Mine. The Jackson
Mine consists of 1 adit (not flowing RN) although RM stated th
he had been further back in the adit where approximately
3" ft. of water did exist), and the mining cabin. NO waste ro
was visible at the site. Photos, GPS, and measurements take
Adit to cabin = 70 ft. Cabin 13 ft. L x 5 ft. W (RN)



GPS could not open file. New file "Team 3A" created. Collect
JM01 Lat: 48° 57' 33.013" Long 117° 34' 10.462 Alt. 3505.27.
After taking the adit photograph rail lines inside the adit.
RM indicated that the family only produced enough in order
to fulfill the mining claim requirements.
Line Generic JM Cedar LLC created to map claim acces
Need to change point generic & line generic from JM to JA
1530 TK + RN depart Jackson Mine en route to Randy Mill
home.
1700 TK + RN arrive at Randy Miller's house (owner of
Van Stone Mine) to return documents. No one
was home; documents were left leaning
against back door.
1710 TK + RN leave Randy Miller's en route to
Metaline Falls.
1900 TK + RN arrive in Metaline Falls.

Daily Overview

Jackson Mine - located with RM (owner) collected GPS,

Rverdrien 6/25/01

6/25/01 Upper Columbia River 0294 01-02-0038

Overview (con't).

JM - photographic documentation, line generic for road location.

Cleveland - samples not collected. Need backgrounds, no topos for area available.

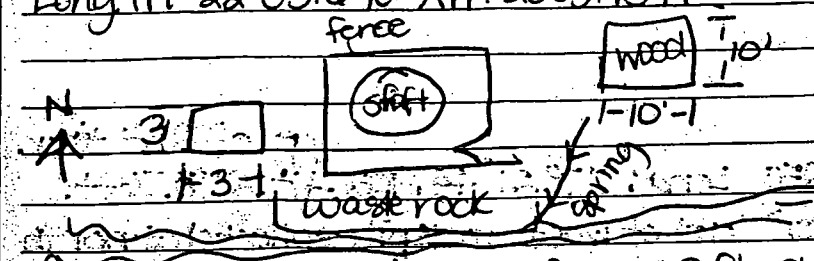
Van Stone - returned documents to Randy Miller (caretaker).

RMcGadden
6/25/01

6/26/01 Upper Columbia River 0295 01-02-0028
0900 TK & RN arrive at P.O. Mine meet LD, Andrew Hafferty (E&E; AH), & Dave Godlewski (PO Mine; DG).
0911 TK collects POSP01SD from tire spring in tailings Pond #1. GPS collected on 6/25/01 Mark Woodke team.
0935 TK collects POSP02SD from spring #2 in tailings Pond #1 GPS collected on 6/25/01 by MW team.
* Note: Location photos for 2 above samples also taken by MW team.
1000 TK, RN, LD, AH, & DG depart Tailings Pond #1, head to Waste Rock pile
1016 Arrive at Waste Rock pile. Collect 3 samples at various locations. Samples will be taken at the base of the slopes. GPS location Lat 48° 52' 54.886 Long 117° 21' 44.317 Alt. 2131.54 ft.
1035 sample "WPC" PO WP02SS collected on northern edge of 2nd tier GPS collected Lat: 48°52'56.257 Long: 117°21'44.902 Alt. 2113.76 ft.
1045 - Sample at lower (river) level of waste rock pile collected at northern edge. Pile has distinct water run off pattern that leads directly to PO River GPS collected Lat 48°52'55.454 Long 117°21'51.472 Alt. 2032.75 ft.
1103 - Relinquish splits of waste rock pile to DG and depart location. TK, RN, LD, AH return to motel to plan site visits for TK & RN. DG collected splits of all samples, and same number of containers
1115 TK, RN, LD, AH, arrive at hotel
1230 TK, RN depart hotel to locate Josephine Mine.
1400 TK, RN arrive at Yellowhead Location consists of a concrete slab w/ rusted Westinghouse equipment. drainage route directly to PO River.
1415 TK collects PPE sediment samples Concrete blocks are visible in the water at the lakes edge. Sample YHPP01SD collected at River edge. GPS collected Lat 48° 52' 34.353 Long 117° 22' 11.051 Alt. 2395.36 ft.
Determine this was an old power station not the Yellowhead mine. All entries from 1400 to end of page should be deleted. Also sample collect will not be sent for analysis
BVOrdeen 6/26/01

6/26/01 Upper Columbia River

1445 - Arrive @ Josephine via boat. ~~Site~~ mine consists of a shaft, collapsing wood structure. The mine is directly across the PO from the Waste Rock at PO Mine. The shaft is surrounded by an 8' barb wire topped chain link fence. The fence was open however indicating potential access. The shaft has water approximately 25' from the surface. The shaft has also had debris ~~fill~~ such as old rail lines. The site also consists of a spring that originates ~2ft from wood structure. Flow at spring is approximately 2-3gpm. GPS collected Lat 48° 52' 58.27" Long 117° 22' 03.690" Alt. 2005.45 ft



from small building to fence 2ft. shaft to wood structure 3ft. fence around shaft 20ft. square GPS collected Lat 48° 52' 58.028 Long 117° 22' 02.964" Alt. 1996.96 ft. waste rock is ~~20 yds~~ 10ft. L x 10 ft. h x 2ft. d. waste rock flows directly into the river so a PPE sample was collected @ River edge

1600 Arrive at Yellowhead Mine. Location consists of a ~~collapsed~~ 5 ft cut, waste rock pile, and collapsed wood structure. GPS collected Lat 48° 52' 38.678 Long 117° 22' 13.907" Alt. 2119.5 The surface drainage is over land approximately 200 yards into the PO River. waste rock pile estimates: 33ft. L x 25ft. h x 2 deep. The area behind the collapsed wood structure is additionally covered with waste rock (area approx. 1000 ft²). The waste rock pile was not sampled because it could not be waste rock from Gold Hill, which is located approx. 0.1 mi. west of the YH location. Photographs and GPS collected.

B/Holden 6/26/01

6/26/01 Upper Columbia River 01-03-0028

1620 TK + RN leave Yellow Head en route to motel.

1630 TK + RN arrive at motel.

Note: (late entry) 0.1 mi. west of Yellowhead location was a possi Mill building foundation, and waste rock pile. According to topo map this should be the Gold Hill Mine. The waste rock pile at this location ends at the edge of Flume Creek which flow directly into the PO River. ~~This mine site is not~~ PO The Gold Hill Mine is not identified on the initial list of ~~site~~ PO mines to visit by the Colville Indian Tribe.

RNordeen
6/26/01

6/27/01 Upper Columbia River 01-02-0028

0915 TK + Al Johnson (AJ) leave motel to locate Washington Mine.

1005 After hiking up hillside for 1/2 hour and found no traces of mine, TK + AJ turned around and headed down. Possible to access area via an upper road. If time permits, a team will attempt to access Washington Mine via upper road.

1030 TK + AJ go to collect background soil sample behind Circle Motel.

1035 TK + AJ arrive at sample location BK0255.

1047 GPS collected lat 48°51' 56.063"
long: 117°21' 25.957 Alt: 2388.74 ft
AJ gave TK permission to sign chain of custody for samples he collected throughout field event.

1050 TK + AJ back at motel. Waiting for C-O-Cs to be printed so that TK can sign them for shipment today.

1145 TK + AJ leave to find King Tut, Red Top, + Lead Hill.

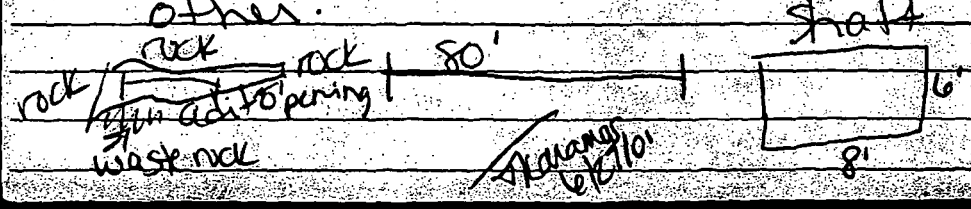
1150 Arrive at FS Road 3155 - gate closed. TWO pictures taken of signs

1200 TK + AJ attempt to find alternate route.

1220 TK + AJ talk to FS at Sullivan Ranger Station. The person in charge of gate keys is at lunch. She will return later. TK + AJ will return this afternoon

1225 TK + AJ leave to find Lucky Strike

~~12~~ 1320 TK + AJ at Lucky Strike. There is 1 dry adit and 1 shaft. Shaft + adit are approx 80 feet apart from each other.



6/27/01 Upper Columbia River 0299 01-0

1325 GPS collected lat. 48°55'49.608"
long: 117°19'54.893" Alt. 2109.64 ft.
(LS01)

1335 No private property signs along FS road. Maps indicate this mine is on forest Service property. TK + AJ will check with Sullivan Lake Ranger Station to verify the property lines.

1340 TK + AJ leave Lucky Strike en route to Sullivan Lake Ranger Station.

1414 TK + AJ arrive at Ranger Station. Mike, the pers who is in charge of keys will be in tomorrow morning. TK will meet him at 7:30 am. Also, TK Jan McGovent(?) stated that Lucky Strike Mine is indeed on FS property.

1420 TK + ~~JA~~ TK AJ leave Ranger Station en route to Z Canyon + Lead Queen.

1520 TK + AJ at Pend Oreille River - at end of road where a local citizen described Z Canyon Mine to be located. No signs of mine. It is possible that the former location is currently submerged by water. GPS + photo taken.
GPS (Z01) lat: 48°58'51.058"
long: 117°20'31.422"
Alt: 2007.54 ft.

1550 TK + AJ hike back out to car.

1615 TK + AJ back at car. leave to find Lead Queen.

1645 ~~At~~ On road FS 328 where a local citizen said that Lead Queen existed. No signs of mine; house on topo map found. It is now collapsed.

TKarannas

6/27/01 Upper Columbia River 0300 01-02-008

1650 GPS collected near collapsed house.
AJ + TK, due to time constraints did not hike around area. It is unknown how much the mine produced or it's exact location (it does not appear on any map). GPS: LQØ1 Lat: 48°58'14.452" long: 117° 19'51.458" Alt: 2927.94ft.

1700 TK + AJ return to motel.

1720 TK + AJ arrive at motel

TKaramas 6/27/01

6/28/01

0730 TK + Dan Weiss (DW) go to Sullivan Lake Ranger Station to get a permit + keys for the Slate Creek Road.

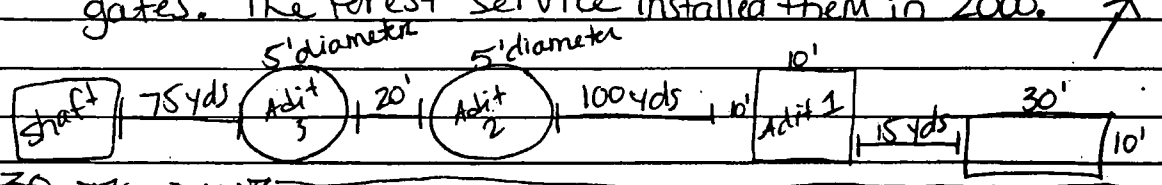
0800 TK + DW leave ranger station en route to Lead Hill mine.

0850 TK + DW arrive at Lead Hill Mine.
3 adits, 1 shaft, waste rock present. None of the adits are flowing. The adits are spread out along the road with waste rock on hillside below the road. Concrete slabs present. Wood ~~te~~ debris on hillside. Appears to be an office (possibly) or wood building.

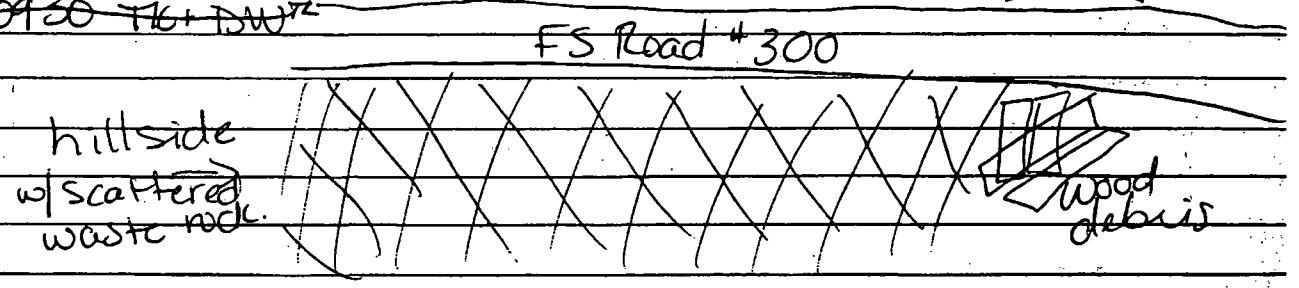
0905 GPS collected at adit #1 ~~LHOT~~ Lead Hill.
lat: 48°58'14.25" long: 117°11'49.14"
Alt: 4870 ft.

0910 No samples of waste rock collected. Waste rock is spread thinly over natural soil. There isn't enough fine waste rock to sample. Layer under waste rock is soil.

0915 From adit #1 to #2 = 100 yards. Distance between adit #2 + #3 is 20 feet. Distance from adit #3 to shaft is approx. 75 yards.
All shafts + adits are closed with bat friendly gates. The Forest service installed them in 2000.



~~0930 TK + DW~~



TKanamaru 6/28/01

6/28/01 Upper Columbia River 0302 01-03-0028

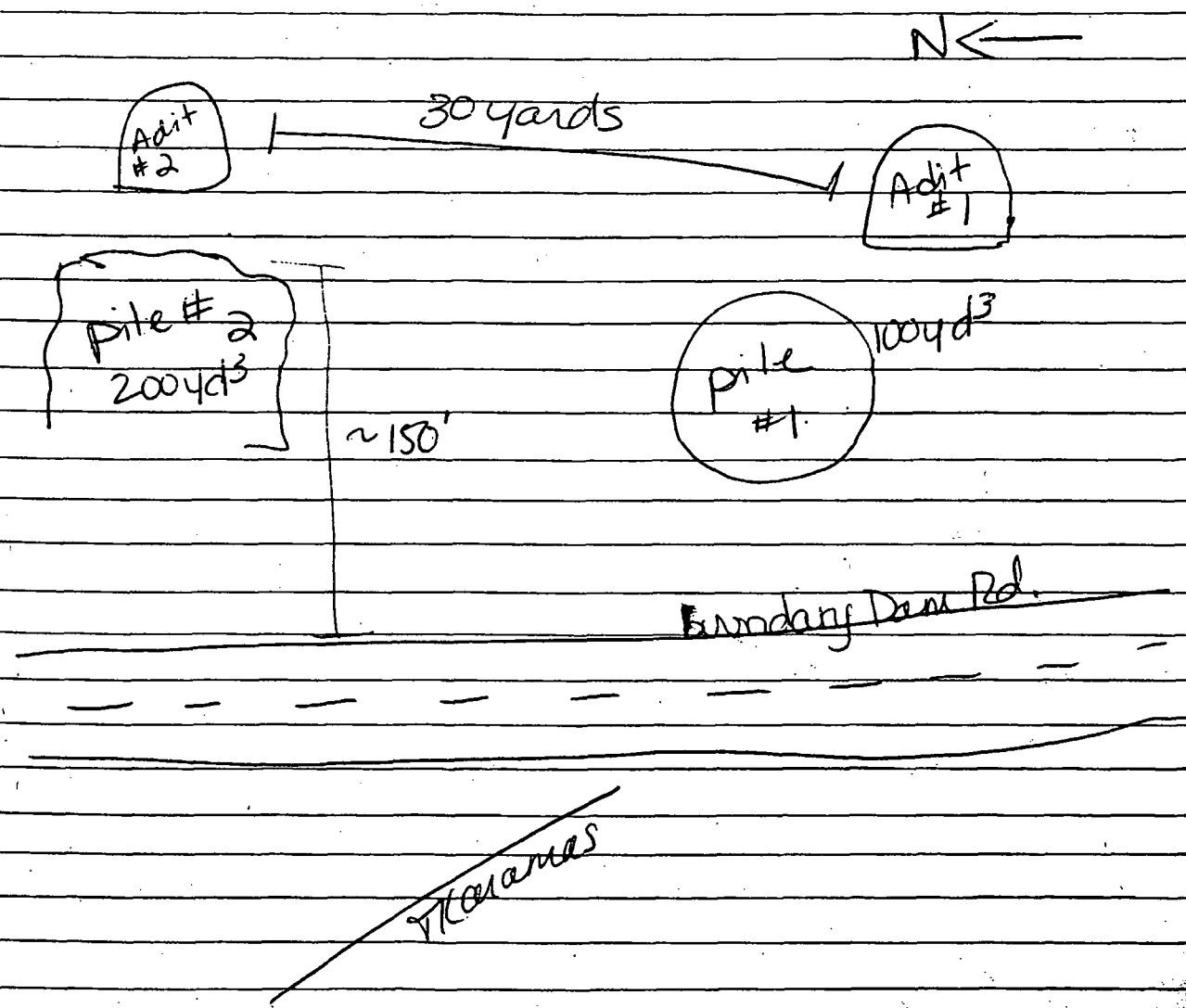
0930 TK + DW leave to located the Red Top + King Tut.
King Tut is labelled as "prospect" on the topo map.
We assume that prospect is King Tut.
0950 GPS attempted on FS road 203. No signs of the prospect. FS road is overgrown. Sides of road are thickly forested.
Lat 48°59'21.47" long 117°11'17.92"
Alt. 4741 ft. Point = King Tut. Coordinates are close to those in inventory list. Picture taken on road.
1005 TK + DW leave King Tut to locate Red Top Mine which is thought to be another prospect.
1020 TK + DW at potential Red Top Mine location.
Trail which mine should be on is overgrown with many fallen ~~at~~ TK trees laying across trail. FS road 200.
1030 GPS collected on trail lat: 48°59'40.13"
long: 117°10'52.96" Alt. 4452 ft.
(point in GPS = Red Top)
TK + DW hike back down to car.
1040 TK + DW leave en route to Sullivan Lake Ranger Station.
1200 After stopping for gas, TK + DW leave to locate Hoage mine.
1220 TK + DW at Hoage Mine. 1 waste rock pile and 1 shaft. Shaft is 6 ft across 8 feet wide. 15 feet down is water. Pile is 10 yds × 10 yds × 1 ~~yard~~ foot deep - approx 100 yd³.
1225 GPS collected: lat: 48°56'15.41"
long: 117°21'16.60" Alt: 2627 ft
1232 TK + DW leave Hoage Mine en route to Lead King.

TKaramas 6/28/01

6/28/01 Upper Columbia RNCR 030301-02-0025

1240 TK + DW Arrive at lead King Mine. 2 adits with ponded water - not flowing. Piles are approx 150 ft from road. 2 adits both with piles near them. Adit #2 has 1 pile 10 yds x 20 yds x 1 foot thick 200 yd³ approx. Adit #1 to #2 = 30 yards across, 10 yds down. Adit #1 has 1 pile approx 100 yds. 10 yd x 10 yd x 1 foot thick.

1255 GPS collected near 1st adit. Lat: 48°57'00.5" Long 117°21'34.54" Alt: 2620 ft.



6/28 Upper Columbia River 01-03-0038 0304

1305 leave lead King - stop for lunch.

1335 TK + DW go to find access to Flume Creek.

1430 TK + DW arrive at location on Flume Creek to collect sample. PRTB SD.

Lat 48° 52' 31.855" Alt 2309 ft

Long 117° 22' 34.520

1515 TK + DW leave Flume Creek en route to Washington Mine - to attempt to locate from the top of Washington Hill. TK + DW recon upper area. It does not appear that there is any trail down the steep mountain-side. A GPS was collected at the bottom of the hill.

1530 GPS (Washington) Lat: 48° 51' 58.06"

long: 117° 22' 27.85" Alt: 2073 ft. Collected at bottom of hill - near bridge - before crossing the Pend Oreille River.

Vkavanaugh 6/28/01

0305

ecology and environment, inc

International Specialists in the Environment

Job Number 01-02-0028

Upper Columbia River/Mines
Stevens and Pend Oreille Counties
Washington

Project Management
Logbook # 15

6/23/01 Upper Columbia River 0306 01-02-002

6/23/01 - 1600 - DW + NA head back to motel to prepare samples. LD drives to Randy Miller to return his gate keys.

2094 Onion Creek Road
home 509-732-6672
cell 509-~~732~~-675-5080

- 1700 - LD leaves Randy Miller and heads back to motel
- 1730 - LD arrives at motel. All teams are working on sample doc. and preparation. Teams will conduct drive bys of the remaining mines before driving over to Metaline Falls. LD is updating the logbook and scheduling teams for tomorrow. DW and NA are taking tomorrow off. RN and TK will head back to Cleveland to collect additional samples. MW and AJ are finishing up all mines and mills that require a drive by to collect pictures and GPS points.
- 1900 - Dinner
- 2100 - LD called Monica and stated Al Johnson would be willing to stay until the 30th. Monica will call Norm Day (Al supervisor) and look into it. WESTON will be collecting background sediment samples for Site MW7. AJ will collect a background soil sample. Monica will call CG and check her schedule. Onion Creek school has 50 students and have a well for their water supply. Van Stone stopped production in 1993. Randy Miller does not know a contact for the school.

Van Stone Mine
Attn Randy Miller
P.O. Box 32
Colville WA 99114

LD 12
RN 12
DW 12
MW 12

~~LD 6/23/01~~

01-02-0028 Upper Columbia River 0307 1/24

Site Name: UCR Location: Northeastern WA

Date: 12/24/01 Job No: _____ SSID No: _____

Proposed Work: finish locating mines and mills

Weather: low 80s, dry windy

Team & Duties: ~~RW~~ AJ + MW finishing drive bys
RW + TK - Cleveland Mine

Instrument Calibration: dosimeter, Hg badges, Jerome, GPS, laptops

Other Parties on site: _____

Safety Meeting: Time: 0700 By: MW

Content: keep in pairs, take breaks

Non-E & E Attendees: AJ

Time (24-hr clock):	Left/Start	Arrive/End
Left Hotel	0730 MW, AJ	
On-site		
Lunch		
Returned to Hotel		

All activities charged to a job while in the field (e.g. off-site activity) must be recorded in log book.

0730 - MW + AJ take off.
0930 - RW + TK begin finishing sample labeling and packagi
The team will then travel to Cleveland Mine and collect additional samples. All team members are to arrive at the Circle Motel in Metaline Falls by 17
If samples aren't collected they will be collected on Monday at Cleveland Mine.
~~JOD 1/24/01~~

6/24/01 Upper Columbia River 0308 01-02-0028

6/24/01 - 1034 - LD called Katy Miller and reported the hours for RN, MW, DW, and LD 12 hours every day of the week beginning 6/17/01 - 6/23/01.

- 1037 - LD called Monica Tonel on her cell phone 206-295-5959 and left a message stating if Al Johnson is willing to stay until the 30th, then CG is not needed.

1200 - lunch

1312 - RN, TK, LD heading towards Metaline Falls

1430 - team arrives in Metaline Falls at the Circle Motel. Team unloads sample coolers and other equipment to charge waiting for DW, MW, AJ and Charlie Gregory (CG) and Alan Jensen (AJensen)

1445 - NA arrives at Circle Motel.

Sample Number Assignments -

Team 1 - 01264151 - 01264250

Team 2 - 01264251 - 01264350

Team 3 - 01264351 - 01264400

Boat Team 4 - 01264401 - 01264449

TOC sample #s for boat team 01050230 - 01050280

1540 - CG and AJensen arrive at Circle Motel.

1715 - DW arrives at Circle Motel.

1800 - Dinner - AJensen, DW, TK, CG, RN, LD

1900 - Back at motel. Meet w/ Weston and Monica Tonel.

1945 - AJ + MW arrive at motel.

All teams locating tributaries for Weston. Weston needs 8 or 10 poly bottles and nitric acid (4). Weston will collect all background SW and SD. They will also collect a background SS at Van Stone for TAL metals, pesticides, and SVOCs. CG classified the percent fines in the samples getting ready for shipment for weight.

01-02-0028 Upper Columbia River 0309 6/24/07

6/24/07 Weston in order for them to collect a background sample similar to the samples already collected. MW and AJ did not finish the airbags of the remaining mines due to time constraints. MW will attempt to document 1 to 4 mines on the way back to Seattle. MW will drive to Seattle via going back through Stevens County. Boat team packed Durango with needed supplies. Monica Tonel has decided to have Van Stone mine to be a stand alone SI which means separate background samples need to be collected. Sediment samples collected at Van Stone Mine were not collected for TOC samples. The E+E team were not aware to collect TOC samples at other locations than the sediments along the Pend Oreille River. Monica Tonel and Tara Keramos stated they had not told the E+E teams so it was ok and that E+E did not have to go back to Van Stone or any other site where sediments were collected. LD verified that from this point onward, any sediment samples will be analyzed for TAL metals, pest/PCBs, and TOC.

LD-12, MW-12, NN-12, QW-12, AJensen 12, CG 12

LD 6/24/07

6/25/01 Upper Columbia River 0310 01-02-0028

Site Name: UCR Location: Northeastern WA

Date: 6/25/01 Job No: _____ SSID No: _____

Proposed Work: Pond Oreille Mine, Cleveland Mine, pick up documents, return to Randy Miller.

Weather: 50's, rainy

Team & Duties: DW, CG, A Jensen - boat team
RN, TK - Cleveland Mine
MW, AS, NA - Pond Oreille Mine

Instrument Calibration: _____

Other Parties on site: Pond Oreille Mine workers

Safety Meeting: Time: 0650 By: RN
Content: Slips, trips, falls, weather

Non-E & E Attendees: NA, AS, TK

Time (24-hr clock):	Left/Start	Arrive/End
Left Hotel	0635	
On-site		
Lunch		
Returned to Hotel		

All activities charged to a job while in the field (e.g. off-site activity) must be recorded in log book.

Ha badges assigned. Same dosimeters assigned to E & E.
0630 - Andy Hafferty called in and received an update.
All team members will meet at Pond Oreille Mine at 0800 for a ½ hour training Chuck Clawson
Water & Sewer Opt.
509-446-3030
JDD 6/25/01

CI-02-0025 Upper Columbia River 6/25/01

0730- LD will call Steve Frazier at Northport Smelter to meet and schedule a visit. If Mr. Frazier does not have time then LD will call Marie Tonel and she will take over contacting and talking to Mr. Frazier.

0745- All teams arrive at Red Devil Mine and meet Dave Godhewski. Team will have an orientation meeting about the activities on site. LD will inform Dave Godhewski about sampling activities.

Al Stewart- Health & Safety officer Mark Brown- plant manager 1950 - 1997 operated 20 yrs shut down. 1995- Omega acquired for underground zinc producer and shipped to Trail BC smelter. Cannibalized old mill. Cleared tailings impoundment. Approved engineering permit from Ecology last week. NPDES permit needs to be renewed. Air permit in 1991 - needs to be updated. EIS 1998 - 2000. Negotiating w/ Ecology regarding site impact - tailings. Invited Colville for visit, still negotiating. Carbonate hosted geology. Don't generate acid at site with drainage. Jim Hatter- mine superintendant on site. Mine outfall- waterfall- every 15 minutes drains. Surface Hazard Training 30 CFR 48-31. Site administration office 446-4516, 911. Equipment moving around on site so be aware. Mine in reconstruction phase. Treat all lines as "live". Tank construction being conducted. Obey all signs on property. Water on river flushes.

-0828- Teams head to adit discharge location. RW + TK head to Cleveland Mine. Delayed opening mine for a year due to metal prices.

-0850- Sampling finished. Boat team heads to Boundary Dam.

~~SRD~~ 6/25/01

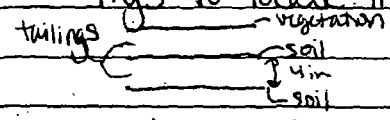
6/25/01 Upper Columbia River 0312-02-0028

6/25/01 - 0855 - Team arrives at tailings pond #1. Intercept trenches. 3 XRF readings for each location. Team will collect 3 SS tailings at drainage inlets and interface. Note one spring will collect SD above interface. Tailings saturated so XRF will not work. 2nd spring noted near midpoint. 1 SS tailings near opening, 1 SS tailings at midpoint, 1 SS tailings at other end. Team will collect 2 SS tailings and then collect the 3rd at the other end. Team will drive to the sample locations.

- 0925 - Team back at vehicle collecting sample equipment.
- 0935 - Team collecting POSPOISD.

LD will take overview samples of the site tomorrow 6/26/01.
Team continuing to collect samples from tailings pond #1.
AJ notes tadpoles in intercept trench. LD will have to add additional samples to the sample alteration form due to the presence of springs flowing into TP# 1 from TP# 2.

- 1055 - Team heads to TP # 3. Area has been logged in preparation for new tailings impoundment area when Pend Oreille Mine reopens. Team arrives and trys to locate interface of tailings and native soil.



NA taking 3 XRF values for 1 select grab sample.
- N48° 52.954 - ±PE 12'
- W117° 20.919

3 SS tailings will be collected in TP# 3.

~~JJD 6/25/01~~

[illegible] Upper Columbia River 6/25/01

6/25/01- AJ collecting tailings SS samples. MW heads into town to see if Bob Beck w/ Shoshone Tree Farms has called and will be back. AJ digs another 3 holes for NA to collect XRF data

N 48°52.977'
W 117°21.020'
Alt 2388 ft

1145- MW arrives at TP#3
- Dave Godlewski has maps of area for report
TP04- multiphased layer
TP05- heavily vegetated, top soil, tailings, native soil ~18 inches, reddish brown soil
TP06- heavily vegetated, dark brown dry soil
- All soil and tailings were dry and fine.

1215- leaving TP#3 to have lunch break.
1230- LD arrives at Circle Motel to make phone calls.
1235- LD called FedEx and scheduled a pick up at the Circle Motel for 6/26/01. Pickup number 7.
1240- LD called Laura Castilli 206-553-4323 and spoke about the additional stained surface soil samples collected at Van Stone Mine. Laura will speak to Bruce Woods to see if Manchester can handle the sample load and will call LD back. RN and TC called and left a message stating they are visiting Jackson Mine at 2PM (1400) and might not be back at 1700. DW, CG, AJensen are on the boat beginning sampling at the Boundary Dam. MW, NA, AJ will continue sampling at Pend Oreille Mine. LD will meet with Dave Godlewski tomorrow at 0800 to take overall photos of the site and to collect figures of the tailings piles for dimensions. LD will call Steve Fraser about visiting Northport Smelter this week. MW, NA + AJ will meet a representative of Shoshone Tree Farms tomorrow at 0830 at the Exxon in Metaline.

LD 6/25/01

6/25/01 Upper Columbia River 01-03-0038

6/25/01 - 1330 - Laura Castrilli called LD and stated Manchester might be able to take either SVOCs or pest/PCBs for the stained soil at Van Stone. Laura will call LD back because the team is not ready to ship the samples by the pickup time scheduled for 0800. LD will be able to ship at the end of the week. Laura needs to make some phone calls to check if that is OK.

-1405- Andy called LD and asked the update on Grandview Mine. LD stated no samples will be collected at the tailings pile at Grandview Mine.

-1408- Laura Castrilli called and left message to call her.

-1410- LD called Laura Castrilli and left message stating LD will call back again.

-1415- LD called Steve Frazier for Northport Smelter 509-684-4311 and stated the property is in litigation right now to be sold to KEF contracting in Canada and he does not have any phone numbers or contact information.

-1420- LD called Monica Tonel at the Circle Motel in Colville and left her a message to call LD back and that access to the Northport Smelter has been denied.

-1430- LD called Laura Castrilli and Laura stated that Manchester will take the samples (pest/PCBs and SVOCs) if they are sent tomorrow.

7411 Beach Dr. E
Port Orchard WA 98366
360-871-0748

LD 6/25/01

6/25/01 - 1440 - Andy Hatfield called LD and talked about flying out on E+E's expense to conduct a QA/QC check. LD stated to call Monica Tonel at the Colville ComfortA Inn and gave him the number.

- 1446 - LD called Laura Castrilli and Laura talked to Bruce Woods and there is a generic traffic report in Forms II Lite for Manchester. Manchester needs 1 copy, Laura needs 1 copy, and LD needs 1 copy. Address the shipment to Sample Custodian. Laura made a note that some samples shipped last Thursday were identified as waste. LD stated that those samples were either waste rock or tailings and that they will be identified now on as SS.

- 1502 - Andy Hatfield called LD and left message to call him back.

- 1503 - LD called Andy Hatfield who had Dhoni and Mike Boykin on the phone. Andy will call Renee and Mark and leave a message. Andy will fly out tonight.

- 1530 - LD drove to Pend Oreille Mine to find MW, AJ, + NA.

- 1600 - LD returned to motel and could not find the team.

- 1625 - Monica Tonel called LD to let her know that she and WESTON collected the background samples SS, SW, SD at Van Stone Mine. She also wanted to let LD know that Andy Hatfield called her to tell her that he was coming to Metaline Falls tonight on E+E's expense. LD will call Monica when the teams get back to let her know if samples were collected at Jackson Mine in Stevens County. Monica and WESTON have 4 more samples to collect and then either both or just Monica will head

SSD 6/25/01

6/25/01 - (CONT'D) 1625 - over to Metaline Falls in Pend Oreille county to continue collecting samples on tributaries located upgradient from mines and/or mills.

- 1638 - Monica Tonel called LD and stated Steve Frazier with Northport Smelter does not want E+E on his property. Mr. Frazier stated there was sampling conducted a few years ago which gave the property a "clean bill of health". Monica will call Guy Gregory and see if a final report was produced and if the sampling referred to by Mr. Frazier was in fact the samples that Ecology collected.
- 1705 - Monica Tonel called LD and stated that EPA attorneys will now get involved with access to the Northport Smelter and it is out of LD's hands now. Monica will take care of the access situation and let LD know any new updates.
- 1710 - MW, AJ, NA arrive back at motel and begin unpacking samples and restocking supplies and equipment.
- 1750 - Boat team arrives at motel.
- 1810 - Dinner - DW, CG, AJ, AJensen, LD
- 1930 - Back at motel. Begin sample preparation and sample doc for shipment.
- 2105 - Monica Tonel called for TK and talked about Cleveland Mine. Monica will talk to Debbie LeBlanc about additional samples and if they are necessary.

TK and RN did not have time to go back to Cleveland mine because they were at Jackson.

JSD 6/25/01

01-02-0028 Upper Columbia River 6/25/01

6/25/01 - Mine with Mr. Matney. Monica Tonel called again to talk to DW about the mines he visited in Stevens County and the associated tributaries. LD will finish collecting samples at the Pend Oreille mine with the aid of TK and RN. CG, ASenn and DW will continue on the river collecting SD. LD will inform Dave Godlewski that the boat team will be adjacent to the Pend Oreille mine tomorrow (6/26/01). RN and TK will ship samples tomorrow via FedEx and will meet LD at the Pend Oreille mine afterwards.

LD 12, MW 12, DW 12, RN 12, CG 12, ASenn 12

JKD 6/25/01

6/26/07 Upper Columbia River 0318 01-02-0028

Site Name: UCR Location: Northeastern WA

Date: 6/26/07 Job No: _____ SSID No: _____

Proposed Work: Mine visits, shipping samples

Weather: _____

Team & Duties: MW, NA, AJ - Snoshone tree farms
DW + AJensen, CG - boat team
LO - Pend Oreille Mine, RN + TK - ship samples

Instrument Calibration: GPS, laptops, dosimeters, Hg badges

Other Parties on site: Dave Godlewski - Pend Oreille Mine

Safety Meeting: Time: 0750 By: DW

Content: slips, trips, falls, be aware of equipment
ticks, bees, tired, take lunch breaks

Non-E & E Attendees: TK, NA, AJ

Time (24-hr clock):	Left/Start	Arrive/End
Left Hotel	0645	
On-site		
Lunch		
Returned to Hotel		

All activities charged to a job while in the field (e.g. off-site activity) must be recorded in log book.

Hg badges assigned. Same dosimeters assigned to E&E.
0700 - LO meets Andy Hafferty at breakfast with DW, CG, AJensen, NA, MW, and AJ. RN and TK are waiting for FedEx to arrive to pick of sample coolers.
0730 - Team members back at Circle Motel.

~~LO 6/26/07~~

6/26/01- 0815 - LD and Andy Hatterty (AH) arrive at Pend Oreille Mine
meet Dave Cadlewski. LD needs copy of MSHA h
and safety forms and copy of topography of site
LD gave Mark Brown copies of fact sheets to
distribute to locals and to put in local newspape

Photo 1-1 - 0845, Dir N by LD - View of empty copper sulfate
tanks that used to be in berms. Scheduled to
go to Arlington.

Photo - ~~D~~ 2 - 0846 - Dir NW by LD, View of staged soil where plastic
tanks resided when PA was conducted in Mar
Soil scheduled to be removed and shipped to
Arlington.

0847 - Dave Cadlewski (DC) driving LD + AH to take photos of
tailings piles.

Photo 1-3 - 0850 - Dir NE by LD - panoramic view of tailings pile
Photo 1-4 - 0851 - Dir E by LD - "
Photo 1-5 - 0852 - Dir E by LD - "
Photo 1-6 - 0853 - Dir S by LD "
Note logged area for new tailings impoundment for
opening of Pend Oreille Mine.

0900 - RN & TK arrive at Pend Oreille Mine.

0905 - Team at tailings pile #1 to recollect POSPOISD and
POSPOISD and overall photos of tailings pile #1.

0911 - Team at location of POSPOISD.

Photo 1-7 - 0914, Dir S, panoramic view of tailings pile #1 from
gravel road through center of pile/pond by LD
Photo 1-8 - 0915, Dir SW by LD "
Photo 1-9 - 0916, Dir W by LD "
Photo 1-10 - 0917 Dir W by LD "
1-11 - 0918 Dir NW by LD "
1-12 - 0919 Dir N by LD "
1-13 - 0920 Dir N by LD "
1-14 - 0921 Dir NE by LD "

~~AH~~ 6/26/01

SCU

6/26/01 Upper Columbia River 03[illegible]0025

Photo 1-15 Dir E by LD " 0922
1-16 Dir SE by LD " 0923
1-17 Dir S by LD " 0924
note vegetation, core samples, water level indicators.
Dave Lodlewski noted that the wetland area has been reduced due to drying out the tailings pond #1. Trees have rooted and are growing. pH 7. DL noted that when he usually measures it's 7.8.
0932 - Team arrives at POSP0285D. pH 6-7
Photo 1-18 - 0934 Dir NE by LD. View of intercept trench which connects to another trench which then discharges into the Red Orville River.
Att walking length of wetlands to see if a SD sample is required. TK continues to sample. 300ft distance of wetlands < .1 mile - no sample required as directed by TK.
0956 - Team heading to waste rock pile.
Quartz Hill drums present during PA have been removed.
Entry into mine - workers building guard office.
1014 Team arrives at waste rock pile. LD delivered split samples to DL.
Photo 1-19 - 1016 - Dir S by LD - view of construction of guard office, entry gate.
Photo 1-20 - 1020 - Dir S by LD - View of upper level of tailings pond #2.
Photo 1-21 - 1021 - Dir N by LD - View of lower level of tailings pond #2 with vegetation.
Tailings pond #2 looks the same as when the PA was conducted in May 1999.
Photo 1-22 - 1030 Dir E by LD - panoramic view of waste rock pile
Photo 1-23 - 1031 Dir SE by LD "
Photo 1-24 - 1032 Dir SE by LD "
~~JDD 6/26/01~~

6/26/01- Photo 1-25- 1033 Dir S by LD "
Photo 2-1 - 1034 Dir SW by LD "
Photo 2-2 - 1035 Dir SW by LD "
Photo 2-3 - 1036 Dir NW by LD "
Photo 2-4 - 1037 Dir N by LD "
Photo 2-5 - 1038 Dir NE by LD "
Photo 2-6 - 1039 Dir NW by LD View of field team collecting POWPOZSS at lower level.
Photo 2-7 - 1040 - Dir S by LD - View of lower level w rock
Photo 2-8 - 1041 - Dir W by LD - View of surface water dra routes from upper waste rock pile to l level.
Photo 2-9 - 1042 - Dir W by LD - View of team heading dow to lower level waste rock pile which m the Pend Oreille River.
Photo 2-10 - 1045 - Dir NE by LD - View of base of waste rock pile.
Photo 2-11 - 1046 - Dir SW by LD - View of surface water drainage from base of waste rock pile to Pend Oreille River.
Photo 2-12 - 1052 - Dir E by LD - View of waste rock and edge of bank and pool of water on the Pend Oreille River
Photo 2-13 - 1053 - Dir E by LD - View of drainage from surface water runoff into the Pend Ore River.
Area looks the same as the PA in May 1999.
1100 - Back at mine office. Sampling concluded. LD will mail receipt for samples to DO.
1112 - Team back at motel.

JRD 6/25/01

6/25/01 Upper Columbia River 01-02-0028

6/25/01 - 1115 - RN called FedEx because the samples have not been picked up. The FedEx driver is supposed to call the motel.

- 1120 - LD called Ella Hale 206-553-1215 who called LD today at 1039 and left a message to call her back. LD left a message

- 1145 - lunch

- 1215 - RN + TK scoping out mine visits
  - Onile
  - Josephine
  - Yellowhead

- Team tried to radio MW, AJ, and RA but no one responded

- 1230 - RN + TK leave motel to locate mines.

Background samples still need to be collected for mines in Stevens County and the Pend Oreille Mine.

- 1330 - Andy Hafferty heads back to Seattle LD scoping out background locations in Stevens and Pend Oreille Counties. LD needs to call Monica Tonel to verify where she and Weston were collecting the background SW and SD.

- 1600 - Ella Hale called LD and stated a call came into the EPA general number regarding the boat team crossing restricted area. Ella is reporting for Amber. LD stated the boat team was going to check with Gary O. Baird - Seattle City Light Chief Hydroelectric Operator 509-446-3073

~~YM 6/26/01~~

6/26/01 - 1630 - RN + TK arrive at motel

- 1645 - DW, CT, AJensen arrive at motel and begin ent sample doc. Boat team apprised LD of checking with Gary Baird and that the boat team will check in with Mr. Baird and that he was not upset when the team left to collect addit samples on the Pend Oreille River.
- 1650 - LD called Ella Hauge 206-553-1215 and apprised Ella that the boat team checked in this morning and also talked to the Boundary Dam health and safety officer. The boat team will check in every morning when near the Boundary Dam.
- 1825 - MW, AJ and NH arrive on site at the motel. All teams entering sample data into Forms II Lite and restocking their vehicles with equipme
- 2000 - Dinner
- 2130 - Team back at motel

Monica Tonel called a couple of times for LD and TK. Monica and Weston will meet LD on Thursday morning and a E+E team member will show them to Onyx Mine in order for them to collect a tributary sample.

LD 12, RN 12, MW 12, DW 12, CT 12, AJensen 12

LD 6/26/01

6/27/01 Upper Columbia River 0324

Site Name: UCR Location: northwestern WA

Date: 6/27/01 Job No: _____ SSID No: _____

Proposed Work: ship samples, Circle Mine, mine visits and dive trips, AJ back to Spokane

Weather: 50-60s, on and off showers

Team & Duties: RW MW - ship samples
JD + TK - scope out mines
CG, DW, ASensen boat team

Instrument Calibration: _____

Other Parties on site: _____

Safety Meeting: Time: 0800 By: RW

Content: ticks, slip, trip, falls

Non-E & E Attendees: TK, AJ, NA

Time (24-hr clock):	Left/Start	Arrive/End
Left Hotel		
On-site		
Lunch		
Returned to Hotel		

All activities charged to a job while in the field (e.g. off-site activity) must be recorded in log book.

Hg badges assigned. Same dosimeters assigned to E+E
0830 - All teams except boat team at motel. The boat team went to get ice for the samples.
0930 - Boat team leaves to go sample
1045 - AJ and TK travel to collect BKOASS from behind the circle motel

JSO 6/27/01

6/27/01 - RN and MW are preparing samples to be shipped today. The SD sample collected at the Josephine Mine needs to be re-collected. The sample will be collected by the boat team for TAL metals, pest/PCB and TOC. SOPPOISD. New photos will have to be taken.

- 1120 - RN, MW, TK still preparing coolers for shipment via Fed Ex.
- 1135 - TK + AJ leave to find mines.
  MW will stay at the motel to update samples collected at Van Stone and Pend Oreille Mines.
- 1150 - RN + NA head to Oriole Mine to collect samples. The team will collect a background SS sample. Weston will collect the SW SD background sample tomorrow. So far 3 coolers will be shipped via FedEx today. LD will call Laura Castrill after the coolers are picked up by FedEx. When the boat team gets back they will prepare all the samples they have collected for shipment. Background samples still need to be collected in Stevens County.
- 1451 - MW still preparing samples for shipment.
- 1505 - RN + NA arrive back at motel
- 1613 - Boat team arrives at motel and are unhooking the boat to scope tributary samples.
- 1715 - TK and AJ arrive at motel from mine visits.
- 1730 - LD called Chuck Clawson with the Metaline Water + Sewer Dept 509-446-3030 to get assistance in sampling Linton Creek. TK spoke with Mr. Clawson yesterday and he offered assistance is selecting a sampling location on Linton Creek near Oriole Mine.

~~SD 6/27/01~~

6/27/01 Upper Columbia River 0326 01-02-0028

6/27/01 - RN drove LO to Circle mine and identified all the creeks associated with the mine. NA is going to take AS back to Spokane tonight.

1820 - Boat team back

1845 - Dinner

LO 12, DW 12, CG 12, MW 12, ASensen 12, RN 12

Page Upside Down

01-02-0028 Upper Columbia River 6/28/01

Site Name: UCR Location: Northeastern WA

Date: 6/28/01 Job No: _____ SSID No: _____

Proposed Work: finish boat sampling, collect background samples in Stevens County

Weather: 50-60s, scattered showers

Team & Duties: RW, ASerson, CG, TL + DW
LD w/ Weston, MW + NA

Instrument Calibration: dosimeters, Hg badges, GPS, laptops

Other Parties on site: Weston

Safety Meeting: Time: 0720 By: RW

Content: finish mine visits

Non-E & E Attendees: NA, TL

Time (24-hr clock):	Left/Start	Arrive/End
Left Hotel	0645	
On-site		
Lunch		
Returned to Hotel		

All activities charged to a job while in the field (e.g. off-site activity) must be recorded in log book.

Hg badges assigned. Same dosimeters assigned.
0730- Monica Tonel arrived.
0800- Weston arrived and met with LD, MW and NA.
0715- LATE ENTRY- TL + DW leave to find mines
0805- Boat teams leave to collect Pend Oreille River samples.
0900- Weston dropping off tire from flat earlier today.
0920- LD, Monica Tonel (MT) and Weston arrive at Flume Creek.

~~JJD 6/28/01~~

6/28/01 Upper Columbia River 01-02-0028328 01-02-0028

6/28/01 - Weston sampling Plume Creek for background SW and SD. LD noted that Weston collected SD first and then collected the SW in an entirely different area (~3ft away from SD) and were calling the samples collocated. Weston is not noting the pH of the water. Weston was walking around in the Plume Creek disturbing the SD. Weston was placing the jars in the ground without visqueen or a barrier layer. 6/28/01 - 135 - 141

1125 - meet Chuck Clawson. Surface water intake. Collect SW. OVERALL

AM. 1153 photo 2-14 by MT pH 6-7 DW01SW
direction: East 64 gpm
domestic H2O supply after confluence of Linton Cr and Metaline domestic drinking H2O supply - 1515
1 Hr poly - TAL metals

1155 photo2-15 by LD
direction: southwest
Close up view of sample collection of confluence

1200 photo2-16 by MT 48gpm pH 6-7 DW02SW samples 1150
direction: North 1200
description: upgradient of Metaline domestic H2O supply + confluence w/ Linton Creek - 1705

- 1740

1205 photo2-17, 18 by LD
direction: southwest
close up view of upgradient Metaline water supply spring/intake - 1900 - 2030 to 12

-1230- lunch

-1300 - LD, MT and Weston traveling along Linton Creek to collect a background SW, SD.

SSO 6/28/01

01-02-0055 Upper Columbia River 0329 6/28/01

WASH - 1350 - [illegible]

- 1400 - Laura Gaddis [illegible] UC and requested UC to contact Chris Hall [illegible] to let him know how many more samples will be shipped.

Chris Hall 206-553-0521
Bruce Woods 206-553-1193
Caroline Mock 703-264-9323

Laura stated if samples are shipped on Monday, the car number and laboratories will remain the same.

OVERALL - UC traveled with MT and Weston to Flume Creek (2SW, 2SD), Linton Creek (1SD), 2SW at metaline domestic drinking water intake, above and below the confluence with Linton Creek.

- 1515 - Boat team back at motel. UC will give 2SW samples to the boat team. Weston preserves the SW samples. Weston documented the samples they collected and GPS'd the locations. Weston will check in later this evening if further samples are required to be collected by their team or MT.

Samples
1150 D001SW confluence in Metaline water supply
1200 D002SW upgradient on Metaline water supply

- 1705 - TC and DW arrive at motel. Team preparing samples for shipment.

- 1710 - MW + NA arrive at Crew motel. Team collected 5 SS background samples. TC and DW finished up the list of sites to visit.

- 1900 - Dinner

- 2030 - Back at motel

WG 12 DW 12 DW 12 CC 12 [illegible] 12 MW 12

ONERPM - All teams finished work work TK was requested to do dirt decon to see where the Pond Creek River samples were collected. TK and DC finished river visits. Teams will prepare all samples for shipment tomorrow. Teams will unpack vehicles and re-stage Budget truck. All teams will leave for Seattle Saturday morning. NA will leave Friday.

SD 01/25/07

GEGA35 27

01-02-0028 Upper Columbia River 0331 6/29/01

Site Name: UCR Location: Northeastern WA

Date: 6/29/01 Job No: _____ SSID No: _____

Proposed Work: demob, ship samples, recon
Pend Oreille river samples collected

Weather: Sunny - 60s

Team & Duties: CG + MT - heading to Northport smelter
A Jensen, LO, TK, DW - on boat
MW + RN packing samples

Instrument Calibration: —

Other Parties on site: _____

Safety Meeting: Time: 0800 By: RN

Content: careful packing and lifting equipment

Non-E & E Attendees: TK, MT, NA

Time (24-hr clock):	Left/Start	Arrive/End
Left Hotel	0745	
On-site		
Lunch		
Returned to Hotel		

All activities charged to a job while in the field (e.g. off-site activity) must be recorded in log book.

0725- LO talked with MT and TK about Northport Smelter (NS)
MT will take CG to (NS) to potentially collect slag samples on the beach
0820- Team back at motel preparing for demob.
NA gave TK permission to sign the C-O-Cs so that he can leave and head back to Seattle
CG gave TK permission to sign for him so that he can go to the Northport Smelter with MT.
JED 6/29/01

6/29/01 Upper Columbia River 01-02-0028 0332

01-02-0028

6/29/01- 1000- Boat team (A Jensen, DW) preparing boat for recon on Pend Oreille River.

- 1035- Teams still preparing samples to be shipped today. So far 5 coolers.
- 1205- LD called Chris Hall 206-553-0521 and told him what samples are being shipped to CLP labs for Saturday Delivery.
- 1235- LD called Katy Miller and left a message with hours
- 1330- A Jensen, CN, DW, TL, LD, MW travel to Boundary Dam to review sample locations.
- 1700- Team arrives back at motel
- 1800- Dinner

Team reviews samples that were shipped and finalize demob scheduled for tomorrow.

LD-12, DW-12, MW-12, NN-12, CG-12, A Jensen 12

DSD 6/29/01

All team
time. R
Tuesday

Site Name: UCP Location: Cosmopolis WA

Date: 1/30/01 Job No: _____ SSID No: _____

Proposed Work: clean back to Seattle

Weather: 40-70s

Team & Duties: head home

Instrument Calibration: —

Other Parties on site: —

Safety Meeting: Time: 0800 By: RN

Content: drive safely

Non-E & E Attendees: DK, MT

Time (24-hr clock):	Left/Start	Arrive/End
Left Hotel		
On-site		
Lunch		
Returned to Hotel		

All activities charged to a job while in the field (e.g. off-site activity) must be recorded in log book.

All teams heading back to Seattle 8hrs for everyone travel time. RN, ASenson and [illegible] need budget check on Tuesday

7/5/01 - Monica Tonel called LD and left a message stating she [illegible] the [illegible] Montana [illegible]

0334

7/9/01 - Laura Castillo [illegible] and stated Sentinel assigned a QC sample for the last SDG sent on 7/5/01 0653

- 0857 - LD called Laura Castillo 553-4333 and left a message stating a QC sample assignment was not necessary but she will note the sample MJOFK6

- 1424 - Joanne LaBaw called LD and asked for the reference in the EIS for the Pend Oreille Mine regarding EPA allowable levels for radioactive waste rock for surface-use materials.

- 1435 - LD called Joanne LaBaw 553-2594 and told her she was sending an email with the references listed.

- 1441 - LD sent email to Joanne LaBaw.

7/10/01 - 0830 - Monica Tonel called LD asking for a number of mines and mills not located or having no pathways. LD stated 3/4 had no pathways and/or no evidence of a mine/mill present.

- 1142 - LD called Monica Tonel and left a message regarding photos and descriptions from Weston.

- 1206 - LD called Tara Karamas regarding the EPA # on the cameras used during the field event.

- 1241 - Monica Tonel called LD and stated the Pend Oreille Mine and river samples will be a stand alone EST report. Monica also stated Weston's photos are in, but the descriptions are not ready.

~~SSD 7/10/07~~

7/10/01 - 1251 - Monica Tonel called LD and stated there will be two reports based on drainage areas. One report for all mines/mills that flow into the Columbia and one report for all mines/mills that flow into the Pend Oreille River. MT will be the TM for the Columbia report and Joanne LaBau will be the TM for the Pend Oreille.

-1301- Monica called LD and stated she will be the TM for both reports now.

7/11/01 - 1559 - Monica Tonel called LD and spoke about deciding draft deliverable dates and completion date for all EST's into 2002.

7/13/01 - 0903 - LD called Monica Tonel and left a message regarding developing a budget memo for Pend Oreille River EST and questions about WESTON data and photologs. LD asked to have a meeting with Monica.

7/16/01 - 0930 - Monica Tonel called LD and scheduled a meeting at the office for 7/17/01 at 1030

7/17/01 - 1030 - LD met with Monica Tonel to discuss Phase II and the budget, the budget for Pend Oreille River EST, deliverables, field event schedule, coordination with WESTON and researching new mines and mills. Refer to email sent to Andy Hattaway by LD 7/17/01 summarizing meeting.

7/18/01 - 0820 - Nancy (Bozeman)? with Ecology called LD 360-407-6040 regarding reviewing site files for Colville Post + Pole, Star, and AHU alloys.

~~JBD 7/18/01~~

7/20/01 - 0857 - Nancy Beltman called LD 360-407-6040 regarding reviewing Ecology site files

7/23/01 - 0925 - Monica Tinel called LD and left message stating she had a conference call with the Colville Tribe and they have 3 more sites to add to Phase II mine lists. Monica also wants to know if Electric Point was visited.

7/24/01 - 0759 - Nancy Beltman called LD.

- 0908 - LD called Nancy Beltman to schedule a visit 7/25/01

- 0916 - Nancy Beltman called LD and gave directions to Ecology in Olympia.

7/25/01 - 0730 - LD leaves Seattle heading towards Dept. of Ecology in Olympia to meet with Nancy Bolton to review site files of NW alloys.

1700 - LD leaves Ecology. LD also met Kathy Vermillion.

late Entry 1549 - Johnnie Harris 509-456-2751 called LD to set up a meeting to review site files of NW alloys, LBar, and Colville Post + Pole.

7/26/01 - 756 - MT called LD and left a message stating the meeting was still on for today at 1300.

- 0930 - LD called Johnnie Harris with Ecology 509-456-2751 and left a message asking if 8/1/01 is a good day to meet in Spokane. LD booked reservations.

- 1300 - LD met with RN, Pete Witt (PW), Craig Mitchell and Susan FitzGerald with WESTON, and MT and Matt Gubitosa with EPA. Weston will submit a trip report to the EPA and will cc E+E with a hard and electronic copy. Weston will supply E+E the following

SSB 7/26/01

[illegible] - [illegible] - [illegible]
- presentation of data
  - no comparisons to background
- figures
  - hardcopy
  - electronic
- assign station labels to match E&E
- add biases
- GPS data in Appendix
- analytical database
- XRF results in Appendix
- sample coding
- photolog in Appendix
- trip report

Matt Gubitosa made a point to both contractors requesting analytical databases. MT will inform Mark Adler to write up a memo with all requirements specified by Matt Gubitosa. LD will submit all reports 7 weeks after the final data package validated by EPA has been received. MT wise talk to Gina Grepo-Grove about adding biases to the data memorandums. MT tasked LD to take another person for investigating mine ownership and roon at Sheep Creek. LD will see if a boat will be required to collect sediment samples from the entrance into Canada and the exit from Canada on Sheep Creek.

7/31/01 - 1620 - LD leaves Seattle office heading towards Sea-Tac airport to catch 1830 flight to Spokane.

- 2000 - LD arrives in Spokane to get vehicle and check in to hotel. LD will meet with Johnnie Harris at Ecology tomorrow (8/1/01) at 0800.

~~LD 7/31/01~~

8/01/01- 0800- LD met Johnnie Harris at Ecology LD begins reviewing NW alloys, L-Bar, and Colville Post + Pole.

-1055 - MT called LD and asked LD to review Lebor Smelter (Northport Smelter) in addition to the previous 3 site files.

OVERVIEW- LD met with Guy Gregory and Tensita Bale with Ecology about current events at LBar and NW alloys. In addition, Guy Gregory spoke about Colville Post and Pole and made it clear about his feelings that EPA should take over the site due to lack of funding at Ecology. Guy Gregory stated that the site contains 2 dip tanks with Penta contamination concentrated around them. The site is located in a floodplain and there is shallow GW. Ecology installed 4 monitoring wells and have received sporadic hits of pentachlorofluorocarbons. There is a direct observation from sheen from the tank area to the Colville River via the surface water migration pathway. The site is located in the proximity of Bonaparte Mill off Williams Lake Road. There are leaking ASTs adjacent to the Colville River. LD feels there is an imminent and substantial threat and EPA ECRA should be notified. With regards to NW alloys, the business (plant) plans to close in approximately 2 months. NW alloys is continuing to work on the final remediation of L-Bar with Ecology. L-Bar maintained 7 different storage locations and NW alloys has been making progress to empty those buildings

8/7/01

[illegible] - [illegible] - [illegible] - which contain GA[illegible] which is extremely reactive to water. contaminants of concern include Na, NO_3, $MgCl_2$, KCl, CaCl, AlN, MgF. The site manager with Ecology is Tonia Bale, w/ Toxics Cleanup
509-458-6337

The proposed final date of the remediation plan is 2002. NW Alloys maintains the L-Bar property and will after final closure procedures. The threat is the discharge of contaminants to the Colville River. Ecology and NW Alloys are working together and continue to monitor GW and will many years after final closure. Ecology has recently closed one of the ditches on site which discharged waste water (storm water) into the Colville River. Monitoring samples have not exceeded regulatory levels upgradient, adjacent to, or downgradient of L-Bar. With regards to Northport Smelter (Teller Company Smelter) Guy Gregory stated the main concerns are drinking water and exposure from the slag on the public access beach. Historically, there is slag in the river and it is unknown who contributed or who is responsible. The slag bin is 8x10x10' located on site do not pose a threat because they have been vitrified and are in a solid state. Guy Gregory added his concerns of run-off control, run-on control, and pad permeability of the Colville Post + Pole site. Guy Gregory also noted there is a strong odor and surface soil staining at Colville Post + Pole.

[illegible] 8/4/01

8/2/01 - LC and RW spend the day at the Stevens County Courthouse in the Assessor's Office, the Stevens County Title Co., and the library researching potential ~~[illegible]~~ mine sites given to E&E by EPA Monica Tonel (MT) 10hrs

8/3/01 - LD and RW scope out mine sites for Phase 2 and determine that a boat is not necessary to sample Sheep Creek 8hrs

- Napoleon
- St. Crispen
- Old Dominion
- Daisy
- NW Alloys
- Chloride Queen
- First Thought
- Gold Reef
- LBar/NW Magnesite

8/4/01 - LD and RW scope out LBar/NW Magnesite and conduct a conference call with Ozzie Williamson

Remediation + Public Affairs Manager
NW alloys
P.O. Box 115
Addy, WA 99101-0115
509-935-3369
fax 509-935-3211
LBar 509-935-4330
509-935-4890
cell 509-675-2405

Two brothers own the old NW Magnesite pile (Brauner) Dick + Bill Brauner. Ozzie stated that NW alloys is currently working on 2 reports on final work at L-Bar. The waste covered by the black tarp is being removed to a landfill via rail cars.

~~SSD 8/4/01~~

8/6/01 - LD spoke to Ozzie Williamson about conducting a site visit the week of 8/27 in Idaho and about contacting with Chelan. LD will call Ozzie next week to work out a schedule. LD will also send a fact sheet and access other page data are finalized and LD has spoken to MT.

8/6/01 - 1330 - LD called MT and scheduled a meeting for 8/7/01 to discuss the recon trip budgets for Pend Oreille River and Upper Columbia River. LD asked MT to call Ozzie Williamson to request names, addresses, and phone numbers of all property owners associated with NW Magnesite and L-Bar. MT will meet LD at 1015 8/7/01 in E&E Seattle office.

1359 - MT called LD and stated she talked to Kevin Melton regarding ownership phone numbers. Kevin is ready to help. LD stated the info is in the EPA mail run for today.

8/7/01 - MT arrives at E&E Seattle office at 1015 for meeting. A trip report will be prepared for L-Bar due to the small remediation project underway with owner NW alloys and perhaps LD will conduct a site visit to document current proceedings. LD will include in the trip report to MT past and current operations and documentation supplied from NW Alloys and Chelan. LD will visit and potentially collect samples at NW Magnesite. LD will visit and potentially collect L-Bar samples. LD needs to read Bonanza Mill PA to determine the sources and targets. LD requested from MT the following info from Washington Department of Ecology: data loggers, data tablet, field sheets, sample photo, SOPs for sample collection, sample description. MT will talk to Mark Adler LD and MT spoke about Colville Post + Pole and whether the site should be site assessment or removal. MT will present the Chelan site info to the RCRA

SSD 8/7/01

8/7/01 - 1015 meeting cont'd - department first before proceeding to a permitted TA. MT requested that sediment samples be collected at the point where the Little River flows into Canada and at the point where the Little River flows out of Canada into the US. MT and LD also discussed ways of cutting back the proposed Pend Oreille River ESI budget. MT called Patti Stone to ask about information on Browns Lake Quarry and Myers Dam. MT left a message. MT took Colville Post + Pole site files along with Lehigh Company Smelter (Northport Smelter) site files. MT will show Lehigh to TC to see if EPA can use Ecology's soil samples. MT and LD reviewed the schedule for Phase 2 and estimate a field event with 3 E+E and 2 EPA personnel for approximately 14 days. LD will revise the Pend Oreille River ESI budget and send it to MT this week. LD will work on Phase 2 addendum and Columbia River ESI budget this week.

1105 - LD called MT and asked what analyses were performed on the samples collected by Weston at Cleveland. Left message.

1337 - Patti Stone called LD and stated she is not familiar with Browns Lake Quarry, but that Dr. Hurst has been to the site. LD asked for Dr. Hurst to contact her. Patti stated she mailed a report regarding Myers Dam to MT. Myers Dam is located below Bonanza Mills and Colville Post + Pole. The tribe is concerned about the area due to all the upstream sediment deposited at the dam. Patti stated samples could be collected from the entry road. A boat is not needed. LD asked about access to sediments on the Little River near the Border and she stated the area is dangerous.

SLD 8/7/01

01-02-0028 Upper Columbia River

8/7/01-1337-CONTD- Patti stated the area is known as Cascade Gorge. Patti believes there is a trail to walk on that will take a person to the Little River edge. Patti re iterated the tribe would prefer surface soil samples to be collected at Lehigh Company smelter, even though Ecology collected soil samples. Patti stated she will speak to MT again over the issue. Patti will check on any info she has on the area of interest and will have Don Hurst call LD.

-1352- end call

-1351- LD called Monica to let her know Patti called and to let him know the Pend Oreille River EST budget will be going up in the EPA mail run today.

-1651- LD emailed Trent Lang with Vragen Brothers Lumber regarding ownership of Anderson mine.

8/8/01-0740- LD called Martha Kernohan with BCC 208-384-7589 and left a message regarding ownership to Phase 2 mills and mines. Martha Kernohan's voice message states she will be out of the office until 9/17/01 but is checking her messages.

-0750- LD faxed list of mines to Martha Kernohan fax 208-384-3516. LD had left a message with Martha stating LD will be faxing over the list and to call LD back with another point of contact.

8/9/01-0908- MT called LD. Kevin McDermott has all potential mine and mill owners names and will be contacting LD directly with any new developments. MT talked with Patti Stone regarding sampling on the Little River. Patti stated the sampling can be conducted without a boat and that additional visits and potential sampling can be

8/9/01 SJD

Upper Columbia River 01-02-0028

8/9/01 - 0908 - CONTD - performed at Browns Quarry and Myers Dam the same day Patti will fax some info on Myers Dam to LD. LD will send up the Columbia River ESI budget and addendum to MT next week.

-0948- Patti Stone called LD and spoke about scheduling the field event so Patti can accompany the field team to help in accessing sample locations at Kettle River and Myers Dam. Don Hurst is scheduled to call LD today to supply information regarding Browns Quarry and Colville Smelter.

-1010- MT called LD regarding manual sent to Region 9. Wrong manual. LD asked MT to call Region 9 and get the manufacturer so that LD can call and order the appropriate manual.

-1016- MT called LD and the contact at Region 9 was gone. MT requested a contact number from LD for GPS.

-1017 - LD called MT with GPS # 1-800-827-8000

-1047- MT called LD and stated she got in contact with the Bellevue office and it will take them a couple days to acquire TDCI - Asset Surveyor. MT asked LD to look for one in a spiral back approximately 1 inch thick.

-1056- LD called MT and stated she found the manual but that it was not bound. MT will call back the Bellevue office to see if they can get a copy earlier.

1059- Patti Stone called LD and stated she was having problems sending the photos of Myers Dam.

1109- LD received 1 picture via email from Patti Stone and emailed her back to let her know it was received.

8/9/01 SSD

01-02-0028
8/9/01 - 1125 -
- 1127 -
1421 ~~1323~~ 10 Dr
Le
ar
INSERT - 13
- 132
Back to 1421 -

0345

01-02-0028 Upper Columbia River

8/9/01 - 1125 - MT called LO and asked for phone numbers for Bonanza Mill owners - Duane and Darrell Webley.

- 1127 - LO called MT and gave her the requested phone numbers.

Duane 509-634-5401

Darrel 509-634-~~5~~ 6429

1421 ~~1323~~ LO Don Hurst called LO and gave information regarding Lehigh Smelter, Kettle River, Myers Dam, Brown's Quarry, and Colville Smelter.

INSERT - 1323 MT called LO regarding Cleveland Mine + Mill and data, etc Weston has collected MT, MA, and DL stated LO can call Susan Fitzgerald directly.

- 1328 - LO called Susan Fitzgerald 521-7654 and left a message to call her back about receiving data and any other information on Cleveland Mine + Mill

Back to 1421 - Don Hurst stated a pic or some sort of hand tool would be sufficient to collect SS sample beneath the slag bricks at Lehigh Smelter. Don mentioned a trench that was developed (partially on the owner) to divert runoff. Don + Faith will return Kettle River and try to identify routes to sample collection areas. Faith and Don are offering bringing a canoe or kyak to collect a SD at Myers Dam. Don stated it is a small Dam, however, the area is being relicensed. Don Hurst does not have much information regarding Brown's Quarry. It is unclear if any treatment took place before shipping ore via train to NW Magnesite. Don Hurst has no information regarding Colville Smelter except that he does not believe the smelter ever operated. He believes that a local man built the smelter then filed for bankruptcy.

SSD 8/9/01

Upper Columbia River 01-02-0028

8/9/01- 1434- LD called MT and left a message asking who put Colville Smelter on the recon list

LD received fax from Patti Stone.

-1502- MT called LD and stated she is reviewing both budget memos

-1547- LD called TK and left a message regarding Cleveland Mine adit and stream characterization

-1553- MT called LD and asked LD to call Denise with GPS office in Bellevue at

1-800-523-6408 to pay for replacement manual for Rigger 9 GPS unit.

-1603- Jake Jakabovsky called LD and stated he re-did the Cleveland figure LD sent earlier in the morning and will mail it to LD

-1608- MT called LD and stated Mark Adair thinks the hours estimated for report writing are too high. LD averaged 16 hrs to write each site (24 sites) for 384 hrs. MT and LD re-figured 5 sites x 16 hrs = 80 hrs 19 sites x 10 hrs = 190 hrs. LD cut 114 hrs from the budget and $5,700. LD sent up the revised budget memo via email.

8/16/01- 1300- Martha Vernohan called LD and stated she received the fax sent to LD and will get back to LD once she gets news from the Little Falls office. 208-384-9529

-1307- MT called LD and left a message stating Ozzie Wilkinson will fax MT a list of contact names and numbers to owners surrounding LBar. MT also stated to remove Colville Smelter from the mine list. MT also stated she called Darrell Webley with Bonanza Mill to request access on 8/15/01. Darrell Webley stated he needed to talk to his brother.

~~8/22/01~~

01-02-0028

8/16/01- 1307- C

8/20/01- 542-

- 0755

- 1641-

8/21/01- 0911

8/22/01- 092

-09:

-100

01-02-0328 Upper Columbia River

8/16/01 - 1307 CONTD - MT ~~requested~~ talked to Ashley at headquarters regarding using previous data at Northport Smelter. MT also gave mine ownership info to Keven McDermott

8/20/01 - 542 - MW called LD regarding discrepancies with the data memo and Form 1s from Gina Grepo-Grove.

- 0755 - Trent Lang called LD and stated Vaagen Brothers owns land surrounding Calhoun Mine, but no land on the mine property itself. 509-684-5071

- 1641 - Don Hurst called LD and left a message stating he checked out the area of the Little River flowing into the US from Canada for sample locations. Don stated he is faxing over maps of the area with suggested sample locations.

8/21/01 - 0911 - MT called LD and left a message stating she is sending over a package of data from Gina Grepo-Grove. MT stated she and Mark Ader have decided to cut the cursory review of the data memos by E+E to save costs. MT was directed to lower the LOE and dollars on the Pend Oreille budget proposed by E+E.

8/22/01 - 0922 - LD called MT and asked about any new info from Keven McDermott.

- 0935 - LD called MT and spoke about the discrepancies found in the EPA data memos and the implications if a cursory review by EPA was cut out. MT stated we will talk further on the issue at the meeting held today at 1400 at E+E's Seattle office.

- 1001 - Keven McDermott called LD and stated she will begin researching contact numbers and will email LD info for each mine as she obtains it.

~~ASD 8/22/01~~

Upper Columbia River 01-02-0028

8/22/01- 0917- Martha Kernohan with Boise Cascade called LD and left a message stating she has heard that E&E has been contacting other people besides her to gain access to property. Martha went on to state she is frustrated and requested all info regarding Boise Cascade to be Fed Ex'd immediately. Martha stated LD has gone beyond ethics.

-1211- LD called Martha Kernohan 208-384-7529 and left a message stating LD is the only point of contact and that she has no idea who else is calling since Martha did not give any names. LD stated to call MT with EPA from now on as the point of contact. LD asked Martha to call her back to clear up any misunderstandings. LD made a point to thank Martha for taking time out of her schedule to work on access.

-1215- LD called MT and left a message summarizing Martha's phone call and LD's response. LD informed MT that she will be the new point of contact.

8/23/01- 0733- LD called MT regarding Gold Leaf Mine justification to remove the Mine from Phase 2. LD will send up the 3D drainage maps to MT via mail run.

-0836- LD called Susan FitzGerald with WESTON 521-7654 and asked for Kevin's # 521-7659.

-0837- LD called Kevin at WESTON 521-7659 and left a message regarding the order samples were collected at Cleveland Mine. The sample collection sheets show that samples were collected furthest upgradient and then down-gradient. The collection sheet also shows that 3D was collected before the co-located SW.

~~8/23/01~~

01-02-0028

8/23/01- 0902

-0905

-11

-1118

-15

-16

8/24/01- 080

01-02-0028 Upper Columbia River

8/23/01- 0902- Kevin w/ WESTON called LD and verified that the samples (3SD, 1SW) were collected incorrectly at Cleveland Mine. Kevin also stated that MT and TK knew and were OK with the situation. TOC samples were sent to NorthCreek Analytical, Bothell, WA.

-0905- LD called TK and asked if she knew WESTON collected the samples incorrectly. TK did not know and stated to wait until the data arrives, but most likely the data is out except for the most upgradient SD sample since that was collected first.

-1100- TK called LD and stated MT was not present at the time of sample collection and was not aware that the samples were collected incorrectly. MT will call WESTON and request a sample alteration form since there was a deviation from their SDAP.

-1118- MT called LD and stated she will task to WESTON

-1535- MT called LD and stated she sent a fax with adjusted hours for the Pend Oreille River budget. MT cut all hours, most from program management, WESTON interface, and HRS score review and edit time.

-1605- LD called MT and asked if WESTON has Cleveland Mine data. MT will call WESTON and get back to me.

8/24/01- 0807- LD called MT and asked if there will be a Phase 2 fact sheet. There will not be a second fact sheet. LD will continue to use original fact sheet.

~~SSD 8/24/01~~

01-02-0028

8/24/01 - 0747 LD received email from MT requesting to cut the Pend Oreille River budget again. MT requested cutting report writing of 19 sites which were not sampled from 95hrs to 48hrs. This averages out to 10 sites x 3hrs/site = 30hrs 9 sites x 2hrs/site = 18hrs.

8/24/01 - 093

- 100

-0810- LD called MT and stated she will get a sentence for each site returning to the photologs due to the insufficient amount of time allotted to write about the 19 sites not sampled. LD also made a point to stress the additional time and dollars required to separate all references into two files since only 1 copy of originals exists. The site project began as one and has now been split as directed by the EPA into the Upper Columbia River ESI and the Pend Oreille River ESI, even though the TDD for the Pend Oreille River ESI has not been issued. LD is on the 5th budget memo for the Pend Oreille River ESI and has not been able to begin obtaining access to Phase 2 mines and mills.

- 13

8/27/01 - 08

- 081

-0820- MT called LD and went over the email and stated to maintain the original hours for the 19 sites (95hrs) and to cut out photolog preparation of 120hrs since that time has already been spent and charged to the Upper Columbia River TDD. LD will resubmit the budget.

-081

-0825- LD called MT and let her know that the budget was cut to 318hrs and approximately $44,000 ($44,254) and that an email with the updated budget will be sent today.

-0817

8/24/01

01-02-0028 upper Columbia River

8/24/01-0932- MT called LD and OK'd the Pend Oreille River budget memo and asked for a hard copy of the budget signed by LD. LD will mail the budget memo today.

-1004- LD called Bill Campbell with Western Continental 509-922-3035 fax 509-927-5051 with regards to First Thought Mine. LD left a message asking Bill to call LD back and that LD will fax a fact sheet today.

- 1303 - Martha Kernohan called LD and left a message stating she will collect the names of people at E+E who have been calling BCC.

8/27/01-0804- LD called Al Lang 509-685-0846 to inquire if he owned property on or around Calhoun Mine. Mr. Lang stated he owns property upland from the mine and thinks the mine went back to the county Mr Lang stated to call Greg Lipsker, a lawyer who is involved with property owners in the area. Mr. Lipsker works for Markland + Witherspoon in Spokane. LD emailed Kevin McDermott for Mr. Lipsker's phone number 509-455-9077

-0813- LD called Michael Lynch 360-357-3917 to ask if he owned Napoleon Mine. LD spoke with a woman who stated Mr. Lynch does not own the mine.

-0815 - LD called another Michael Lynch at 360-357-4882 and spoke to the wife of Michael Lynch's brother. Michael Lynch does not live at this address. The woman stated that the Michael Lynch she knows does not own a mine named Napoleon.

-0817- LD called E. L. Minnier 509-684-9029 and asked if he or anyone in his family owned Daisy Mine, specifically Willene E. Minnier. Mr. Minnier

Upper Columbia River 01-02-0028

8/27/01-0817-CONTD - stated that Willene Minnie has remarried and he will contact her and ask if she owns Daisy Mine. LD left her name and phone number.

-0822- LD called Janet Dickey Emmanuel and asked if she owned United Copper Mine. Mrs Emmanuel stated she owns the entrance and a little bit more land into the mine. She does not recall any other property owners. Mrs. Emmanuel also stated to call lawyer Phillip Skok who knows all owners with regards to United Copper Mine. LD emailed Monica Tonel to contact Mr. Skok. LD will send an access letter and fact sheet today.

-1036- LD called Bill Campbell again with regards to First Thought Mine. LD will send the access letter today. 509-922-3035

8/28/01-0848- MT called LD and left a message asking where samples were collected that were analyzed for SVOCs. A data packet is coming from Gerald Dodo.

-0928- LD called MT and left a message stating that stained soil identified at the Van Stone Mine.

-0934- MT called LD and stated she received the addendum to the SOAP and delivered it to Laura Castrilli and Gina Grepo Grove to review.

-0948- MT called LD and stated no cursory review by E&E is required for SVOC data reviewed by Gerald Dodo. MT will call Weston and check to see if Cleveland Mine + Mills data has arrived in house

~~LD 8/28/01~~

draft

APPENDIX C

GLOBAL POSITIONING SYSTEM COORDINATES

Table C-1

GLOBAL POSITIONING SYSTEM DATA
LOWER PEND OREILLE RIVER EXPANDED SITE INSPECTION
PEND OREILLE COUNTY, WASHINGTON

sample number	station id in field info	station id on map	pdop	date	time	long	lat	Longitude Degrees	Longitude Minutes	Longitude Seconds	Lat Degrees	Lat Minutes	Lat Seconds	horzprec
01264268	BBPP01SW	BBPP01SW/SD	6.9	6/26/2001	12:55:43P	-117.406	48.847	-117	24	21.6	48	50	49.2	1.123
01264270	BBPP02SW	BBPP02SW/SD	7.7	6/26/2001	12:57:55P	-117.407	48.847	-117	24	25.2	48	50	49.2	0.9
01264358	BK02SS	BK02SS	4.6	6/27/2001	10:43:07A	-117.357	48.866	-117	21	25.2	48	51	57.6	0.855
01264274	BK03SS	BK03SS	7	6/27/2001	01:21:42P	-117.416	48.86	-117	24	57.6	48	51	36	0.786
01264416	GMPOPP04SD	GMPOPP04SW/SD	3.1	6/27/2001	12:17:30P	-117.367	48.87	-117	22	1.2	48	52	12	0.571
01264417	GMPOPP05SD	GMPOPP05SW/SD	5.3	6/27/2001	12:37:54P	-117.367	48.87	-117	22	1.2	48	52	12	0.722
01264271	ORSP01SW	ORSP01SW/SD	5.4	6/27/2001	12:30:25P	-117.414	48.86	-117	24	50.4	48	51	36	1.023
01264273	ORSP02SD	ORSP02SD	4.4	6/27/2001	01:59:19P	-117.413	48.86	-117	24	46.8	48	51	36	0.62
01264263	POCK01SD	POCK01SW/SD	4.8	6/25/2001	04:25:58P	-117.35	48.893	-117	21	0	48	53	34.8	0.576
01264401	POPP01SW	POPP01SW	5.2	6/26/2001	01:53:26P	-117.359	48.886	-117	21	32.4	48	53	9.6	0.775
01264411	POPP02SD	POPP02SW/SD	4.5	6/26/2001	01:38:27P	-117.352	48.892	-117	21	7.2	48	53	31.2	0.605
01264351	POSP01SD	POSP01SD	3.2	6/25/2001	09:37:11A	-117.352	48.888	-117	21	7.2	48	53	16.8	0.568
01264261	POSP01SD	POSP01SD	3.2	6/25/2001	09:37:11A	-117.352	48.888	-117	21	7.2	48	53	16.8	0.568
01264352	POSP02SD	POSP02SD	5.3	6/25/2001	10:00:31A	-117.35	48.889	-117	21	0	48	53	20.4	0.869
01264262	POSP02SD	POSP02SD	5.3	6/25/2001	10:00:31A	-117.35	48.889	-117	21	0	48	53	20.4	0.869
01264252	POTP01SS	POTP01SS	4.1	6/25/2001	09:43:56A	-117.351	48.888	-117	21	3.6	48	53	16.8	0.729
01264253	POTP02SS	POTP02SS	5.4	6/25/2001	10:02:05A	-117.35	48.889	-117	21	0	48	53	20.4	0.895
01264254	POTP03SS	POTP03SS	5	6/25/2001	10:44:46A	-117.348	48.891	-117	20	52.8	48	53	27.6	0.39
01264255	POTP04SS	POTP04SS	3.1	6/25/2001	11:40:33A	-117.35	48.882	-117	21	0	48	52	55.2	0.356
01264256	POTP05SS	POTP05SS	2.2	6/25/2001	11:48:38A	-117.351	48.883	-117	21	3.6	48	52	58.8	0.341
01264258	POTP07SS	POTP07SS	4.2	6/25/2001	02:09:11P	-117.349	48.888	-117	20	56.4	48	53	16.8	0.406
01264259	POTP08SS	POTP08SS	3.1	6/25/2001	02:10:55P	-117.349	48.887	-117	20	56.4	48	53	13.2	0.328
01264260	POTP09SS	POTP09SS	5.4	6/25/2001	10:01:41A	-117.35	48.889	-117	21	0	48	53	20.4	0.906
01264354	POWP02SS	POWP02SS	3	6/26/2001	10:39:15A	-117.362	48.882	-117	21	43.2	48	52	55.2	0.307
01264426	PRBK01SD	PRBK01SD	4.8	6/28/2001	01:54:02P	-117.393	48.829	-117	23	34.8	48	49	44.4	0.475
01264427	PRBK02SD	PRBK02SD	3.7	6/28/2001	01:55:23P	-117.393	48.828	-117	23	34.8	48	49	40.8	0.594
01264428	PRBK03SD	PRBK03SD	3.9	6/28/2001	02:03:33P-	-117.393	48.828	-117	23	34.8	48	49	40.8	0.608
01264402	PRRS01SD	PRRS01SD	4.6	6/25/2001	11:00:33A	-117.344	48.986	-117	20	38.4	48	59	9.6	0.807
01264404	PRRS02SD	PRRS02SD	5.3	6/25/2001	12:25:02P	-117.33	48.957	-117	19	48	48	57	25.2	0.739
01264409	PRRS03SD	PRRS03SD	5.7	6/26/2001	11:50:51A	-117.35	48.895	-117	21	0	48	53	42	0.948
01264414	PRRS04SD	PRRS04SD	3.4	6/27/2001	11:41:18A	-117.369	48.878	-117	22	8.4	48	52	40.8	0.583
01264403	PRTB01SD	PRTB01SD	5.5	6/25/2001	11:57:59A	-117.333	48.963	-117	19	58.8	48	57	46.8	0.432
01264405	PRTB02SD	PRTB02SD	6.1	6/25/2001	01:52:20P	-117.342	48.926	-117	20	31.2	48	55	33.6	0.558
01264406	PRTB03SD	PRTB03SD	4.2	6/25/2001	02:22:12P	-117.341	48.924	-117	20	27.6	48	55	26.4	0.618
01264407	PRTB04SD	PRTB04SD	3.6	6/26/2001	10:03:02A	-117.331	48.96	-117	19	51.6	48	57	36	0.606
01264408	PRTB05SD	PRTB05SD	9.8	6/26/2001	10:54:37A	-117.329	48.924	-117	19	44.4	48	55	26.4	1.061
01264421	PRTB06SD	PRTB06SD	9	6/27/2001	05:11:22P	-117.369	48.963	-117	22	8.4	48	57	46.8	0.727

0354

Table C-1

GLOBAL POSITIONING SYSTEM DATA
LOWER PEND OREILLE RIVER EXPANDED SITE INSPECTION
PEND OREILLE COUNTY, WASHINGTON

sample number	station id in field info	station id on map	pdop	date	time	long	lat	Longitude Degrees	Longitude Minutes	Longitude Seconds	Lat Degrees	Lat Minutes	Lat Seconds	horzprec
01264422	PRTB07SD	PRTB07SD	3.6	6/27/2001	06:00:08P	-117.373	48.901	-117	22	22.8	48	54	3.6	0.549
01264424	PRTB08SD	PRTB08SD	3.6	6/28/2001	12:36:06P	-117.369	48.864	-117	22	8.4	48	51	50.4	0.656
01264425	PRTB09SD	PRTB09SD	3.1	6/28/2001	01:00:09P	-117.386	48.853	-117	23	9.6	48	51	10.8	0.534
01264265	TCBK01SW	TCBK01SW/SD	3.6	6/25/2001	03:56:46P	-117.348	48.897	-117	20	52.8	48	53	49.2	0.567

	station-old	station-new	pdop	date	time	long	lat	deg	min	sec	deg	min	sec	horzprec
	BELLA MAY	BELLA MAY	5.1	6/26/2001	01:34:14P	-117.406	48.847	-117	24	21.6	48	50	49.2	0.614
	BLUE BUCK	BLUE BUCKET	5.5	6/26/2001	12:06:23P	-117.407	48.847	-117	24	25.2	48	50	49.2	1.048
	DIAMOND R	DIAMOND	2.4	6/26/2001	11:27:12A	-117.42	48.854	-117	25	12	48	51	14.4	0.417
	FLUME CRE	FLUME CREEK	4.6	6/28/2001	02:42:01P	-117.376	48.876	-117	22	33.6	48	52	33.6	1.188
	JOPP01SD	JOPP01SD	3.1	6/28/2001	09:33:33A	-117.368	48.883	-117	22	4.8	48	52	58.8	0.572
	JOSP01	JOSP01SW	4.4	6/26/2001	03:09:52P	-117.368	48.883	-117	22	4.8	48	52	58.8	0.845
	LEHIGH MI	LEHIGH #1	6.7	6/26/2001	01:59:39P	-117.406	48.848	-117	24	21.6	48	50	52.8	0.81
	LEHIGH TW	LEHIGH #2	2.9	6/26/2001	10:41:55A	-117.417	48.852	-117	25	1.2	48	51	7.2	0.358
	METALINE	METALINE	4.1	6/26/2001	10:15:07A	-117.392	48.838	-117	23	31.2	48	50	16.8	0.616
	ORIOLE MI	ORIOLE MINE	5.1	6/26/2001	02:45:49P	-117.413	48.86	-117	24	46.8	48	51	36	1.09
	POBK01	POBK01SW/SD	3.2	6/27/2001	01:16:55P	-117.368	48.868	-117	22	4.8	48	52	4.8	0.506
	PSTP06SS	PSTP06SS	2.2	6/25/2001	11:52:42A	-117.351	48.881	-117	21	3.6	48	52	51.6	0.34
	WASHINGTO	WASHINGTON	5	6/28/2001	03:10:22P	-117.374	48.866	-117	22	26.4	48	51	57.6	1.341
	WEST CONT	WEST CONTACT	4.5	6/26/2001	10:46:33A	-117.417	48.852	-117	25	1.2	48	51	7.2	0.512
	YH01	YELLOW HEAD	3.8	6/26/2001	03:58:50P	-117.371	48.877	-117	22	15.6	48	52	37.2	0.558
	HOAGE MIN	HOAGE	3.4	6/28/2001	12:24:14P	-117.355	48.938	-117	21	18	48	56	16.8	0.608
	KING TUT	KING TUT	5.2	6/28/2001	09:47:33A	-117.188	48.989	-117	11	16.8	48	59	20.4	0.414
	LEAD HILL	LEAD HILL	2.9	6/28/2001	09:05:22A	-117.197	48.971	-117	11	49.2	48	58	15.6	0.462
	LEAD KING	LEAD KING	3.7	6/28/2001	12:48:48P	-117.36	48.95	-117	21	36	48	57	0	0.613
	LQ01	LEAD QUEEN	4.6	6/27/2001	04:37:12P	-117.331	48.979	-117	19	51.6	48	58	44.4	0.479
	LS01	LUCKY STRIKE	7.1	6/27/2001	01:19:47P	-117.332	48.93	-117	19	55.2	48	55	48	0.853
	RED TOP	RED TOP	4.8	6/28/2001	10:23:36A	-117.181	48.994	-117	10	51.6	48	59	38.4	0.674

0355

APPENDIX D

DATA QUALITY ASSURANCE REVIEW MEMORANDUMS AND ANALYTICAL DATA FORMS

draft

ENVIRONMENTAL SERVICES ASSISTANCE TEAM

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

DELIVERABLE NARRATIVE

DATE: August 6, 2001

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

THROUGH: Dave Dobb, Team Manager, ESAT Region 10 GMG for D.D

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

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: MJ0ES7

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1124
TDN: 1048
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 18 soil samples collected from the above referenced site has been completed. These samples were analyzed for total metals by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ0ES7	MJ0ET3	MJ0ET8	MJ0EW3
MJ0ES8	MJ0ET4	MJ0ET9	MJ0EW4
MJ0ES9	MJ0ET5	MJ0EW0	MJ0EW5
MJ0ET0	MJ0ET6	MJ0EW1	
MJ0ET1	MJ0ET7	MJ0EW2	

DATA QUALIFICATIONS

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

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

Holding Time - Acceptable

The suggested holding time for mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 6/21/01. The samples were analyzed for mercury within 15 days and all other metals within 19 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

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

Initial Calibration - Acceptable

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

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

None of the data were qualified on this basis.

Calibration Verification - Acceptable

The initial and continuing calibration verifications met the criteria for frequency of analysis and recovery criteria of 90-110% and 80-120% for mercury. The recoveries ranged from 92-109% for ICP-AES and from 82-93% for mercury. None of the data were qualified on this basis.

Detection Limits - Acceptable

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

Blanks

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

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

Analyte	Associated Samples
sodium	MJ0ET6, MJ0ET9, MJ0EW0, MJ0EW2
thallium	MJ0ES9, MJ0ET0, MJ0ET1, MJ0ET3, MJ0ET4, MJ0ET6, MJ0ET7, MJ0ET8, MJ0EW0, MJ0EW2, MJ0EW5

Zinc was detected above the CRDL in the preparation blank. None of the sample results were affected.

0359

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met. The recoveries ranged from 93-114%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis

Sample MJ0ET9 was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference with the exception of potassium. Results for potassium in all samples were qualified as estimated, "J". The "E" qualifiers applied by the laboratory were crossed-out by the reviewer.

Laboratory Control Sample - Acceptable

The frequency of analysis and the recovery criteria for the laboratory control sample was met. The recoveries ranged from 59-108%. None of the data were qualified on this basis.

Duplicate Sample Analysis - Acceptable

Sample MJ0ET9 was utilized for duplicate analysis. The duplicate results met the frequency of analysis and method control limit criteria (±20% RPD or ± CRDL) for all target analytes with the exception of copper. Copper did meet the suggested technical control limit criteria (±35% RPD or ± 2X CRDL) for soils. The "*" qualifiers applied by the laboratory were crossed-out by the reviewer. None of the data were qualified on this basis.

Matrix Spike Analysis

Sample MJ0ET9 was used for the spike analysis. The frequency of analysis and recovery criteria were met with the exception of antimony (68%), arsenic (171%), copper (243%), mercury (-61%) and selenium (64%) in the spike sample MJ0ET9S. Due to possible bias, the detected and non-detected antimony and selenium results in all samples were qualified as estimated, "J/UJ". Due to possible bias, the detected arsenic and copper results in all samples were qualified as estimated, "J". Due to possible bias, the detected mercury results in all samples were qualified as estimated, "J". Mercury was detected in all samples. The "N" qualifiers applied by the laboratory were crossed-out by the reviewer. The recoveries for lead and zinc could not be accurately determined because the concentrations native to the sample were greater than 4 times the amount of spike added to the sample. All of the other spike recoveries were acceptable and ranged from 94-119%.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 414. Fifteen (3.6%) were qualified as non-detected due to blank contamination. One hundred eight (26%) were qualified as estimated due to ICP serial dilution and spike analyses.

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

0360

DATA QUALIFIERS

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

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0FK6

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FK6

Matrix (soil/water): SOIL Lab Sample ID: 39295S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 94.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1570			P
7440-36-0	Antimony	2.5	B	~~N~~ ~~JL~~	P
7440-38-2	Arsenic	18.4			P
7440-39-3	Barium	47.1			P
7440-41-7	Beryllium	0.14	B		P
7440-43-9	Cadmium	4.0		~~*~~	P
7440-70-2	Calcium	262000		~~E~~ JL	P
7440-47-3	Chromium	3.9			P
7440-48-4	Cobalt	2.5	B		P
7440-50-8	Copper	21.2		~~E~~ JL	P
7439-89-6	Iron	4220			P
7439-92-1	Lead	3010		~~*~~ JK	P
7439-95-4	Magnesium	31000		~~*~~ JK	P
7439-96-5	Manganese	105			P
7439-97-6	Mercury	0.05	U		CV
7440-02-0	Nickel	73.9			P
7440-09-7	Potassium	985	B		P
7782-49-2	Selenium	3.1			P
7440-22-4	Silver	0.54	B		P
7440-23-5	Sodium	287	B		P
7440-28-0	Thallium	1.1	U		P
7440-62-2	Vanadium	43.8			P
7440-66-6	Zinc	890		~~*~~ ~~E~~	P
	Cyanide				NR

CP 8-8-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0FK7

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FK6

Matrix (soil/water): SOIL Lab Sample ID: 39296S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 97.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	750			P
7440-36-0	Antimony	1.3	B	~~N~~ JL	P
7440-38-2	Arsenic	21.8			P
7440-39-3	Barium	20.2	B		P
7440-41-7	Beryllium	0.05	B		P
7440-43-9	Cadmium	34.2		~~E~~	P
7440-70-2	Calcium	190000		~~E~~ JL	P
7440-47-3	Chromium	2.0	B		P
7440-48-4	Cobalt	1.1	B		P
7440-50-8	Copper	9.2		~~E~~ JL	P
7439-89-6	Iron	12400			P
7439-92-1	Lead	8100		~~E~~ JK	P
7439-95-4	Magnesium	68500		~~E~~ JK	P
7439-96-5	Manganese	194			P
7439-97-6	Mercury	0.16			CV
7440-02-0	Nickel	20.9			P
7440-09-7	Potassium	303	B		P
7782-49-2	Selenium	0.70	U		P
7440-22-4	Silver	0.93	B		P
7440-23-5	Sodium	364	B		P
7440-28-0	Thallium	1.1	~~B~~	U	P
7440-62-2	Vanadium	18.4			P
7440-66-6	Zinc	7420		~~E~~	P
	Cyanide				NR

OP 9-8-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

0363

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0FK8

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FK6

Matrix (soil/water): SOIL Lab Sample ID: 39297S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 96.5

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	848			P
7440-36-0	Antimony	2.5	B	~~N~~ JLM	P
7440-38-2	Arsenic	35.1			P
7440-39-3	Barium	29.5	B		P
7440-41-7	Beryllium	0.05	B		P
7440-43-9	Cadmium	44.1		~~E~~	P
7440-70-2	Calcium	195000		~~E~~ JL	P
7440-47-3	Chromium	2.8			P
7440-48-4	Cobalt	1.4	B		P
7440-50-8	Copper	10.8		~~E~~ JL	P
7439-89-6	Iron	8510			P
7439-92-1	Lead	6030		~~E~~ JK	P
7439-95-4	Magnesium	62400		~~E~~ JK	P
7439-96-5	Manganese	196			P
7439-97-6	Mercury	0.19			CV
7440-02-0	Nickel	33.6			P
7440-09-7	Potassium	505	B		P
7782-49-2	Selenium	1.7			P
7440-22-4	Silver	0.73	B		P
7440-23-5	Sodium	397	B		P
7440-28-0	Thallium	1.1	~~B~~	U	P
7440-62-2	Vanadium	36.0			P
7440-66-6	Zinc	9300		~~E~~	P
	Cyanide				NR

MP 8-8-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0FL1

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FK6

Matrix (soil/water): SOIL Lab Sample ID: 39299S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 79.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	13500			P
7440-36-0	Antimony	0.71	U	~~J~~UJK	P
7440-38-2	Arsenic	3.5			P
7440-39-3	Barium	296			P
7440-41-7	Beryllium	0.42	~~U~~B		P
7440-43-9	Cadmium	0.86	~~U~~B	~~J~~	P
7440-70-2	Calcium	19100		~~J~~ JL	P
7440-47-3	Chromium	22.6			P
7440-48-4	Cobalt	8.0	~~U~~B		P
7440-50-8	Copper	17.0		~~J~~ JL	P
7439-89-6	Iron	18100			P
7439-92-1	Lead	47.2		~~J~~ JK	P
7439-95-4	Magnesium	3870		~~J~~ JK	P
7439-96-5	Manganese	989			P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	18.9			P
7440-09-7	Potassium	2250			P
7782-49-2	Selenium	0.84	U		P
7440-22-4	Silver	0.68	~~U~~B		P
7440-23-5	Sodium	386	~~U~~B		P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	35.2			P
7440-66-6	Zinc	201		~~J~~	P
	Cyanide				NR

CP 8-8-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

ENVIRONMENTAL SERVICES ASSISTANCE TEAM

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

DELIVERABLE NARRATIVE

DATE: August 7, 2001

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

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

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

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: MJ0EN5

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1129
TDN: 1052
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 20 soil samples collected from the above referenced site has been completed. These samples were analyzed for total metals by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ0EN5	MJ0EP0	MJ0EP5	MJ0EQ0
MJ0EN6	MJ0EP1	MJ0EP6	MJ0EQ1
MJ0EN7	MJ0EP2	MJ0EP7	MJ0EQ2
MJ0EN8	MJ0EP3	MJ0EP8	MJ0EQ3
MJ0EN9	MJ0EP4	MJ0EP9	MJ0EQ4

DATA QUALIFICATIONS

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

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

Holding Time - Acceptable

The suggested holding time for mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 6/20/01. The samples were analyzed for mercury within 7 days and all other metals within 9 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

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

Initial Calibration - Acceptable

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

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

None of the data were qualified on this basis.

Calibration Verification - Acceptable

The initial and continuing calibration verifications met the criteria for frequency of analysis and recovery criteria of 90-110% and 80-120% for mercury. The recoveries ranged from 96-110% for ICP-AES and from 82-98% for mercury. None of the data were qualified on this basis.

Detection Limits - Acceptable

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

Blanks

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

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

Analyte	Associated Samples
barium	MJ0EN5, MJ0EQ1
chromium	MJ0EN5, MJ0EQ1, MJ0EQ3
nickel	MJ0EN5

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

Analyte	Associated Samples
thallium	All

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met. The recoveries ranged from 89-117%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis

Sample MJ0EP5 was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference with the exception of copper. Results for copper in all samples were qualified as estimated, "J". The "E" qualifiers applied by the laboratory were crossed-out by the reviewer.

Laboratory Control Sample - Acceptable

The frequency of analysis and the recovery criteria for the laboratory control sample was met. The recoveries ranged from 65-117%. None of the data were qualified on this basis.

Duplicate Sample Analysis - Acceptable

Sample MJ0EP5 was utilized for duplicate analysis. The duplicate results met the frequency of analysis and method control limit criteria for all target analytes. None of the data were qualified on this basis.

Matrix Spike Analysis

Sample MJ0EP5 was used for the spike analysis. The frequency of analysis and recovery criteria were met with the exception of antimony (46%) in the spike sample MJ0EP5S. Due to possible bias, the detected and non-detected antimony results in all samples were qualified as estimated, "J/UJ". The "N" qualifiers applied by the laboratory were crossed-out by the reviewer. The recoveries for lead and zinc could not be accurately determined because the concentrations native to the sample were greater than 4 times the amount of spike added to the sample. All of the other spike recoveries were acceptable and ranged from 93-120%.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 460. Six (1.3%) were qualified as non-detected due to blank contamination. Sixty (17%) were qualified as estimated due to negative blanks, ICP serial dilution and spike analyses.

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

DATA QUALIFIERS

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

U.S. EPA - CLP
1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F10

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EQ5

Matrix (soil/water): WATER Lab Sample ID: 39143S

Level (low/med): LOW Date Received: 06/29/01

% 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	168	U		P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	4.0	U		P
7440-39-3	Barium	27.1	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	68300			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	1.1	U		P
7440-50-8	Copper	0.70	U		P
7439-89-6	Iron	54.6	U		P
7439-92-1	Lead	1.5	U		P
7439-95-4	Magnesium	11900			P
7439-96-5	Manganese	1.5	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.5	U		P
7440-09-7	Potassium	1410	B		P
7782-49-2	Selenium	3.4	U	NUJK	P
7440-22-4	Silver	0.80	U		P
7440-23-5	Sodium	2300	B		P
7440-28-0	Thallium	3.9	U		P
7440-62-2	Vanadium	0.90	U		P
7440-66-6	Zinc	2.5	B	NUJK	P
	Cyanide				NR

PR 8-7-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP
1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F11

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EQ5

Matrix (soil/water): WATER Lab Sample ID: 39144S

Level (low/med): LOW Date Received: 06/29/01

% 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	168	U		P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	4.0	U		P
7440-39-3	Barium	69.5	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.36	B		P
7440-70-2	Calcium	130000			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	1.1	U		P
7440-50-8	Copper	0.70	U		P
7439-89-6	Iron	54.6	U		P
7439-92-1	Lead	1.5	~~B~~ U		P
7439-95-4	Magnesium	31200			P
7439-96-5	Manganese	1.2	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	7.9	B		P
7440-09-7	Potassium	2910	B		P
7782-49-2	Selenium	3.4	U	~~N~~ UJK	P
7440-22-4	Silver	0.80	U		P
7440-23-5	Sodium	3330	B		P
7440-28-0	Thallium	3.9	U		P
7440-62-2	Vanadium	0.90	U		P
7440-66-6	Zinc	63.2		~~N~~ JL	P
	Cyanide				NR

CP 8-7-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP
1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F13

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EQ5

Matrix (soil/water): WATER Lab Sample ID: 39145S

Level (low/med): LOW Date Received: 06/29/01

% 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	168	U		P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	4.0	U		P
7440-39-3	Barium	50.1	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	84400			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	1.1	U		P
7440-50-8	Copper	0.70	U		P
7439-89-6	Iron	54.6	U		P
7439-92-1	Lead	1.5	U		P
7439-95-4	Magnesium	15600			P
7439-96-5	Manganese	0.40	U		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.7	B		P
7440-09-7	Potassium	1740	B		P
7782-49-2	Selenium	3.4	U	~~N~~UJK	P
7440-22-4	Silver	0.80	U		P
7440-23-5	Sodium	1580	B		P
7440-28-0	Thallium	3.9	U		P
7440-62-2	Vanadium	0.90	U		P
7440-66-6	Zinc	30.6		~~N~~ JL	P
	Cyanide				NR

CP 8-7-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP
1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F15

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EQ5

Matrix (soil/water): WATER Lab Sample ID: 39146S

Level (low/med): LOW Date Received: 06/29/01

% 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	195	B		P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	4.0	U		P
7440-39-3	Barium	48.5	B		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	84800			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	1.1	U		P
7440-50-8	Copper	0.70	U		P
7439-89-6	Iron	125			P
7439-92-1	Lead	3.2	U		P
7439-95-4	Magnesium	14500			P
7439-96-5	Manganese	4.5	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.6	B		P
7440-09-7	Potassium	1720	B		P
7782-49-2	Selenium	3.4	U	UJK	P
7440-22-4	Silver	0.80	U		P
7440-23-5	Sodium	1520	B		P
7440-28-0	Thallium	3.9	U		P
7440-62-2	Vanadium	0.90	U		P
7440-66-6	Zinc	36.5		JL	P
	Cyanide				NR

CP 8-7-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

0373

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0FJ5

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EQ5

Matrix (soil/water): WATER Lab Sample ID: 38900S

Level (low/med): LOW Date Received: 06/27/01

% 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	168	U		P
7440-36-0	Antimony	3.0	U		P
7440-38-2	Arsenic	4.0	U		P
7440-39-3	Barium	41.0	~~B~~		P
7440-41-7	Beryllium	0.20	U		P
7440-43-9	Cadmium	0.30	U		P
7440-70-2	Calcium	65600			P
7440-47-3	Chromium	0.70	U		P
7440-48-4	Cobalt	1.1	U		P
7440-50-8	Copper	0.70	U		P
7439-89-6	Iron	54.6	U		P
7439-92-1	Lead	2.9	~~B~~	U	P
7439-95-4	Magnesium	35700			P
7439-96-5	Manganese	0.40	U		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.6	~~B~~		P
7440-09-7	Potassium	1790	~~B~~		P
7782-49-2	Selenium	3.4	U	~~N~~UJK	P
7440-22-4	Silver	0.80	U		P
7440-23-5	Sodium	1890	~~B~~		P
7440-28-0	Thallium	3.9	U		P
7440-62-2	Vanadium	0.90	U		P
7440-66-6	Zinc	575		~~N~~ JL	P
	Cyanide				NR

CP 8-7-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

ENVIRONMENTAL SERVICES ASSISTANCE TEAM

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

DELIVERABLE NARRATIVE

DATE: July 31, 2001

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

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

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

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: MJ0GM7

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1116
TDN: 1048
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 20 soil samples collected from the above referenced site has been completed. These samples were analyzed for total metals by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ0F18	MJ0F25	MJ0GM7	MJ0GN3
MJ0F19	MJ0F26	MJ0GM9	MJ0GN4
MJ0F20	MJ0F27	MJ0GN0	MJ0GN5
MJ0F21	MJ0FK4	MJ0GN1	MJ0GN6
MJ0F22	MJ0FK5	MJ0GN2	MJ0GN7

DATA QUALIFICATIONS

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

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

Holding Time - Acceptable

The suggested holding time for mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 6/26, 6/27 and 6/28/01. The samples were analyzed for mercury within 20 days and all other metals within 20 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

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

Initial Calibration - Acceptable

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

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

None of the data were qualified on this basis.

Calibration Verification - Acceptable

The initial and continuing calibration verifications met the criteria for frequency of analysis and recovery criteria of 90-110% and 80-120% for mercury. The recoveries ranged from 90-107% for ICP-AES and from 84-95% for mercury. None of the data were qualified on this basis.

Detection Limits - Acceptable

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

Blanks

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

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

Analyte	Associated Samples
antimony	All except MJ0F19, MJ0GN2
cadmium	MJ0GN5
chromium	MJ0GN2
cobalt	MJ0GN2
selenium	MJ0F21, MJ0GN1, MJ0GN2

silver	MJ0F22, MJ0GM7, MJ0GM9 MJ0GN0, MJ0GN1, MJ0GN3, MJ0GN4, MJ0GN5, MJ0GN6, MJ0GN7

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met by all of the ICS analyzed. The recoveries ranged from 94-119%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis

Sample MJ0GN5 was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference with the exception of copper. Results for copper in all samples were qualified as estimated, "J". The "E" qualifiers applied by the laboratory were crossed-out by the reviewer.

Laboratory Control Sample - Acceptable

The frequency of analysis and the recovery criteria for the laboratory control sample was met. The recoveries ranged from 63-132%. None of the data were qualified on this basis.

Duplicate Sample Analysis - Acceptable

Sample MJ0GN5 was utilized for duplicate analysis. The duplicate results met the frequency of analysis and method control limit criteria for all target analytes. None of the data were qualified on this basis.

Matrix Spike Analysis - Acceptable

Sample MJ0GN5 was used for the spike analysis. The frequency of analysis and recovery criteria were met. All of the spike recoveries were acceptable and ranged from 76-107%. None of the data were qualified on this basis.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 460. Thirty four (7.4%) were qualified as non-detected due to blank contamination. Twenty (4.3%) were qualified as estimated due to ICP serial dilution analysis.

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

0377

DATA QUALIFIERS

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

U.S. EPA - CLP
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EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F18

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39283S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 83.9

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5190			P
7440-36-0	Antimony	4.1	~~B~~ U		P
7440-38-2	Arsenic	4.6			P
7440-39-3	Barium	234			P
7440-41-7	Beryllium	0.24	~~B~~		P
7440-43-9	Cadmium	8.5			P
7440-70-2	Calcium	65000			P
7440-47-3	Chromium	14.2			P
7440-48-4	Cobalt	9.6	~~B~~		P
7440-50-8	Copper	32.3		~~E~~ JL	P
7439-89-6	Iron	7680			P
7439-92-1	Lead	301			P
7439-95-4	Magnesium	36400			P
7439-96-5	Manganese	4210			P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	15.7			P
7440-09-7	Potassium	249	~~B~~		P
7782-49-2	Selenium	0.79	U		P
7440-22-4	Silver	2.8			P
7440-23-5	Sodium	255	~~B~~		P
7440-28-0	Thallium	1.2	U		P
7440-62-2	Vanadium	10.5	~~B~~		P
7440-66-6	Zinc	784			P
	Cyanide				NR

CP 7-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0F19

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39284S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 58.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9280			P
7440-36-0	Antimony	12.7	JB		P
7440-38-2	Arsenic	13.8			P
7440-39-3	Barium	123			P
7440-41-7	Beryllium	0.38	JB		P
7440-43-9	Cadmium	27.0			P
7440-70-2	Calcium	51900			P
7440-47-3	Chromium	14.8			P
7440-48-4	Cobalt	9.8	JB		P
7440-50-8	Copper	71.7		~~E~~ JL	P
7439-89-6	Iron	20900			P
7439-92-1	Lead	714			P
7439-95-4	Magnesium	33200			P
7439-96-5	Manganese	2230			P
7439-97-6	Mercury	0.09	U		CV
7440-02-0	Nickel	21.1			P
7440-09-7	Potassium	531	JB		P
7782-49-2	Selenium	1.2	U		P
7440-22-4	Silver	5.6			P
7440-23-5	Sodium	364	JB		P
7440-28-0	Thallium	1.7	U		P
7440-62-2	Vanadium	17.1	JB		P
7440-66-6	Zinc	5740			P
	Cyanide				NR

CP 7-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

0380

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F20

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39285S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 81.7

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	12900			P
7440-36-0	Antimony	1.1	~~B~~	U	P
7440-38-2	Arsenic	6.7			P
7440-39-3	Barium	374			P
7440-41-7	Beryllium	0.49	B		P
7440-43-9	Cadmium	1.2	B		P
7440-70-2	Calcium	2460			P
7440-47-3	Chromium	12.9			P
7440-48-4	Cobalt	12.0	B		P
7440-50-8	Copper	19.7		JL	P
7439-89-6	Iron	16700			P
7439-92-1	Lead	22.3			P
7439-95-4	Magnesium	4360			P
7439-96-5	Manganese	4050			P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	19.4			P
7440-09-7	Potassium	644	B		P
7782-49-2	Selenium	0.83	U		P
7440-22-4	Silver	0.92	B		P
7440-23-5	Sodium	251	B		P
7440-28-0	Thallium	1.2	U		P
7440-62-2	Vanadium	17.9			P
7440-66-6	Zinc	115			P
	Cyanide				NR

CP 7-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

0381
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0FK4

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39291S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 70.6

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	476			P
7440-36-0	Antimony	1.8	~~E~~ U		P
7440-38-2	Arsenic	17.2			P
7440-39-3	Barium	14.5	B		P
7440-41-7	Beryllium	0.03	U		P
7440-43-9	Cadmium	9.8			P
7440-70-2	Calcium	142000			P
7440-47-3	Chromium	3.0			P
7440-48-4	Cobalt	0.31	U		P
7440-50-8	Copper	23.0		~~E~~ JL	P
7439-89-6	Iron	56800			P
7439-92-1	Lead	351			P
7439-95-4	Magnesium	63400			P
7439-96-5	Manganese	202			P
7439-97-6	Mercury	0.09	B		CV
7440-02-0	Nickel	10.3	B		P
7440-09-7	Potassium	164	B		P
7782-49-2	Selenium	0.94	U		P
7440-22-4	Silver	1.7	B		P
7440-23-5	Sodium	287	B		P
7440-28-0	Thallium	2.2	B		P
7440-62-2	Vanadium	9.0	B		P
7440-66-6	Zinc	3320			P
	Cyanide				NR

7-31-01

Color Before: BLACK Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

0382

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0FK5

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39292S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 72.7

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1430			P
7440-36-0	Antimony	1.7	~~B~~	U	P
7440-38-2	Arsenic	11.8			P
7440-39-3	Barium	25.5	B		P
7440-41-7	Beryllium	0.10	B		P
7440-43-9	Cadmium	14.6			P
7440-70-2	Calcium	175000			P
7440-47-3	Chromium	12.5			P
7440-48-4	Cobalt	0.75	B		P
7440-50-8	Copper	165		JL	P
7439-89-6	Iron	17000			P
7439-92-1	Lead	1960			P
7439-95-4	Magnesium	57800			P
7439-96-5	Manganese	254			P
7439-97-6	Mercury	0.39			CV
7440-02-0	Nickel	9.0	B		P
7440-09-7	Potassium	510	B		P
7782-49-2	Selenium	0.93	U		P
7440-22-4	Silver	0.72	B		P
7440-23-5	Sodium	310	B		P
7440-28-0	Thallium	1.4	U		P
7440-62-2	Vanadium	20.8			P
7440-66-6	Zinc	2610			P
	Cyanide				NR

7-31-01

Color Before: GREY Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

0383

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM7

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39273S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 70.4

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8400			P
7440-36-0	Antimony	1.1	~~B~~	U	P
7440-38-2	Arsenic	5.2			P
7440-39-3	Barium	110			P
7440-41-7	Beryllium	0.36	B		P
7440-43-9	Cadmium	1.6			P
7440-70-2	Calcium	14600			P
7440-47-3	Chromium	25.5			P
7440-48-4	Cobalt	5.5	B		P
7440-50-8	Copper	84.0		JL	P
7439-89-6	Iron	16600			P
7439-92-1	Lead	449			P
7439-95-4	Magnesium	10400			P
7439-96-5	Manganese	313			P
7439-97-6	Mercury	0.07	U		CV
7440-02-0	Nickel	12.3			P
7440-09-7	Potassium	1560			P
7782-49-2	Selenium	0.97	U		P
7440-22-4	Silver	0.72	~~B~~	U	P
7440-23-5	Sodium	393	B		P
7440-28-0	Thallium	1.4	U		P
7440-62-2	Vanadium	20.1			P
7440-66-6	Zinc	864			P
	Cyanide				NR

-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

FORM I - IN ILM04.1

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U.S. EPA - CLP
1

0384

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM9

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39274S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 45.9

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	2.3	~~B~~	U	P
7440-38-2	Arsenic	16.3			P
7440-39-3	Barium	183			P
7440-41-7	Beryllium	0.53	B		P
7440-43-9	Cadmium	0.57	B		P
7440-70-2	Calcium	21500			P
7440-47-3	Chromium	17.6			P
7440-48-4	Cobalt	8.2	B		P
7440-50-8	Copper	25.9		~~E~~ JL	P
7439-89-6	Iron	27000			P
7439-92-1	Lead	35.7			P
7439-95-4	Magnesium	8910			P
7439-96-5	Manganese	921			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	20.9			P
7440-09-7	Potassium	2020	B		P
7782-49-2	Selenium	1.5	U		P
7440-22-4	Silver	1.4	~~B~~	U	P
7440-23-5	Sodium	548	B		P
7440-28-0	Thallium	2.2	U		P
7440-62-2	Vanadium	28.3			P
7440-66-6	Zinc	287			P
	Cyanide				NR

CL 7-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

FORM I - IN ILM04.1

14

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0GN0

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39275S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 61.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5720			P
7440-36-0	Antimony	1.4	~~B~~	U	P
7440-38-2	Arsenic	2.8	B		P
7440-39-3	Barium	57.8	B		P
7440-41-7	Beryllium	0.15	B		P
7440-43-9	Cadmium	0.19	B		P
7440-70-2	Calcium	1390	B		P
7440-47-3	Chromium	10.1			P
7440-48-4	Cobalt	6.5	B		P
7440-50-8	Copper	8.1	B		P
7439-89-6	Iron	15900			P
7439-92-1	Lead	7.6			P
7439-95-4	Magnesium	2410			P
7439-96-5	Manganese	198			P
7439-97-6	Mercury	0.08	U		CV
7440-02-0	Nickel	17.4			P
7440-09-7	Potassium	760	B		P
7782-49-2	Selenium	1.1	U		P
7440-22-4	Silver	0.71	~~B~~	U	P
7440-23-5	Sodium	284	B		P
7440-28-0	Thallium	1.7	U		P
7440-62-2	Vanadium	15.6	B		P
7440-66-6	Zinc	60.9			P
	Cyanide				NR

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0GN1

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39276S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 67.2

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2620			P
7440-36-0	Antimony	0.99	B	U	P
7440-38-2	Arsenic	2.3	B		P
7440-39-3	Barium	44.2	B		P
7440-41-7	Beryllium	0.10	B		P
7440-43-9	Cadmium	0.98	B		P
7440-70-2	Calcium	3610			P
7440-47-3	Chromium	6.2			P
7440-48-4	Cobalt	2.3	B		P
7440-50-8	Copper	4.3	B	~~J~~	P
7439-89-6	Iron	6700			P
7439-92-1	Lead	4.6			P
7439-95-4	Magnesium	1200	B		P
7439-96-5	Manganese	107			P
7439-97-6	Mercury	0.07	U		CV
7440-02-0	Nickel	12.5			P
7440-09-7	Potassium	405	B		P
7782-49-2	Selenium	1.4	B	U	P
7440-22-4	Silver	0.40	B	U	P
7440-23-5	Sodium	360	B		P
7440-28-0	Thallium	1.5	U		P
7440-62-2	Vanadium	17.4			P
7440-66-6	Zinc	59.8			P
	Cyanide				NR

Color Before: BLACK Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

0387

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GN2

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39277S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 90.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	213			P
7440-36-0	Antimony	5.2	B		P
7440-38-2	Arsenic	6.7			P
7440-39-3	Barium	31.6	B		P
7440-41-7	Beryllium	0.02	U		P
7440-43-9	Cadmium	9.6			P
7440-70-2	Calcium	290000			P
7440-47-3	Chromium	0.86	B	U	P
7440-48-4	Cobalt	0.29	B	U	P
7440-50-8	Copper	6.6		# JL	P
7439-89-6	Iron	807			P
7439-92-1	Lead	17400			P
7439-95-4	Magnesium	10800			P
7439-96-5	Manganese	79.3			P
7439-97-6	Mercury	0.16			CV
7440-02-0	Nickel	5.0	B		P
7440-09-7	Potassium	98.1	B		P
7782-49-2	Selenium	1.3		U	P
7440-22-4	Silver	2.3			P
7440-23-5	Sodium	250	B		P
7440-28-0	Thallium	1.1	U		P
7440-62-2	Vanadium	8.6	B		P
7440-66-6	Zinc	2040			P
	Cyanide				NR

CP 7-31-01

Color Before: GREY Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
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0388
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GN3

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39278S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 79.0

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8950			P
7440-36-0	Antimony	0.98	~~B~~	U	P
7440-38-2	Arsenic	4.8			P
7440-39-3	Barium	33.2	~~B~~		P
7440-41-7	Beryllium	0.16	B		P
7440-43-9	Cadmium	0.94	~~B~~		P
7440-70-2	Calcium	42400			P
7440-47-3	Chromium	18.3			P
7440-48-4	Cobalt	9.2	~~B~~		P
7440-50-8	Copper	17.5		~~E~~ JL	P
7439-89-6	Iron	25900			P
7439-92-1	Lead	19.0			P
7439-95-4	Magnesium	8510			P
7439-96-5	Manganese	437			P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	26.3			P
7440-09-7	Potassium	403	~~B~~		P
7782-49-2	Selenium	0.86	U		P
7440-22-4	Silver	0.84	~~B~~	U	P
7440-23-5	Sodium	249	~~B~~		P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	12.2	~~B~~		P
7440-66-6	Zinc	263			P
	Cyanide				NR

CP 7-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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0389
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GN4

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39279S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 79.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	5930			P
7440-36-0	Antimony	1.7	B	U	P
7440-38-2	Arsenic	6.0			P
7440-39-3	Barium	49.7	B		P
7440-41-7	Beryllium	0.17	B		P
7440-43-9	Cadmium	0.80	B		P
7440-70-2	Calcium	30500			P
7440-47-3	Chromium	14.4			P
7440-48-4	Cobalt	5.5	B		P
7440-50-8	Copper	16.0		JL	P
7439-89-6	Iron	13600			P
7439-92-1	Lead	86.8			P
7439-95-4	Magnesium	18700			P
7439-96-5	Manganese	427			P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	14.2			P
7440-09-7	Potassium	985	B		P
7782-49-2	Selenium	0.85	U		P
7440-22-4	Silver	0.57	B	U	P
7440-23-5	Sodium	314	B		P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	25.4			P
7440-66-6	Zinc	261			P
	Cyanide				NR

CP 7-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
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0390
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GN5

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39280S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 77.1

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6020			P
7440-36-0	Antimony	1.0	~~B~~	U	P
7440-38-2	Arsenic	5.2			P
7440-39-3	Barium	59.9			P
7440-41-7	Beryllium	0.18	B		P
7440-43-9	Cadmium	0.20	~~B~~	U	P
7440-70-2	Calcium	17500			P
7440-47-3	Chromium	13.2			P
7440-48-4	Cobalt	4.8	B		P
7440-50-8	Copper	17.5		~~E~~ JL	P
7439-89-6	Iron	12500			P
7439-92-1	Lead	7.3			P
7439-95-4	Magnesium	9100			P
7439-96-5	Manganese	243			P
7439-97-6	Mercury	0.07	U		CV
7440-02-0	Nickel	13.3			P
7440-09-7	Potassium	1260	B		P
7782-49-2	Selenium	0.88	U		P
7440-22-4	Silver	0.56	~~B~~	U	P
7440-23-5	Sodium	372	B		P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	29.5			P
7440-66-6	Zinc	49.7			P
	Cyanide				NR

CP 7-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

0391
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GN6

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39281S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 76.6

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8350			P
7440-36-0	Antimony	1.0	~~B~~	U	P
7440-38-2	Arsenic	5.3			P
7440-39-3	Barium	102			P
7440-41-7	Beryllium	0.27	~~B~~		P
7440-43-9	Cadmium	0.25	~~B~~		P
7440-70-2	Calcium	15900			P
7440-47-3	Chromium	17.9			P
7440-48-4	Cobalt	7.6	~~B~~		P
7440-50-8	Copper	22.4		≠ JL	P
7439-89-6	Iron	17000			P
7439-92-1	Lead	10.5			P
7439-95-4	Magnesium	9180			P
7439-96-5	Manganese	429			P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	16.8			P
7440-09-7	Potassium	1600			P
7782-49-2	Selenium	0.88	U		P
7440-22-4	Silver	0.83	~~B~~	U	P
7440-23-5	Sodium	328	~~B~~		P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	32.5			P
7440-66-6	Zinc	74.1			P
	Cyanide				NR

CP 7-31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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U.S. EPA - CLP
1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GN7

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GM7

Matrix (soil/water): SOIL Lab Sample ID: 39282S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 84.2

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6770			P
7440-36-0	Antimony	0.91	~~B~~	U	P
7440-38-2	Arsenic	5.3			P
7440-39-3	Barium	72.4			P
7440-41-7	Beryllium	0.20	B		P
7440-43-9	Cadmium	0.26	~~B~~		P
7440-70-2	Calcium	20400			P
7440-47-3	Chromium	16.4			P
7440-48-4	Cobalt	6.8	B		P
7440-50-8	Copper	19.3		~~E~~ JL	P
7439-89-6	Iron	14200			P
7439-92-1	Lead	8.7			P
7439-95-4	Magnesium	9450			P
7439-96-5	Manganese	345			P
7439-97-6	Mercury	0.05	U		CV
7440-02-0	Nickel	15.0			P
7440-09-7	Potassium	1260			P
7782-49-2	Selenium	0.81	U		P
7440-22-4	Silver	0.64	~~B~~	U	P
7440-23-5	Sodium	336	B		P
7440-28-0	Thallium	1.2	U		P
7440-62-2	Vanadium	30.8			P
7440-66-6	Zinc	53.4			P
	Cyanide				NR

CP 7.31-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

ENVIRONMENTAL SERVICES ASSISTANCE TEAM

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

DELIVERABLE NARRATIVE

DATE: July 30, 2001

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

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

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

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: MJ0FJ0

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1114
TDN: 1048
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 19 soil samples collected from the above referenced site has been completed. These samples were analyzed for total metals by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ0EZ6	MJ0F01	MJ0F08	MJ0FJ1
MJ0EZ7	MJ0F02	MJ0F09	MJ0FJ2
MJ0EZ8	MJ0F03	MJ0F14	MJ0FJ3
MJ0EZ9	MJ0F04	MJ0F16	MJ0FJ4
MJ0F00	MJ0F05	MJ0FJ0	

DATA QUALIFICATIONS

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

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

Holding Time - Acceptable

The suggested holding time for mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 6/18, 6/24, 6/25, 6/26 and 6/27/01. The samples were analyzed for mercury within 18 days and all other metals within 22 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

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

Initial Calibration - Acceptable

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

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

None of the data were qualified on this basis.

Calibration Verification - Acceptable

The initial and continuing calibration verifications met the criteria for frequency of analysis and recovery criteria of 90-110% and 80-120% for mercury. The recoveries ranged from 91-109% for ICP-AES and from 81-89% for mercury. None of the data were qualified on this basis.

Detection Limits - Acceptable

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

Blanks

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

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

Analyte	Associated Samples
arsenic	MJ0EZ8, MJ0F08, MJ0F09, MJ0F14, MJ0F16
sodium	MJ0EZ7, MJ0EZ9, MJ0F00, MJ0F02, MJ0F03, MJ0F04, MJ0F05, MJ0F08, MJ0F09, MJ0F14, MJ0F16, MJ0J2, MJ0J3

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

Analyte	Associated Samples
thallium	All except MJ0FJ2

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met by all of the ICS analyzed. The recoveries ranged from 86-116%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis

Sample MJ0EZ6 was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference with the exception of copper. Results for copper in all samples were qualified as estimated, "J". The "E" qualifiers applied by the laboratory were crossed-out by the reviewer.

Laboratory Control Sample - Acceptable

The frequency of analysis and the recovery criteria for the laboratory control sample was met. The recoveries ranged from 70-154%. None of the data were qualified on this basis.

Duplicate Sample Analysis - Acceptable

Sample MJ0EZ6 was utilized for duplicate analysis. The duplicate results met the frequency of analysis and method control limit criteria (±20% RPD or ± CRDL) for all target analytes with the exception of lead. Lead did meet the suggested technical control limit criteria (±35% RPD or ± 2X CRDL) for soils. The "*" qualifiers applied by the laboratory were crossed-out by the reviewer. None of the data were qualified on this basis.

Matrix Spike Analysis

Sample MJ0EZ6 was used for the spike analysis. The frequency of analysis and recovery criteria were met with the exception of antimony (45%) and zinc (142%) in the spike sample MJ0EZ6S. Due to possible bias, the detected and non-detected antimony results in all samples were qualified as estimated, "J/UJ". Due to possible bias, the detected zinc results in all samples were qualified as estimated, "J". The "N" qualifiers applied by the laboratory were crossed-out by the reviewer. The recoveries for lead and manganese could not be accurately determined because the concentrations native to the sample were greater than 4 times the amount of spike added to the sample. All of the other spike recoveries were acceptable and ranged from 77-105%.

0396

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 437. Eighteen (4.1%) were qualified as non-detected due to blank contamination. Seventy five (17%) were qualified as estimated due to negative blanks, ICP serial dilution and spike analyses.

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

DATA QUALIFIERS

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

0397

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0EZ7

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39148S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 82.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	325			P
7440-36-0	Antimony	2.5	B	~~N~~ JLm	P
7440-38-2	Arsenic	20.6			P
7440-39-3	Barium	20.3	B		P
7440-41-7	Beryllium	0.05	U		P
7440-43-9	Cadmium	15.0			P
7440-70-2	Calcium	182000			P
7440-47-3	Chromium	10.4			P
7440-48-4	Cobalt	0.65	B		P
7440-50-8	Copper	176		~~E~~ JL	P
7439-89-6	Iron	32000			P
7439-92-1	Lead	680		~~*~~	P
7439-95-4	Magnesium	74300			P
7439-96-5	Manganese	228			P
7439-97-6	Mercury	0.25			CV
7440-02-0	Nickel	9.6	B		P
7440-09-7	Potassium	195	B		P
7782-49-2	Selenium	0.83	U		P
7440-22-4	Silver	0.65	B		P
7440-23-5	Sodium	129	~~B~~ U		P
7440-28-0	Thallium	0.95	U	UJK	P
7440-62-2	Vanadium	7.2	B		P
7440-66-6	Zinc	4130		~~N~~ JH	P
	Cyanide				NR

CP 7-30-01

Color Before: GREY Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0EZ8

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39149S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 71.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8080			P
7440-36-0	Antimony	0.82	U	~~N~~UJK	P
7440-38-2	Arsenic	5.1		U	P
7440-39-3	Barium	71.1			P
7440-41-7	Beryllium	0.26	B		P
7440-43-9	Cadmium	0.08	U		P
7440-70-2	Calcium	16900			P
7440-47-3	Chromium	19.2			P
7440-48-4	Cobalt	8.0	B		P
7440-50-8	Copper	27.6		~~N~~JL	P
7439-89-6	Iron	15900			P
7439-92-1	Lead	9.5		~~N~~	P
7439-95-4	Magnesium	8460			P
7439-96-5	Manganese	310			P
7439-97-6	Mercury	0.07	U		CV
7440-02-0	Nickel	18.9			P
7440-09-7	Potassium	1340	B		P
7782-49-2	Selenium	0.94	U		P
7440-22-4	Silver	0.68	B		P
7440-23-5	Sodium	250	B		P
7440-28-0	Thallium	1.1	U	UJK	P
7440-62-2	Vanadium	36.3			P
7440-66-6	Zinc	67.6		~~N~~JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0EZ9

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39150S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 75.4

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4680			P
7440-36-0	Antimony	1.1	B	~~N~~ JLmw	P
7440-38-2	Arsenic	18.9			P
7440-39-3	Barium	70.4			P
7440-41-7	Beryllium	0.14	B		P
7440-43-9	Cadmium	9.2			P
7440-70-2	Calcium	94100			P
7440-47-3	Chromium	13.9			P
7440-48-4	Cobalt	3.3	B		P
7440-50-8	Copper	58.3		~~E~~ JL	P
7439-89-6	Iron	37800			P
7439-92-1	Lead	467		~~E~~	P
7439-95-4	Magnesium	42300			P
7439-96-5	Manganese	279			P
7439-97-6	Mercury	0.16			CV
7440-02-0	Nickel	15.1			P
7440-09-7	Potassium	665	B		P
7782-49-2	Selenium	0.90	U		P
7440-22-4	Silver	1.1	B		P
7440-23-5	Sodium	193	~~B~~ U		P
7440-28-0	Thallium	1.0	U	UJK	P
7440-62-2	Vanadium	24.0			P
7440-66-6	Zinc	2190		~~N~~ JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

0400

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F00

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39151S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 86.7

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	146			P
7440-36-0	Antimony	1.5	B	~~N~~ JL	P
7440-38-2	Arsenic	19.8			P
7440-39-3	Barium	8.7	B		P
7440-41-7	Beryllium	0.05	U		P
7440-43-9	Cadmium	8.5			P
7440-70-2	Calcium	152000			P
7440-47-3	Chromium	3.9			P
7440-48-4	Cobalt	0.25	U		P
7440-50-8	Copper	90.0		~~N~~ JL	P
7439-89-6	Iron	62700			P
7439-92-1	Lead	666		~~N~~	P
7439-95-4	Magnesium	97400			P
7439-96-5	Manganese	220			P
7439-97-6	Mercury	0.15			CV
7440-02-0	Nickel	20.0			P
7440-09-7	Potassium	74.3	B		P
7782-49-2	Selenium	0.78	U		P
7440-22-4	Silver	0.98	B		P
7440-23-5	Sodium	95.3	~~B~~ U		P
7440-28-0	Thallium	0.89	U	UJK	P
7440-62-2	Vanadium	3.7	B		P
7440-66-6	Zinc	1590		~~N~~ JH	P
	Cyanide				NR

CA 7-30-01

Color Before: GREY Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

0401

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F01

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39152S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 94.4

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	312			P
7440-36-0	Antimony	2.1	JB	~~N~~ JL	P
7440-38-2	Arsenic	40.0			P
7440-39-3	Barium	7.8	JB		P
7440-41-7	Beryllium	0.04	U		P
7440-43-9	Cadmium	8.2			P
7440-70-2	Calcium	117000			P
7440-47-3	Chromium	2.7			P
7440-48-4	Cobalt	0.23	U		P
7440-50-8	Copper	40.3		~~E~~ JL	P
7439-89-6	Iron	171000			P
7439-92-1	Lead	1650		~~*~~	P
7439-95-4	Magnesium	70800			P
7439-96-5	Manganese	214			P
7439-97-6	Mercury	0.10			CV
7440-02-0	Nickel	21.4			P
7440-09-7	Potassium	87.7	JB		P
7782-49-2	Selenium	0.71	U		P
7440-22-4	Silver	2.3			P
7440-23-5	Sodium	27.5	U		P
7440-28-0	Thallium	0.82	U	UJK	P
7440-62-2	Vanadium	5.1	JB		P
7440-66-6	Zinc	2500		~~N~~ JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BLACK Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F02

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39153S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 78.6

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	243			P
7440-36-0	Antimony	1.6	B	~~N~~ JLm	P
7440-38-2	Arsenic	20.8			P
7440-39-3	Barium	10.0	B		P
7440-41-7	Beryllium	0.05	U		P
7440-43-9	Cadmium	11.9			P
7440-70-2	Calcium	148000			P
7440-47-3	Chromium	7.1			P
7440-48-4	Cobalt	0.28	U		P
7440-50-8	Copper	178		~~E~~ JL	P
7439-89-6	Iron	60800			P
7439-92-1	Lead	818		~~E~~	P
7439-95-4	Magnesium	91800			P
7439-96-5	Manganese	236			P
7439-97-6	Mercury	0.18			CV
7440-02-0	Nickel	16.6			P
7440-09-7	Potassium	134	B		P
7782-49-2	Selenium	0.87	U		P
7440-22-4	Silver	1.3	B		P
7440-23-5	Sodium	146	~~B~~ U		P
7440-28-0	Thallium	0.99	U	UJK	P
7440-62-2	Vanadium	9.0	B		P
7440-66-6	Zinc	2520		~~N~~ JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0F03

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39326S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 75.4

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	614			P
7440-36-0	Antimony	2.0	B	N FLm	P
7440-38-2	Arsenic	26.4			P
7440-39-3	Barium	15.7	B		P
7440-41-7	Beryllium	0.05	U		P
7440-43-9	Cadmium	30.4			P
7440-70-2	Calcium	159000			P
7440-47-3	Chromium	14.3			P
7440-48-4	Cobalt	0.44	B		P
7440-50-8	Copper	242		E JL	P
7439-89-6	Iron	61800			P
7439-92-1	Lead	1760		*	P
7439-95-4	Magnesium	69200			P
7439-96-5	Manganese	217			P
7439-97-6	Mercury	0.58			CV
7440-02-0	Nickel	16.1			P
7440-09-7	Potassium	336	B		P
7782-49-2	Selenium	0.90	U		P
7440-22-4	Silver	1.3	B		P
7440-23-5	Sodium	74.4	~~B~~ U		P
7440-28-0	Thallium	1.0	U	UJK	P
7440-62-2	Vanadium	11.0	B		P
7440-66-6	Zinc	6540		N JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

FORM I - IN ILM04.1

10

0404

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F04

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39154S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 81.8

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	293			P
7440-36-0	Antimony	1.5	B	~~N~~ JL	P
7440-38-2	Arsenic	22.4			P
7440-39-3	Barium	10.2	B		P
7440-41-7	Beryllium	0.05	U		P
7440-43-9	Cadmium	20.1			P
7440-70-2	Calcium	156000			P
7440-47-3	Chromium	8.0			P
7440-48-4	Cobalt	0.27	U		P
7440-50-8	Copper	113		~~E~~ JL	P
7439-89-6	Iron	61100			P
7439-92-1	Lead	1000		~~*~~	P
7439-95-4	Magnesium	81800			P
7439-96-5	Manganese	208			P
7439-97-6	Mercury	0.25			CV
7440-02-0	Nickel	13.7			P
7440-09-7	Potassium	156	B		P
7782-49-2	Selenium	0.82	U		P
7440-22-4	Silver	1.1	B		P
7440-23-5	Sodium	82.6	~~B~~ U		P
7440-28-0	Thallium	0.94	U	UJK	P
7440-62-2	Vanadium	7.6	B		P
7440-66-6	Zinc	4540		~~N~~ JH	P
	Cyanide				NR

DP 7-30-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

0405

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F05

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39155S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 83.4

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	222			P
7440-36-0	Antimony	1.5	B	~~N~~ JLM	P
7440-38-2	Arsenic	21.1			P
7440-39-3	Barium	8.9	B		P
7440-41-7	Beryllium	0.05	U		P
7440-43-9	Cadmium	10.4			P
7440-70-2	Calcium	158000			P
7440-47-3	Chromium	7.2			P
7440-48-4	Cobalt	0.26	U		P
7440-50-8	Copper	88.0		~~E~~ JL	P
7439-89-6	Iron	56000			P
7439-92-1	Lead	919		~~E~~	P
7439-95-4	Magnesium	73300			P
7439-96-5	Manganese	184			P
7439-97-6	Mercury	0.16			CV
7440-02-0	Nickel	13.7			P
7440-09-7	Potassium	145	B		P
7782-49-2	Selenium	0.80	U		P
7440-22-4	Silver	0.92	B		P
7440-23-5	Sodium	108	~~B~~ U		P
7440-28-0	Thallium	0.92	U	UJK	P
7440-62-2	Vanadium	7.6	B		P
7440-66-6	Zinc	2270		~~N~~ JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

0406

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F08

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39156S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 57.1

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2100			P
7440-36-0	Antimony	1.0	U	~~N~~UJK	P
7440-38-2	Arsenic	7.6		U	P
7440-39-3	Barium	44.2	B		P
7440-41-7	Beryllium	0.10	B		P
7440-43-9	Cadmium	3.5			P
7440-70-2	Calcium	115000			P
7440-47-3	Chromium	9.2			P
7440-48-4	Cobalt	1.7	B		P
7440-50-8	Copper	22.5		~~E~~ JL	P
7439-89-6	Iron	6130			P
7439-92-1	Lead	180		~~E~~	P
7439-95-4	Magnesium	35500			P
7439-96-5	Manganese	455			P
7439-97-6	Mercury	0.11	B		CV
7440-02-0	Nickel	44.8			P
7440-09-7	Potassium	373	B		P
7782-49-2	Selenium	1.2	U		P
7440-22-4	Silver	0.28	U		P
7440-23-5	Sodium	177	~~B~~	U	P
7440-28-0	Thallium	1.4	U	UJK	P
7440-62-2	Vanadium	26.8			P
7440-66-6	Zinc	326		~~N~~ JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BLACK Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

0407
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F09

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39157S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 69.7

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2960			P
7440-36-0	Antimony	0.86	U	~~N~~UJK	P
7440-38-2	Arsenic	4.7		U	P
7440-39-3	Barium	48.6	B		P
7440-41-7	Beryllium	0.10	B		P
7440-43-9	Cadmium	1.4	B		P
7440-70-2	Calcium	202000			P
7440-47-3	Chromium	5.7			P
7440-48-4	Cobalt	2.8	B		P
7440-50-8	Copper	9.2		~~E~~JL	P
7439-89-6	Iron	8120			P
7439-92-1	Lead	6.8		~~J~~	P
7439-95-4	Magnesium	7090			P
7439-96-5	Manganese	211			P
7439-97-6	Mercury	0.07	U		CV
7440-02-0	Nickel	13.8			P
7440-09-7	Potassium	293	B		P
7782-49-2	Selenium	0.98	U		P
7440-22-4	Silver	0.23	U		P
7440-23-5	Sodium	152	~~B~~	U	P
7440-28-0	Thallium	1.1	U	UJK	P
7440-62-2	Vanadium	11.9	B		P
7440-66-6	Zinc	65.2		~~N~~JH	P
	Cyanide				NR

CP 7-30-01

Color Before: GREY Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

FORM I - IN ILM04.1

0408

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F14

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39158S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 38.7

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6760			P
7440-36-0	Antimony	1.5	U	~~N~~UJK	P
7440-38-2	Arsenic	9.1		U	P
7440-39-3	Barium	114			P
7440-41-7	Beryllium	0.28	B		P
7440-43-9	Cadmium	2.8			P
7440-70-2	Calcium	35400			P
7440-47-3	Chromium	11.9			P
7440-48-4	Cobalt	4.5	B		P
7440-50-8	Copper	23.0		~~N~~ JL	P
7439-89-6	Iron	12000			P
7439-92-1	Lead	72.5		~~N~~	P
7439-95-4	Magnesium	8730			P
7439-96-5	Manganese	194			P
7439-97-6	Mercury	0.13	U		CV
7440-02-0	Nickel	44.9			P
7440-09-7	Potassium	915	B		P
7782-49-2	Selenium	1.7	U		P
7440-22-4	Silver	0.65	B		P
7440-23-5	Sodium	231	~~B~~ U		P
7440-28-0	Thallium	2.0	U	UJK	P
7440-62-2	Vanadium	19.7	B		P
7440-66-6	Zinc	560		~~N~~ JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BLACK Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

0409
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0F16

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0FJ0

Matrix (soil/water): SOIL Lab Sample ID: 39159S

Level (low/med): LOW Date Received: 06/29/01

% Solids: 84.9

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3640			P
7440-36-0	Antimony	0.70	U	~~N~~UJK	P
7440-38-2	Arsenic	3.6		U	P
7440-39-3	Barium	59.0			P
7440-41-7	Beryllium	0.13	B		P
7440-43-9	Cadmium	1.7			P
7440-70-2	Calcium	70500			P
7440-47-3	Chromium	6.5			P
7440-48-4	Cobalt	4.4	B		P
7440-50-8	Copper	8.9		~~E~~ JL	P
7439-89-6	Iron	9540			P
7439-92-1	Lead	59.9		~~*~~	P
7439-95-4	Magnesium	32200			P
7439-96-5	Manganese	341			P
7439-97-6	Mercury	0.05	U		CV
7440-02-0	Nickel	17.3			P
7440-09-7	Potassium	392	B		P
7782-49-2	Selenium	0.79	U		P
7440-22-4	Silver	0.30	B		P
7440-23-5	Sodium	106	~~B~~	U	P
7440-28-0	Thallium	0.91	U	UJK	P
7440-62-2	Vanadium	11.4	B		P
7440-66-6	Zinc	329		~~N~~ JH	P
	Cyanide				NR

CP 7-30-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

ENVIRONMENTAL SERVICES ASSISTANCE TEAM

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

DELIVERABLE NARRATIVE

DATE: August 3, 2001

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

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

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

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: MJ0GL0

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1121
TDN: 1048
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 10 water samples collected from the above referenced site has been completed. These samples were analyzed for total metals by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ0F17	MJ0GM4
MJ0FK9	MJ0GM6
MJ0GL0	MJ0GM8
MJ0GL9	MJ0GN8
MJ0GM1	MJ0GN9

DATA QUALIFICATIONS

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

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

Holding Time - Acceptable

The suggested holding time for mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 6/25, 6/26, 6/27 and 6/28/01. The samples were analyzed for mercury within 16 days and all other metals within 17 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

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

Initial Calibration - Acceptable

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

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

None of the data were qualified on this basis.

Calibration Verification - Acceptable

The initial and continuing calibration verifications met the criteria for frequency of analysis and recovery criteria of 90-110% and 80-120% for mercury. The recoveries ranged from 94-110% for ICP-AES and from 92-103% for mercury. None of the data were qualified on this basis.

Detection Limits - Acceptable

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

Blanks

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

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

Analyte	Associated Samples
iron	MJ0FK9, MJ0GL0, MJ0GM8, MJ0GN9
sodium	All

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

Analyte	Associated Samples
silver	All
copper	MJ0F17, MJ0FK9, MJ0GN9

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met by all of the ICS analyzed. The recoveries ranged from 82-119%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis

Sample MJ0GL0 was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference with the exception of potassium. Results for potassium in all samples were qualified as estimated, "J". The "E" qualifiers applied by the laboratory were crossed-out by the reviewer.

Laboratory Control Sample - Acceptable

The frequency of analysis and the recovery criteria for the laboratory control sample was met. The recoveries ranged from 98-114%. None of the data were qualified on this basis.

Duplicate Sample Analysis - Acceptable

Sample MJ0GL0 was utilized for duplicate analysis. The duplicate results met the frequency of analysis and method control limit criteria for all target analytes. None of the data were qualified on this basis.

Matrix Spike Analysis - Acceptable

Sample MJ0GL0 was used for the spike analysis. The frequency of analysis and recovery criteria were met. All of the spike recoveries were acceptable and ranged from 90-103%. None of the data were qualified on this basis.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 230. Fifteen (6.5%) were qualified as non-detect due to blank contamination. Twenty three (10%) were qualified as estimated due to negative blanks and ICP serial dilution analysis.

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

DATA QUALIFIERS

0413

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

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

ICP ID Number: P3 Date: 04/15/01

Flame AA ID Number:

Furnace AA ID Number:

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum	308.20		200	68.2	P
Antimony	206.80		60	2.5	P
Arsenic	189.00		10	2.6	P
Barium	493.40		200	0.7	P
Beryllium	313.00		5	0.3	P
Cadmium	226.50		5	0.6	P
Calcium	317.90		5000	25.6	P
Chromium	267.70		10	0.6	P
Cobalt	228.60		50	1.0	P
Copper	324.70		25	1.0	P
Iron	271.40		100	14.6	P
Lead	220.30		3	2.8	P
Magnesium	279.00		5000	27.0	P
Manganese	257.60		15	0.3	P
Mercury			0.2		NR
Nickel	231.60		40	1.1	P
Potassium	766.40		5000	11.7	P
Selenium	196.00		5	2.0	P
Silver	328.00		10	0.5	P
Sodium	330.20		5000	474.3	P
Thallium	190.80		10	3.4	P
Vanadium	292.40		50	1.0	P
Zinc	206.20		20	0.6	P
Cyanide			10		NR

Comments:

P3: THERMO JARRELL ASH

10
INSTRUMENT DETECTION LIMITS (QUARTERLY)

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

ICP ID Number: Date: 04/15/01

Flame AA ID Number: C5

Furnace AA ID Number:

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		NR
Antimony			60		NR
Arsenic			10		NR
Barium			200		NR
Beryllium			5		NR
Cadmium			5		NR
Calcium			5000		NR
Chromium			10		NR
Cobalt			50		NR
Copper			25		NR
Iron			100		NR
Lead			3		NR
Magnesium			5000		NR
Manganese			15		NR
Mercury	253.70		0.2	0.1	CV
Nickel			40		NR
Potassium			5000		NR
Selenium			5		NR
Silver			10		NR
Sodium			5000		NR
Thallium			10		NR
Vanadium			50		NR
Zinc			20		NR
Cyanide			10		NR

Comments:
C5: CETAC M6000

13
PREPARATION LOG

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Method: P

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
LCSW	07/10/01		50
MJ0F17	07/10/01		50
MJ0FK9	07/10/01		50
MJ0GL0	07/10/01		50
MJ0GL0D	07/10/01		50
MJ0GL0S	07/10/01		50
MJ0GL9	07/10/01		50
MJ0GM1	07/10/01		50
MJ0GM4	07/10/01		50
MJ0GM6	07/10/01		50
MJ0GM8	07/10/01		50
MJ0GN8	07/10/01		50
MJ0GN9	07/10/01		50
PBW	07/10/01		50

13
PREPARATION LOG

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Method: CV

EPA Sample No.	Preparation Date	Weight (gram)	Volume (mL)
MJ0F17	07/10/01		100
MJ0FK9	07/10/01		100
MJ0GL0	07/10/01		100
MJ0GL0D	07/10/01		100
MJ0GL0S	07/10/01		100
MJ0GL9	07/10/01		100
MJ0GM1	07/10/01		100
MJ0GM4	07/10/01		100
MJ0GM6	07/10/01		100
MJ0GM8	07/10/01		100
MJ0GN8	07/10/01		100
MJ0GN9	07/10/01		100
PBW	07/10/01		100

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0F17

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39293S

Level (low/med): LOW Date Received: 06/30/01

% 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	114	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	20.8	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	1.3	B		P
7440-70-2	Calcium	18900			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.0	U	UJK	P
7439-89-6	Iron	14.6	U		P
7439-92-1	Lead	3.0	B		P
7439-95-4	Magnesium	9530			P
7439-96-5	Manganese	0.75	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7440-09-7	Potassium	740	B	~~J~~	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	UJK	P
7440-23-5	Sodium	3000	~~B~~ U		P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	102			P
	Cyanide				NR

CF 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP
1

0419
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0FK9

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39294S

Level (low/med): LOW Date Received: 06/30/01

% 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	134	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	54.3	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.87	B		P
7440-70-2	Calcium	137000			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.2	B	~~JLMW~~	P
7439-89-6	Iron	82.1	~~B~~	U	P
7439-92-1	Lead	21.5			P
7439-95-4	Magnesium	46400			P
7439-96-5	Manganese	1.1	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	8.4	B		P
7440-09-7	Potassium	2290	B	~~E~~ ~~JLMW~~	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	UJK	P
7440-23-5	Sodium	2990	~~B~~	U	P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	117			P
	Cyanide				NR

UP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP
1

0420
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL0

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39253S

Level (low/med): LOW Date Received: 06/30/01

% 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	105	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	5.8	B		P
7440-39-3	Barium	71.6	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.66	B		P
7440-70-2	Calcium	48500			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	2.2	B		P
7439-89-6	Iron	71.3	~~B~~ U		P
7439-92-1	Lead	8.7			P
7439-95-4	Magnesium	30200			P
7439-96-5	Manganese	0.43	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	4.6	B		P
7440-09-7	Potassium	1170	B	~~E~~ J ~~Fm~~	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	UJK	P
7440-23-5	Sodium	2460	~~B~~ U		P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	212			P
	Cyanide				NR

CP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0GL9

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39254S

Level (low/med): LOW Date Received: 06/30/01

% 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	125	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	58.5	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	89400			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.2	B		P
7439-89-6	Iron	409			P
7439-92-1	Lead	9.3			P
7439-95-4	Magnesium	29000			P
7439-96-5	Manganese	33.0			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7440-09-7	Potassium	2540	B	~~J~~ J+	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	UJK	P
7440-23-5	Sodium	2570	~~B~~	U	P
7440-28-0	Thallium	3.4	B		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	62.5			P
	Cyanide				NR

CP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

0422

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM1

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39256S

Level (low/med): LOW Date Received: 06/30/01

% 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	150	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	62.6	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	20100			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.0	U		P
7439-89-6	Iron	107			P
7439-92-1	Lead	2.8	U		P
7439-95-4	Magnesium	5230			P
7439-96-5	Manganese	10	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7440-09-7	Potassium	873	B	~~J~~ J tmu	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	UJK	P
7440-23-5	Sodium	4340	~~B~~ U		P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	4.4	B		P
	Cyanide				NR

CP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

0423

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM4

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39257S

Level (low/med): LOW Date Received: 06/30/01

% 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	156	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	58.2	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	18300			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.0	U		P
7439-89-6	Iron	103			P
7439-92-1	Lead	2.8	U		P
7439-95-4	Magnesium	4840	B		P
7439-96-5	Manganese	11.1	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7440-09-7	Potassium	799	B	~~J~~ JLM	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	UJK	P
7440-23-5	Sodium	2730	~~B~~ U		P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	5.5	B		P
	Cyanide				NR

UP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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0424
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM6

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39255S

Level (low/med): LOW Date Received: 06/30/01

% 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	245			P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	62.5	~~B~~		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	18800			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.5	~~B~~		P
7439-89-6	Iron	273			P
7439-92-1	Lead	4.1			P
7439-95-4	Magnesium	5020			P
7439-96-5	Manganese	25.5			P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7440-09-7	Potassium	846	~~B~~	~~EJLMW~~	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.59	~~B~~	~~JLMW~~	P
7440-23-5	Sodium	3900	~~B~~ U		P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.0	~~B~~		P
7440-66-6	Zinc	20.6			P
	Cyanide				NR

CP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM8

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39258S

Level (low/med): LOW Date Received: 06/30/01

% 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	104	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	57.3	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	18700			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.3	B		P
7439-89-6	Iron	53.7	~~B~~ U		P
7439-92-1	Lead	2.8	U		P
7439-95-4	Magnesium	4950	B		P
7439-96-5	Manganese	7.7	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7440-09-7	Potassium	792	B	~~E~~ J ~~M~~	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	U J K	P
7440-23-5	Sodium	4160	~~B~~ U		P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	2.8	B		P
	Cyanide				NR

CP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP
1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0GN8

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39259S

Level (low/med): LOW Date Received: 06/30/01

% 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	112	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	13.2	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	24500			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.0	U		P
7439-89-6	Iron	44.4	~~B~~ U		P
7439-92-1	Lead	2.8	U		P
7439-95-4	Magnesium	8900			P
7439-96-5	Manganese	6.0	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7440-09-7	Potassium	792	B	~~J~~ JLM	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	UJK	P
7440-23-5	Sodium	2200	~~B~~ U		P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.0	U		P
7440-66-6	Zinc	3.9	B		P
	Cyanide				NR

CP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP
1

0428

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GN9

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0GL0

Matrix (soil/water): WATER Lab Sample ID: 39260S

Level (low/med): LOW Date Received: 06/30/01

% 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	149	B		P
7440-36-0	Antimony	2.5	U		P
7440-38-2	Arsenic	2.6	U		P
7440-39-3	Barium	14.7	B		P
7440-41-7	Beryllium	0.30	U		P
7440-43-9	Cadmium	0.60	U		P
7440-70-2	Calcium	27300			P
7440-47-3	Chromium	0.60	U		P
7440-48-4	Cobalt	1.0	U		P
7440-50-8	Copper	1.0	U	UJK	P
7439-89-6	Iron	34.8	~~B~~ U		P
7439-92-1	Lead	2.8	U		P
7439-95-4	Magnesium	9560			P
7439-96-5	Manganese	3.7	B		P
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	1.1	U		P
7440-09-7	Potassium	889	B	~~J~~ J4	P
7782-49-2	Selenium	2.0	U		P
7440-22-4	Silver	0.50	U	UJK	P
7440-23-5	Sodium	2790	~~B~~ U		P
7440-28-0	Thallium	3.4	U		P
7440-62-2	Vanadium	1.6	B		P
7440-66-6	Zinc	0.65	B		P
	Cyanide				NR

CP 8-3-01

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

MEMORANDUM

DATE: November 6, 2001

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

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

SUBJ: **Inorganic Data Summary Check, Upper Columbia River Mines/Mills ESI, Stevens and Pend Oreille Counties, Washington**

REF: TDD: 01-02-0028 PAN: 001281.0073.01SR

The data quality summary check of 3 water and 11 solid samples collected from the Upper Columbia River Mines/Mills ESI, Stevens and Pend Oreille Counties, Washington has been completed. Target Analyte List metals analysis (EPA CLP SOW ILM04.1) was performed by Sentinel, Inc., Huntsville, Alabama.

The samples were numbered:

MJ0KD3	MJ0KK0	MJ0KK3	MJ0KK6	MJ0KK9	MJ0KH1
MJ0KK1	MJ0KK4	MJ0KK7	MJ0KL0	MJ0KH6	MJ0KK2
MJ0KK5	MJ0KK8				

The following discrepancy was noted:

Sample MJ0KK6 was identified as MJ0KK4 in the last section of the memorandum; sample qualifications were applied correctly, therefore no action was taken.

All sample results originally qualified "B" by the laboratory to indicate a result less than the CRDL were changed to "JBK" by the secondary reviewer to indicate an estimated quantity less than the CRDL with an unknown bias.

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

IN REPLY
REFER TO: OEA-095

November 1, 2001

MEMORANDUM

SUBJECT: Upper Columbia River/ESI Mines and Mills, CLP Metals Analysis, Data Validation
Case: 29730
SDG: MJ0KD3

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

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

CC: Bruce Woods, Region 10 CLP TPO
Mark Woodke, Ecology and Environment Inc.

The following is a validation of ICP-AES and mercury analyses of eleven soil/sediment and three water samples from the Upper Columbia River/ESI Mines and Mills site. The analyses were performed following the USEPA Contract Laboratory Program Statement of Work for Inorganics Analysis Multi-media, Multi-Concentration, ILM04.1. Analyses were conducted by Sentinel, Inc., Huntsville, Alabama. This validation was conducted for the following samples:

MJ0KD3	MJ0KK0	MJ0KK3	MJ0KK6	MJ0KK9
MJ0KH1	MJ0KK1	MJ0KK4	MJ0KK7	MJ0KL0
MJ0KH6	MJ0KK2	MJ0KK5	MJ0KK8	

Data Qualifications

The following comments refer to the Sentinel Laboratory's performance in meeting quality control specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILM04.1*. 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 09/10/01 and 09/13/01. ICP-AES analyses were completed

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between 09/27/01 and 10/02/01. Mercury analyses were completed on 09/25/01.

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 and ICP-AES analyses on 09/25/01. No qualification was made based on sample preparation.

3.0 Calibrations/Calibration Verifications -

The samples were analyzed for mercury by CVAAS on 09/25/01. The initial calibration included one blank and six standards. The curve was linear with a correlation coefficient greater than 0.995.

The samples were analyzed by ICP-AES on 09/27/01 (most analytes), 09/28/01 (re-analysis for copper and/or lead for samples affected by poor continuing calibration verification recovery or interference check sample recovery) and 10/02/01 (dilution analysis for copper in sample MJ0KK1). The instruments were standardized each day of analysis according to the analytical method using one blank and a single 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 <u>reported</u> sample results met the frequency and recovery criteria; with the exception of sodium and silver in the final CCV for the primary 09/28/01 analysis. Since both recoveries (each were 89.7%R), were so close to the acceptance criteria, no qualification was made based on ICP-AES or CVAAS calibration verification.

There was one instance of a calibration verification (CCV)/calibration blank (CCB) pair being ran after a 1.5 hour break in analysis. Since the only affected sample analyses were for the duplicate, matrix spike and post spike analyses for soil/sediment sample MJ0KK3 (the results of which compared favorably with the earlier native analysis for this sample), and since the affected analyses were immediately preceded by an acceptable CCV/CCB pair, no qualification was made based on the break in analysis/long time between CCV/CCBs.

4.0 Laboratory Control Samples - Acceptable

Laboratory Control samples (LCS) are digested and analyzed along with the samples to verify the efficiency of laboratory procedures (LCS analyses are not required for mercury in water). All recoveries associated with reported sample results met the acceptance criteria for control samples, therefore no qualification was made based on LCS results.

5.0 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, barium, calcium, copper, iron, magnesium, manganese, potassium, silver, and zinc were detected in the water preparation blank. Calcium and potassium were detected in the soil/sediment preparation blank. Aluminum, barium, calcium, chromium, iron, magnesium, manganese, and silver were detected in one or more continuing calibration blanks (CCBs). Beryllium, magnesium, and sodium in one or more CCBs had negative values with absolute values greater than the detection limits.

Based on blank contamination, the following qualifications were made:

- aluminum in sample MJ0KH6 was qualified 'U', undetected
- beryllium in samples MJ0KK4 and MJ0KL0 was qualified 'J', estimated
- chromium in sample MJ0KH1 was qualified 'U', undetected
- copper in sample MJ0KH6 was qualified 'U', undetected
- manganese in sample MJ0KH6 was qualified 'U', undetected
- silver in samples MJ0KH1 and MJ0KK5 was qualified 'U', undetected.

The remaining sample results were greater than five times the associated blank levels (or were already undetected) and were not qualified on this basis.

6.0 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 and end of each sample analysis run and recoveries must be between 80% and 120%. All ICS recoveries associated with

reported sample results were within the recovery criterion.

The raw data for a number of samples had interfering levels of calcium, magnesium, and/or iron. Analytes for which iron is an interferent were qualified as follows:

- Cadmium in sample MJ0KD3 was qualified 'UJ' estimated detection limit (possible false negative).

7.0 Duplicate Analysis -

Duplicate analysis was done on water sample MJ0KH6. Water duplicate results were within the ±20% Relative Percent Difference (RPD) or ±CRDL criteria for water results < 5 times the CRDL criteria; with the exception of iron (outside the CRDL criteria). All water iron results were qualified 'J' estimated.

Duplicate analysis was done on soil/sediment sample MJ0KK3. Soil/sediment duplicate results were within the ±35% Relative Percent Difference (RPD) or ±2xCRDL criteria for soil/sediment results < 5 times the CRDL criteria; therefore no qualification was made on this basis.

Laboratory '*' qualifiers were removed from soil/sediment arsenic results as the laboratory used the stricter water criteria to qualify soil/sediment 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 water sample MJ0KH6. All soil/sediment matrix spike recoveries were within the required QC limits; therefore water results were not qualified based on matrix spike recovery.

Matrix spike analysis was done on soil/sediment sample MJ0KK3. All soil/sediment matrix spike recoveries were within the required QC limits; with the exception of antimony (64%R) and arsenic (45.2%). All antimony and arsenic soil/sediment results were qualified 'J', estimated (low bias suspected for samples not qualified for other reasons).

9.0 ICP-AES Serial Dilution -

Water sample MJ0KH6 and soil/sediment sample MJ0KK3 were analyzed by ICP-AES serial dilution to check for potential interferences. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) were within the 10%D criteria; with the exception of

potassium in water (27.7%D) and calcium in soil/sediment (11.7%D). All water potassium results were qualified 'J', estimated. All soil/sediment calcium results were qualified 'J', estimated (unknown bias).

10.0 Detection Limits - Acceptable

Sample results which fall below the instrument detection limit (IDL) are assigned the value of the instrument detection limit and the 'U' qualifier is attached.

Contract Required Detection Limit (CRDL) standards are required for most analytes to demonstrate a linear calibration curve near the CRDL. CRDL standards were run at the required frequency.

11.0 Overall Assessment of the Data

This validation of the data is based on the criteria outlined in the *National Functional Guidelines for Inorganic Data Review (02/94)*.

The sample cooler(s) had a temperature upon receipt of 9°C. According to the sample receipt log book, all applicable pHs were within specific guidelines. Properly preserved water metals samples (pH<2) do not require cooling (40 CFR 136.2, Table II). In the reviewer's judgement, it is unlikely that the elevated temperature for soil/sediment would cause appreciable loss of metals, therefore no action was taken based on the elevated cooler temperature.

Soil/sediment sample MJ0KK4 had a very low percent solids - 19.1. The raw data was checked to make sure there wasn't a calculation error. There was no calculation error.

For soil/sediment the amount of each sample analyzed for mercury is 0.2 g, wet weight, while the amount of each sample analyzed for other metals is 1.0 gram, wet weight. With 19.1%, this means only approximately 0.038 g of solid material was analyzed for mercury and approximately 0.191 g of solid material was analyzed for the other metals. Since mercury was not detected in this sample and since such a minute amount of material was digested, the undetected mercury result for samples MJ0KK6 was qualified 'R', unusable. There were a number of detects for the ICP-AES analysis, indicating that at least some ICP analytes were measurable in the small sample aliquot. All ICP-AES analytes, including non-detects, in samples MJ0KK6 was qualified 'J', estimated (unknown bias).

There were 322 data points reported: 8 results were qualified due to blank contamination; 22 results were estimated due to matrix spike recovery; 3 results were estimated due to duplicate precision; 14 results were estimated due to serial dilution; 1 result was suspected to be a possible false negative due to high iron; 22 results were estimated due to reduced sample aliquot size; 1 result was rejected

due to extremely reduced sample aliquot size. Overall, 20.5 percent of the data was qualified (only counting one qualification per data point for those results qualified for more than one reason). **0435**

Below are the definitions for the National Functional Guidelines for Inorganic Data Review (02/94) 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 associated value. The associated value is either the sample quantitation limit or the sample detection limit.

J - The associated value is an estimated quantity.

R - The data are unusable. (Note: Analyte may or may not be present.)

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

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

L - Low bias.

H - High bias.

K - Unknown Bias.

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

MJ0KK8

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

Lab Code: SENTIN Case No.: 29730 SAS No.: SDG No.: MJ0KD3

Matrix (soil/water): SOIL Lab Sample ID: 40930S

Level (low/med): LOW Date Received: 09/19/01

% Solids: 54.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7980			P
7440-36-0	Antimony	1.1	U	~~N~~ JL	P
7440-38-2	Arsenic	3.5	JBK	~~N*~~ JL	P
7440-39-3	Barium	114			P
7440-41-7	Beryllium	0.27	JBK		P
7440-43-9	Cadmium	0.07	U		P
7440-70-2	Calcium	11900		~~E~~ JK	P
7440-47-3	Chromium	11.0			P
7440-48-4	Cobalt	5.0	JBK		P
7440-50-8	Copper	10.2			P
7439-89-6	Iron	13500			P
7439-92-1	Lead	12.9			P
7439-95-4	Magnesium	6010			P
7439-96-5	Manganese	252			P
7439-97-6	Mercury	0.09	U		CV
7440-02-0	Nickel	10.8	JBK		P
7440-09-7	Potassium	1370	JBK		P
7782-49-2	Selenium	1.3	U		P
7440-22-4	Silver	0.83	JBK		P
7440-23-5	Sodium	272	JBK		P
7440-28-0	Thallium	1.9	U		P
7440-62-2	Vanadium	17.4	JBK		P
7440-66-6	Zinc	52.5			P
	Cyanide				NR

11/01/01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

ecology and environment, inc.
International Specialists in the Environment
2101 Fourth Avenue, Suite 1900, Seattle, WA 98121
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: August 22, 2001

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

for FROM: Mark Woodke, Chemist, E & E, Seattle, WA LD

SUBJ: **Inorganic Data Quality Assurance Summary Check, Upper Columbia River Stevens and Pend Oreille Counties, Washington**

REF: TDD: 01-02-0028 PAN: 001281.0073.01SR

The data quality assurance summary review of 211 soil and 24 water samples collected from the Upper Columbia River in Stevens and Pend Oreille Counties, Washington, has been completed. These samples were analyzed for inorganic target elements and cyanide in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analyses (ILM04.0) by Sentinel, Inc. of Huntsville, AL.

The following discrepancies were noted:

In case number 29440, sample delivery group MJ0EQ5, lead was not qualified as "U" on the Forms Is as listed in the memo in the blanks section. The secondary reviewer added the "U" qualifier.

In case number 29440, sample delivery group MJ0GL0, sample MJ0GN9 was listed twice for iron in the blank section. The primary reviewer corrected the memo to list MJ0GN8 and MJ0GN9. Only the narrative requires editing.

The "B" flag indicates that the reported concentration is between the instrument detection limit (IDL) and contract required detection limit (CRDL).

All discrepancies were reported to Ms. Gina Grepo-Grove, TOPO, USEPA, Region 10 on August 22, 2001. The narrative was corrected by the primary reviewer.

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

August 15, 2001

Reply To
Attn Of: OEA-095

MEMORANDUM

Subject: Data Validation Report for the Total Inorganic Analyses of Samples from Upper Columbia River/Lake Roosevelt Expanded Site Assessment
Case: 29440 SDGs: MJ0GL0, MJ0EQ5, MJ0GG6, MJ0ES7, MJ0FK6, MJ0FJ0, MJ0EW6, MJ0GE0, MJ0GJ5, MJ0GM7, MJ0EQ6, MJ0EN5, MJ0EY7,

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

To: Monica Tonel, SAM, ECL

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

The quality assurance (QA) review of 211 soil and 24 water samples collected from the above referenced site has been completed. These samples were analyzed for full inorganic target compounds in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Inorganic Analyses (revision ILM04.1). The analyses were performed by Sentinel, Inc of Huntsville, AL. The data validations were performed by the Environmental Services Assistance Team (ESAT) of the USEPA Manchester Environmental Laboratory, Port Orchard, WA.

There were no significant problems encountered with the data. A total of 5405 data points were reviewed and evaluated. Approximately 0.35% of the total data points were qualified as unusable due to extremely low matrix recoveries. Approximately 17% of the total data points were qualified as estimated due to serial dilution results, contamination in the blanks and/or poor matrix spike recoveries. Additional 2.9% of the total data points were qualified as non-detects due to contamination in the blank. All of the samples were analyzed in accordance with the technical requirements specified in the SOW. Data as qualified can be used for all purposes.

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

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ENVIRONMENTAL SERVICES ASSISTANCE TEAM

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

0439

DELIVERABLE NARRATIVE

DATE: August 6, 2001

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

THROUGH: Dave Dobb, Team Manager, ESAT Region 10 CMC for DD.

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

SUBJECT: Data Validation Report for the Inorganic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: MJ0EY7

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1127
TDN: 1048
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 20 soil samples collected from the above referenced site has been completed. These samples were analyzed for total metals by Sentinel, Inc. of Huntsville, AL. The following samples were reviewed in this validation report:

MJ0EY7	MJ0EZ2	MJ0GL3	MJ0GL8
MJ0EY8	MJ0EZ3	MJ0GL4	MJ0GM0
MJ0EY9	MJ0F12	MJ0GL5	MJ0GM2
MJ0EZ0	MJ0GL1	MJ0GL6	MJ0GM3
MJ0EZ1	MJ0GL2	MJ0GL7	MJ0GM5

DATA QUALIFICATIONS

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

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

Holding Time - Acceptable

The suggested holding time for mercury is 28 days from the date of sample collection and the holding time for the rest of the metals is 180 days. The samples were collected on 6/23, 6/25, 6/26 and 6/27/01. The samples were analyzed for mercury within 19 days and all other metals within 24 days of the sample collection date. None of the data were qualified on this basis.

Sample Preparation - Acceptable

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

Initial Calibration - Acceptable

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

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

None of the data were qualified on this basis.

Calibration Verification - Acceptable

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

Detection Limits - Acceptable

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

Blanks

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

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

Analyte	Associated Samples
cadmium	MJ0EY9, MJ0GL3, MJ0GL8, MJ0GM2, MJ0GM5
sodium	MJ0EY8
silver	MJ0EY7, MJ0EY8, MJ0EY9, MJ0EZ0, MJ0EZ1, MJ0EZ2, MJ0EZ3, MJ0GL8, MJ0GM0, MJ0GM2, MJ0GM3, MJ0GM5

Analytes which yielded a negative response in the preparation blank and/or continuing calibration blank(s) at concentrations comparable to or less than the absolute value of the blank(s) were qualified as estimated, "J/UJ", due to possible low bias. The following samples were qualified: 0441

Analyte	Associated Samples
selenium	All

ICP-AES Interference Check Sample - Acceptable

The ICP-AES interference check samples (ICS) were analyzed to verify inter-element and background correction factors. The frequency of analysis (beginning and end of sequence) and recovery criteria (80-120%) were met. The recoveries ranged from 91-118%. None of the data were qualified on this basis.

ICP-AES Serial Dilution Analysis

Sample MJ0EY9 was analyzed for serial dilution. All of the analytes which exceeded the minimum concentration criterion (50 times the IDL) agreed within 10% difference with the exception of calcium and magnesium. Results for calcium and magnesium in all samples were qualified as estimated, "J". The "E" qualifiers applied by the laboratory were crossed-out by the reviewer.

Laboratory Control Sample - Acceptable

The frequency of analysis and the recovery criteria for the laboratory control sample was met. The recoveries ranged from 64-172%. None of the data were qualified on this basis.

Duplicate Sample Analysis - Acceptable

Sample MJ0EY9 was utilized for duplicate analysis. The duplicate results met the frequency of analysis and method control limit criteria (±20% RPD or ± CRDL) for all target analytes with the exception of zinc. Zinc did meet the suggested technical control limit criteria (±35% RPD or ± 2X CRDL) for soils. The "*" qualifiers applied by the laboratory were crossed-out by the reviewer. None of the data were qualified on this basis.

Matrix Spike Analysis

Sample MJ0EY9 was used for the spike analysis. The frequency of analysis and recovery criteria were met with the exception of manganese (126%) and selenium (67%) in the spike sample MJ0EY9S. Due to possible bias, the detected and non-detected selenium results in all samples were qualified as estimated, "J/UJ". Due to possible bias, the detected manganese results in all samples were qualified as estimated, "J". The "N" qualifiers applied by the laboratory were crossed-out by the reviewer. All of the other spike recoveries were acceptable and ranged from 80-104%.

0442

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 460. Eighteen (3.9%) were qualified as non-detected due to blank contamination. Eighty (17%) were qualified as estimated due to negative blanks, ICP serial dilution and spike analyses.

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

DATA QUALIFIERS

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

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0443
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL1

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39261S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 78.5

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	10700			P
7440-36-0	Antimony	1.2	B		P
7440-38-2	Arsenic	5.8			P
7440-39-3	Barium	123			P
7440-41-7	Beryllium	0.30	B		P
7440-43-9	Cadmium	0.51	B		P
7440-70-2	Calcium	24400		E JL	P
7440-47-3	Chromium	23.9			P
7440-48-4	Cobalt	8.5	B		P
7440-50-8	Copper	32.1			P
7439-89-6	Iron	21700			P
7439-92-1	Lead	28.1			P
7439-95-4	Magnesium	11200		E JL	P
7439-96-5	Manganese	429		N JH	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	19.2			P
7440-09-7	Potassium	1730			P
7782-49-2	Selenium	0.87	U	N UJK	P
7440-22-4	Silver	0.75	B		P
7440-23-5	Sodium	358	B		P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	41.6			P
7440-66-6	Zinc	130			P
	Cyanide				NR

cp 8-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

FORM I - IN ILM04.1

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U.S. EPA - CLP
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0444
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL2

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39262S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 37.9

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2470			P
7440-36-0	Antimony	2.4	B		P
7440-38-2	Arsenic	2.4	U		P
7440-39-3	Barium	105	B		P
7440-41-7	Beryllium	0.07	B		P
7440-43-9	Cadmium	1.3	B		P
7440-70-2	Calcium	206000		~~E~~ JL	P
7440-47-3	Chromium	57.7			P
7440-48-4	Cobalt	1.3	B		P
7440-50-8	Copper	20.3			P
7439-89-6	Iron	3240			P
7439-92-1	Lead	7.1			P
7439-95-4	Magnesium	3060		~~E~~ JL	P
7439-96-5	Manganese	93.7		~~N~~ JH	P
7439-97-6	Mercury	0.13	U		CV
7440-02-0	Nickel	8.0	B		P
7440-09-7	Potassium	333	B		P
7782-49-2	Selenium	4.9		~~N~~ JL	P
7440-22-4	Silver	0.39	B		P
7440-23-5	Sodium	763	B		P
7440-28-0	Thallium	2.7	U		P
7440-62-2	Vanadium	6.4	B		P
7440-66-6	Zinc	58.2			P
	Cyanide				NR

CP 8-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
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0445
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL3

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39263S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 76.1

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8410			P
7440-36-0	Antimony	0.82	B		P
7440-38-2	Arsenic	4.9			P
7440-39-3	Barium	85.6			P
7440-41-7	Beryllium	0.24	B		P
7440-43-9	Cadmium	0.09	B	U	P
7440-70-2	Calcium	2350		JL	P
7440-47-3	Chromium	19.7			P
7440-48-4	Cobalt	6.5	B		P
7440-50-8	Copper	23.5			P
7439-89-6	Iron	14400			P
7439-92-1	Lead	9.4			P
7439-95-4	Magnesium	4660		JL	P
7439-96-5	Manganese	217		JH	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	15.6			P
7440-09-7	Potassium	1340			P
7782-49-2	Selenium	0.88	U	UJK	P
7440-22-4	Silver	0.55	B		P
7440-23-5	Sodium	349	B		P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	32.8			P
7440-66-6	Zinc	54.0			P
	Cyanide				NR

UP 8-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
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0446
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL4

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39264S

Level (low/med): LOW Date Received: 06/30/01

% 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	3850			P
7440-36-0	Antimony	2.4	B		P
7440-38-2	Arsenic	5.6			P
7440-39-3	Barium	91.0			P
7440-41-7	Beryllium	0.21	B		P
7440-43-9	Cadmium	6.1			P
7440-70-2	Calcium	59800		~~E~~ JL	P
7440-47-3	Chromium	86.2			P
7440-48-4	Cobalt	4.0	B		P
7440-50-8	Copper	17.7			P
7439-89-6	Iron	9400			P
7439-92-1	Lead	38.7			P
7439-95-4	Magnesium	12100		~~E~~ JL	P
7439-96-5	Manganese	246		~~N~~ JH	P
7439-97-6	Mercury	0.09	U		CV
7440-02-0	Nickel	35.2			P
7440-09-7	Potassium	938	B		P
7782-49-2	Selenium	1.2	U	~~N~~ UJK	P
7440-22-4	Silver	0.52	B		P
7440-23-5	Sodium	462	B		P
7440-28-0	Thallium	1.8	U		P
7440-62-2	Vanadium	42.9			P
7440-66-6	Zinc	342		+	P
	Cyanide				NR

CP 8-6-01

Color Before: BLACK Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
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0447
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL5

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39265S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 39.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6610			P
7440-36-0	Antimony	2.3	B		P
7440-38-2	Arsenic	16.2			P
7440-39-3	Barium	99.7	B		P
7440-41-7	Beryllium	0.23	B		P
7440-43-9	Cadmium	1.0	B		P
7440-70-2	Calcium	14700		~~E~~ JL	P
7440-47-3	Chromium	13.8			P
7440-48-4	Cobalt	6.1	B		P
7440-50-8	Copper	16.3			P
7439-89-6	Iron	16200			P
7439-92-1	Lead	23.2			P
7439-95-4	Magnesium	7580		~~E~~ JL	P
7439-96-5	Manganese	517		~~N~~ JH	P
7439-97-6	Mercury	0.12	U		CV
7440-02-0	Nickel	22.7			P
7440-09-7	Potassium	1170	B		P
7782-49-2	Selenium	1.7	U	~~N~~ UJK	P
7440-22-4	Silver	0.75	B		P
7440-23-5	Sodium	669	B		P
7440-28-0	Thallium	2.6	U		P
7440-62-2	Vanadium	33.0			P
7440-66-6	Zinc	163			P
	Cyanide				NR

CP 8-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

FORM I - IN ILM04.1

15

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL6

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39266S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 28.1

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2220			P
7440-36-0	Antimony	2.1	U		P
7440-38-2	Arsenic	3.3	U		P
7440-39-3	Barium	109	B		P
7440-41-7	Beryllium	0.07	U		P
7440-43-9	Cadmium	1.8	B		P
7440-70-2	Calcium	342000		~~E~~ JL	P
7440-47-3	Chromium	8.2			P
7440-48-4	Cobalt	1.4	B		P
7440-50-8	Copper	15.8	B		P
7439-89-6	Iron	4170			P
7439-92-1	Lead	12.7			P
7439-95-4	Magnesium	5680		~~E~~ JL	P
7439-96-5	Manganese	217		~~N~~ JH	P
7439-97-6	Mercury	0.18	U		CV
7440-02-0	Nickel	5.6	B		P
7440-09-7	Potassium	533	B		P
7782-49-2	Selenium	2.4	U	~~N~~ UJK	P
7440-22-4	Silver	0.21	U		P
7440-23-5	Sodium	975	B		P
7440-28-0	Thallium	3.6	U		P
7440-62-2	Vanadium	8.6	B		P
7440-66-6	Zinc	49.3		~~J~~	P
	Cyanide				NR

CP 8-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
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0449

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL7

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39267S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 79.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3530			P
7440-36-0	Antimony	0.72	U		P
7440-38-2	Arsenic	8.3			P
7440-39-3	Barium	48.1	B		P
7440-41-7	Beryllium	0.18	B		P
7440-43-9	Cadmium	0.40	B		P
7440-70-2	Calcium	49100		~~E~~ JL	P
7440-47-3	Chromium	7.0			P
7440-48-4	Cobalt	4.6	B		P
7440-50-8	Copper	12.0			P
7439-89-6	Iron	14200			P
7439-92-1	Lead	13.6			P
7439-95-4	Magnesium	27100		~~E~~ JL	P
7439-96-5	Manganese	209		~~N~~ JH	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	20.7			P
7440-09-7	Potassium	990	B		P
7782-49-2	Selenium	0.84	U	~~N~~ UJK	P
7440-22-4	Silver	0.38	B		P
7440-23-5	Sodium	318	B		P
7440-28-0	Thallium	1.3	U		P
7440-62-2	Vanadium	9.0	B		P
7440-66-6	Zinc	107		~~E~~	P
	Cyanide				NR

CP 8-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
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0450

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GL8

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39268S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 75.2

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6950			P
7440-36-0	Antimony	1.4	B		P
7440-38-2	Arsenic	5.0			P
7440-39-3	Barium	44.5	B		P
7440-41-7	Beryllium	0.17	B		P
7440-43-9	Cadmium	0.11	~~B~~	U	P
7440-70-2	Calcium	3400		~~E~~ JL	P
7440-47-3	Chromium	17.1			P
7440-48-4	Cobalt	6.5	B		P
7440-50-8	Copper	21.8			P
7439-89-6	Iron	14200			P
7439-92-1	Lead	8.3			P
7439-95-4	Magnesium	4450		~~E~~ JL	P
7439-96-5	Manganese	209		~~N~~ JH	P
7439-97-6	Mercury	0.06	U		CV
7440-02-0	Nickel	14.1			P
7440-09-7	Potassium	978	B		P
7782-49-2	Selenium	0.90	U	~~N~~ UJK	P
7440-22-4	Silver	0.57	~~B~~	U	P
7440-23-5	Sodium	392	B		P
7440-28-0	Thallium	1.4	U		P
7440-62-2	Vanadium	31.5			P
7440-66-6	Zinc	43.8		~~E~~	P
	Cyanide				NR

CP 8-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

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17A

U.S. EPA - CLP
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0451

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM0

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39269S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 41.1

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3310			P
7440-36-0	Antimony	2.1	B		P
7440-38-2	Arsenic	13.1			P
7440-39-3	Barium	250			P
7440-41-7	Beryllium	0.13	B		P
7440-43-9	Cadmium	6.1			P
7440-70-2	Calcium	209000		~~E~~ JL	P
7440-47-3	Chromium	9.2			P
7440-48-4	Cobalt	5.7	B		P
7440-50-8	Copper	28.4			P
7439-89-6	Iron	31100			P
7439-92-1	Lead	346			P
7439-95-4	Magnesium	42200		~~E~~ JL	P
7439-96-5	Manganese	1970		~~N~~ JH	P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	40.4			P
7440-09-7	Potassium	2410	B		P
7782-49-2	Selenium	1.6	U	~~N~~ UJK	P
7440-22-4	Silver	0.74	~~B~~ U		P
7440-23-5	Sodium	578	B		P
7440-28-0	Thallium	2.5	U		P
7440-62-2	Vanadium	12.2	B		P
7440-66-6	Zinc	2370			P
	Cyanide				NR

DP 9-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

U.S. EPA - CLP
1

0452

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM2

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39270S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 85.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4250			P
7440-36-0	Antimony	0.90	B		P
7440-38-2	Arsenic	3.2			P
7440-39-3	Barium	44.7	B		P
7440-41-7	Beryllium	0.11	B		P
7440-43-9	Cadmium	0.27	B	U	P
7440-70-2	Calcium	8600		E JL	P
7440-47-3	Chromium	6.0			P
7440-48-4	Cobalt	3.4	B		P
7440-50-8	Copper	24.4			P
7439-89-6	Iron	9160			P
7439-92-1	Lead	23.6			P
7439-95-4	Magnesium	5930		E JL	P
7439-96-5	Manganese	160		N JH	P
7439-97-6	Mercury	0.05	U		CV
7440-02-0	Nickel	7.8	B		P
7440-09-7	Potassium	682	B		P
7782-49-2	Selenium	0.80	U	N UJK	P
7440-22-4	Silver	0.28	B	U	P
7440-23-5	Sodium	272	B		P
7440-28-0	Thallium	1.2	U		P
7440-62-2	Vanadium	15.4			P
7440-66-6	Zinc	160		+	P
	Cyanide				NR

8-6-01

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

FORM I - IN ILM04.1

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U.S. EPA - CLP
1

0453
EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM3

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39271S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 60.9

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7660			P
7440-36-0	Antimony	1.2	B		P
7440-38-2	Arsenic	3.0	B		P
7440-39-3	Barium	89.7			P
7440-41-7	Beryllium	0.27	B		P
7440-43-9	Cadmium	0.88	B		P
7440-70-2	Calcium	12100		~~E~~ JL	P
7440-47-3	Chromium	17.1			P
7440-48-4	Cobalt	5.6	B		P
7440-50-8	Copper	19.7			P
7439-89-6	Iron	14500			P
7439-92-1	Lead	38.5			P
7439-95-4	Magnesium	7540		~~E~~ JL	P
7439-96-5	Manganese	188		~~N~~ JH	P
7439-97-6	Mercury	0.08	U		CV
7440-02-0	Nickel	14.5			P
7440-09-7	Potassium	1180	B		P
7782-49-2	Selenium	1.1	U	~~N~~UJK	P
7440-22-4	Silver	0.46	~~B~~ U		P
7440-23-5	Sodium	418	B		P
7440-28-0	Thallium	1.7	U		P
7440-62-2	Vanadium	21.4			P
7440-66-6	Zinc	205		~~J~~	P
	Cyanide				NR

CP 8-6-01

Color Before: BLACK Clarity Before: Texture: MEDIUM

Color After: YELLOW Clarity After: Artifacts:

Comments:

FORM I - IN ILM04.1

28

0451

EPA SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

MJ0GM5

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

Lab Code: SENTIN Case No.: 29440 SAS No.: SDG No.: MJ0EY7

Matrix (soil/water): SOIL Lab Sample ID: 39272S

Level (low/med): LOW Date Received: 06/30/01

% Solids: 89.3

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

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3160			P
7440-36-0	Antimony	0.64	U		P
7440-38-2	Arsenic	4.5			P
7440-39-3	Barium	44.6			P
7440-41-7	Beryllium	0.11	B		P
7440-43-9	Cadmium	0.34	B	U	P
7440-70-2	Calcium	27500		E JL	P
7440-47-3	Chromium	7.1			P
7440-48-4	Cobalt	2.5	B		P
7440-50-8	Copper	8.1			P
7439-89-6	Iron	7810			P
7439-92-1	Lead	43.5			P
7439-95-4	Magnesium	15000		E JL	P
7439-96-5	Manganese	209		N JH	P
7439-97-6	Mercury	0.05	U		CV
7440-02-0	Nickel	5.9	B		P
7440-09-7	Potassium	427	B		P
7782-49-2	Selenium	0.75	U	NUJK	P
7440-22-4	Silver	0.20	B	U	P
7440-23-5	Sodium	244	B		P
7440-28-0	Thallium	1.1	U		P
7440-62-2	Vanadium	9.3	B		P
7440-66-6	Zinc	152		J	P
	Cyanide				NR

CP 8-6-01

Color Before: BROWN Clarity Before: Texture: COARSE

Color After: YELLOW Clarity After: Artifacts:

Comments:

ENVIRONMENTAL SERVICES ASSISTANCE TEAM

0455

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

DELIVERABLE NARRATIVE

DATE: August 13, 2001

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

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

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

SUBJECT: Data Validation Report for the Organic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: J0EQ6

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1138
TDN: 1050
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 20 soil samples collected from the above referenced site has been completed. The samples were analyzed for Pest/PCB in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analyses (OLM04.2) by Envirosystems, Inc. of Columbia, MD.

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the USEPA CLP SOW for Organic Analysis (OLM04.2), the USEPA CLP National Functional Guidelines for Organic Data Review (10/99) and the Region 10 Guidelines for CLP Data Review.

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

Holding Time - Acceptable

All of the samples met the method and technical (40 CFR 136) required holding times with the exception of samples J0ET3, J0ET4 and J0ET5. These samples were extracted 15 days from the sample collection date which only slightly exceeded the suggested technical holding time of 14 days for soils. None of the data were qualified on this basis. The Holding Times Summary listing the pertinent collection, extraction, and analysis dates is attached at the end of this validation report.

Instrument Performance - Acceptable

The GC system met the SOW specified technical acceptance criteria prior to sample analyses, i.e., GC performance checks, retention times, and calibrations. The system remained stable throughout the course of analyses. Instrument blanks were all clean and there were no indications of carry-over.

0456

Initial Calibrations - Acceptable

One Pest/PCB initial calibration was performed. The initial calibration met the SOW technical acceptance criteria.

Continuing Calibration Verification (CCVs) Standards - Acceptable

All of the CCVs met the criteria for frequency of analysis, the retention time and the percent differences (%Ds) criteria.

Compound Quantitation and Detection Limits - Acceptable

All of the samples were analyzed at the contract required quantitation limits (CRQLs). Target compounds that were detected at concentrations less than the CRQLs were qualified as estimated, "J". All of the reported results were adjusted for sample amounts analyzed.

Blanks - Acceptable

No target analytes were detected in any of the method or instrument blanks.

Analytical Sequence - Acceptable

All of the standards, blanks, samples, and QC samples were analyzed in accordance with the SOW specified analytical sequence.

Surrogate Spikes - Acceptable

All of the Pest/PCB surrogate spike recoveries met the applicable QC criteria (30-150%).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Acceptable

Pest/PCB sample J0EQ6 was utilized for MS/MSD analyses. The criteria for frequency of analysis, recoveries and RPDs were met.

Sample Clean-up - Acceptable

The pesticide florisil cartridge and GPC calibration checks met the criteria for frequency of analysis and recovery with the following exception:

Endrin had a recovery of 117% in one of the GPC calibration checks which was above the upper QC limit of 110%. Sample results were not affected and therefore, none of the data were qualified on this basis.

Compound Identification

Single component pesticides and aroclors were qualified as follows: where %Ds (between two column concentrations) >30% but ≤60% - detected results were qualified as estimated, "J"; %Ds >60% with concentrations >CRQL - results were qualified as tentatively identified at the estimated concentration , "JN"; %Ds >60% with concentrations <CRQL - results were qualified as non-detects, "U", at the CRQL; %Ds >400% - results were qualified as non-detects with raised quantitation limit if >CRQL.

0457

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 560. All data points were qualified as non-detected, "U".

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

Data Qualifiers

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

Holding Time Summary - Case 29440 **SDG: J0EQ6**

0458

Sample Number	Collection Date	VTSR*	Pest/PCB Extraction	Pest/PCB Analysis
J0EQ6	6/20/01	6/22/01	6/27/01	7/19/01
J0ET3	6/21/01	6/28/01	7/6/01	7/18/01
J0ET4	6/21/01	6/28/01	7/6/01	7/18/01
J0ET5	6/21/01	6/28/01	7/6/01	7/19/01
J0EW5	6/21/01	6/28/01	7/6/01	7/19/01
J0EZ4	6/23/01	6/28/01	7/6/01	7/19/01
J0EZ5	6/23/01	6/28/01	7/6/01	7/19/01
J0EZ6	6/24/01	6/28/01	7/6/01	7/19/01
J0F08	6/25/01	6/28/01	7/6/01	7/19/01
J0F09	6/25/01	6/28/01	7/6/01	7/19/01
J0F14	6/26/01	6/30/01	7/6/01	7/19/01
J0F16	6/26/01	6/30/01	7/6/01	7/19/01
J0F18	6/27/01	6/30/01	7/6/01	7/19/01
J0F19	6/27/01	6/30/01	7/6/01	7/19/01
J0FJ1	6/23/01	6/28/01	7/6/01	7/19/01
J0FJ2	6/23/01	6/28/01	7/6/01	7/19/01
J0FK0	6/23/01	6/28/01	7/6/01	7/19/01
J0FK4	6/26/01	6/28/01	7/6/01	7/19/01
J0FK5	6/26/01	6/28/01	7/6/01	7/19/01
J0FL2	6/28/01	6/30/01	7/6/01	7/19/01

*VTSR - Verified time of sample receipt in the laboratory.

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J0F08

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0EQ6

Matrix: (soil/water) SOIL Lab Sample ID: 01061682

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 53 decanted: (Y/N) N Date Received: 06/28/01

Extraction: (Type) SONC Date Extracted: 07/06/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 7.7 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	3.6	U
319-85-7	beta-BHC	3.6	U
319-86-8	delta-BHC	3.6	U
58-89-9	gamma-BHC (Lindane)	3.6	U
76-44-8	Heptachlor	3.6	U
309-00-2	Aldrin	3.6	U
1024-57-3	Heptachlor epoxide	3.6	U
959-98-8	Endosulfan I	3.6	U
60-57-1	Dieldrin	7.0	U
72-55-9	4,4'-DDE	7.0	U
72-20-8	Endrin	7.0	U
33213-65-9	Endosulfan II	7.0	U
72-54-8	4,4'-DDD	7.0	U
1031-07-8	Endosulfan sulfate	7.0	U
50-29-3	4,4'-DDT	7.0	U
72-43-5	Methoxychlor	36	U
53494-70-5	Endrin ketone	7.0	U
7421-93-4	Endrin aldehyde	7.0	U
5103-71-9	alpha-Chlordane	3.6	U
5103-74-2	gamma-Chlordane	3.6	U
8001-35-2	Toxaphene	360	U
12674-11-2	Aroclor-1016	70	U
11104-28-2	Aroclor-1221	140	U
11141-16-5	Aroclor-1232	70	U
53469-21-9	Aroclor-1242	70	U
12672-29-6	Aroclor-1248	70	U
11097-69-1	Aroclor-1254	70	U
11096-82-5	Aroclor-1260	70	U

8-13-01

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J0F09

0460

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0EQ6

Matrix: (soil/water) SOIL Lab Sample ID: 01061683

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 27 decanted: (Y/N) N Date Received: 06/28/01

Extraction: (Type) SONC Date Extracted: 07/06/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 8.5 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.3	U
319-85-7	beta-BHC	2.3	U
319-86-8	delta-BHC	2.3	U
58-89-9	gamma-BHC (Lindane)	2.3	U
76-44-8	Heptachlor	2.3	U
309-00-2	Aldrin	2.3	U
1024-57-3	Heptachlor epoxide	2.3	U
959-98-8	Endosulfan I	2.3	U
60-57-1	Dieldrin	4.5	U
72-55-9	4,4'-DDE	4.5	U
72-20-8	Endrin	4.5	U
33213-65-9	Endosulfan II	4.5	U
72-54-8	4,4'-DDD	4.5	U
1031-07-8	Endosulfan sulfate	4.5	U
50-29-3	4,4'-DDT	4.5	U
72-43-5	Methoxychlor	23	U
53494-70-5	Endrin ketone	4.5	U
7421-93-4	Endrin aldehyde	4.5	U
5103-71-9	alpha-Chlordane	2.3	U
5103-74-2	gamma-Chlordane	2.3	U
8001-35-2	Toxaphene	230	U
12674-11-2	Aroclor-1016	45	U
11104-28-2	Aroclor-1221	92	U
11141-16-5	Aroclor-1232	45	U
53469-21-9	Aroclor-1242	45	U
12672-29-6	Aroclor-1248	45	U
11097-69-1	Aroclor-1254	45	U
11096-82-5	Aroclor-1260	45	U

8-15-01

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J0F14

0461

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0EQ6

Matrix: (soil/water) SOIL Lab Sample ID: 01061719

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 47 decanted: (Y/N) N Date Received: 06/30/01

Extraction: (Type) SONC Date Extracted: 07/06/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 7.8 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	3.2	U
319-85-7	beta-BHC	3.2	U
319-86-8	delta-BHC	3.2	U
58-89-9	gamma-BHC (Lindane)	3.2	U
76-44-8	Heptachlor	3.2	U
309-00-2	Aldrin	3.2	U
1024-57-3	Heptachlor epoxide	3.2	U
959-98-8	Endosulfan I	3.2	U
60-57-1	Dieldrin	6.2	U
72-55-9	4,4'-DDE	6.2	U
72-20-8	Endrin	6.2	U
33213-65-9	Endosulfan II	6.2	U
72-54-8	4,4'-DDD	6.2	U
1031-07-8	Endosulfan sulfate	6.2	U
50-29-3	4,4'-DDT	6.2	U
72-43-5	Methoxychlor	32	U
53494-70-5	Endrin ketone	6.2	U
7421-93-4	Endrin aldehyde	6.2	U
5103-71-9	alpha-Chlordane	3.2	U
5103-74-2	gamma-Chlordane	3.2	U
8001-35-2	Toxaphene	320	U
12674-11-2	Aroclor-1016	62	U
11104-28-2	Aroclor-1221	130	U
11141-16-5	Aroclor-1232	62	U
53469-21-9	Aroclor-1242	62	U
12672-29-6	Aroclor-1248	62	U
11097-69-1	Aroclor-1254	62	U
11096-82-5	Aroclor-1260	62	U

CP 8-13-01

FORM I PEST. OLM04.2

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0462

J0F16

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0EQ6

Matrix: (soil/water) SOIL Lab Sample ID: 01061720

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 17 decanted: (Y/N) N Date Received: 06/30/01

Extraction: (Type) SONC Date Extracted: 07/06/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 8.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.0	U
319-85-7	beta-BHC	2.0	U
319-86-8	delta-BHC	2.0	U
58-89-9	gamma-BHC (Lindane)	2.0	U
76-44-8	Heptachlor	2.0	U
309-00-2	Aldrin	2.0	U
1024-57-3	Heptachlor epoxide	2.0	U
959-98-8	Endosulfan I	2.0	U
60-57-1	Dieldrin	4.0	U
72-55-9	4,4'-DDE	4.0	U
72-20-8	Endrin	4.0	U
33213-65-9	Endosulfan II	4.0	U
72-54-8	4,4'-DDD	4.0	U
1031-07-8	Endosulfan sulfate	4.0	U
50-29-3	4,4'-DDT	4.0	U
72-43-5	Methoxychlor	20	U
53494-70-5	Endrin ketone	4.0	U
7421-93-4	Endrin aldehyde	4.0	U
5103-71-9	alpha-Chlordane	2.0	U
5103-74-2	gamma-Chlordane	2.0	U
8001-35-2	Toxaphene	200	U
12674-11-2	Aroclor-1016	40	U
11104-28-2	Aroclor-1221	81	U
11141-16-5	Aroclor-1232	40	U
53469-21-9	Aroclor-1242	40	U
12672-29-6	Aroclor-1248	40	U
11097-69-1	Aroclor-1254	40	U
11096-82-5	Aroclor-1260	40	U

8-13-01

FORM I PEST. OLM04.2

0085

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J0F18

0463

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0EQ6

Matrix: (soil/water) SOIL Lab Sample ID: 01061721

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 17 decanted: (Y/N) N Date Received: 06/30/01

Extraction: (Type) SONC Date Extracted: 07/06/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 8.1 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.0	U
319-85-7	beta-BHC	2.0	U
319-86-8	delta-BHC	2.0	U
58-89-9	gamma-BHC (Lindane)	2.0	U
76-44-8	Heptachlor	2.0	U
309-00-2	Aldrin	2.0	U
1024-57-3	Heptachlor epoxide	2.0	U
959-98-8	Endosulfan I	2.0	U
60-57-1	Dieldrin	4.0	U
72-55-9	4,4'-DDE	4.0	U
72-20-8	Endrin	4.0	U
33213-65-9	Endosulfan II	4.0	U
72-54-8	4,4'-DDD	4.0	U
1031-07-8	Endosulfan sulfate	4.0	U
50-29-3	4,4'-DDT	4.0	U
72-43-5	Methoxychlor	20	U
53494-70-5	Endrin ketone	4.0	U
7421-93-4	Endrin aldehyde	4.0	U
5103-71-9	alpha-Chlordane	2.0	U
5103-74-2	gamma-Chlordane	2.0	U
8001-35-2	Toxaphene	200	U
12674-11-2	Aroclor-1016	40	U
11104-28-2	Aroclor-1221	81	U
11141-16-5	Aroclor-1232	40	U
53469-21-9	Aroclor-1242	40	U
12672-29-6	Aroclor-1248	40	U
11097-69-1	Aroclor-1254	40	U
11096-82-5	Aroclor-1260	40	U

CP 8-13-01

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J0F19

0464

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0EQ6

Matrix: (soil/water) SOIL Lab Sample ID: 01061722

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 44 decanted: (Y/N) N Date Received: 06/30/01

Extraction: (Type) SONC Date Extracted: 07/06/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 7.6 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	3.0	U
319-85-7	beta-BHC	3.0	U
319-86-8	delta-BHC	3.0	U
58-89-9	gamma-BHC (Lindane)	3.0	U
76-44-8	Heptachlor	3.0	U
309-00-2	Aldrin	3.0	U
1024-57-3	Heptachlor epoxide	3.0	U
959-98-8	Endosulfan I	3.0	U
60-57-1	Dieldrin	5.9	U
72-55-9	4,4'-DDE	5.9	U
72-20-8	Endrin	5.9	U
33213-65-9	Endosulfan II	5.9	U
72-54-8	4,4'-DDD	5.9	U
1031-07-8	Endosulfan sulfate	5.9	U
50-29-3	4,4'-DDT	5.9	U
72-43-5	Methoxychlor	30	U
53494-70-5	Endrin ketone	5.9	U
7421-93-4	Endrin aldehyde	5.9	U
5103-71-9	alpha-Chlordane	3.0	U
5103-74-2	gamma-Chlordane	3.0	U
8001-35-2	Toxaphene	300	U
12674-11-2	Aroclor-1016	59	U
11104-28-2	Aroclor-1221	120	U
11141-16-5	Aroclor-1232	59	U
53469-21-9	Aroclor-1242	59	U
12672-29-6	Aroclor-1248	59	U
11097-69-1	Aroclor-1254	59	U
11096-82-5	Aroclor-1260	59	U

8-13-01

FORM I PEST OLM04.2

0093

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. 0465

J0FK4

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0EQ6

Matrix: (soil/water) SOIL Lab Sample ID: 01061687

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 27 decanted: (Y/N) N Date Received: 06/28/01

Extraction: (Type) SONC Date Extracted: 07/06/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 7.6 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.3	U
319-85-7	beta-BHC	2.3	U
319-86-8	delta-BHC	2.3	U
58-89-9	gamma-BHC (Lindane)	2.3	U
76-44-8	Heptachlor	2.3	U
309-00-2	Aldrin	2.3	U
1024-57-3	Heptachlor epoxide	2.3	U
959-98-8	Endosulfan I	2.3	U
60-57-1	Dieldrin	4.5	U
72-55-9	4,4'-DDE	4.5	U
72-20-8	Endrin	4.5	U
33213-65-9	Endosulfan II	4.5	U
72-54-8	4,4'-DDD	4.5	U
1031-07-8	Endosulfan sulfate	4.5	U
50-29-3	4,4'-DDT	4.5	U
72-43-5	Methoxychlor	23	U
53494-70-5	Endrin ketone	4.5	U
7421-93-4	Endrin aldehyde	4.5	U
5103-71-9	alpha-Chlordane	2.3	U
5103-74-2	gamma-Chlordane	2.3	U
8001-35-2	Toxaphene	230	U
12674-11-2	Aroclor-1016	45	U
11104-28-2	Aroclor-1221	92	U
11141-16-5	Aroclor-1232	45	U
53469-21-9	Aroclor-1242	45	U
12672-29-6	Aroclor-1248	45	U
11097-69-1	Aroclor-1254	45	U
11096-82-5	Aroclor-1260	45	U

CR 8-15-01

FORM I PEST OLM04.2

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

0466

J0FK5

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0EQ6

Matrix: (soil/water) SOIL Lab Sample ID: 01061688

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 28 decanted: (Y/N) N Date Received: 06/28/01

Extraction: (Type) SONC Date Extracted: 07/06/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 8.2 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.4	U
319-85-7	beta-BHC	2.4	U
319-86-8	delta-BHC	2.4	U
58-89-9	gamma-BHC (Lindane)	2.4	U
76-44-8	Heptachlor	2.4	U
309-00-2	Aldrin	2.4	U
1024-57-3	Heptachlor epoxide	2.4	U
959-98-8	Endosulfan I	2.4	U
60-57-1	Dieldrin	4.6	U
72-55-9	4,4'-DDE	4.6	U
72-20-8	Endrin	4.6	U
33213-65-9	Endosulfan II	4.6	U
72-54-8	4,4'-DDD	4.6	U
1031-07-8	Endosulfan sulfate	4.6	U
50-29-3	4,4'-DDT	4.6	U
72-43-5	Methoxychlor	24	U
53494-70-5	Endrin ketone	4.6	U
7421-93-4	Endrin aldehyde	4.6	U
5103-71-9	alpha-Chlordane	2.4	U
5103-74-2	gamma-Chlordane	2.4	U
8001-35-2	Toxaphene	240	U
12674-11-2	Aroclor-1016	46	U
11104-28-2	Aroclor-1221	93	U
11141-16-5	Aroclor-1232	46	U
53469-21-9	Aroclor-1242	46	U
12672-29-6	Aroclor-1248	46	U
11097-69-1	Aroclor-1254	46	U
11096-82-5	Aroclor-1260	46	U

8-13-01

FORM I PEST OLM04.2

ENVIRONMENTAL SERVICES ASSISTANCE TEAM

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

0467

DELIVERABLE NARRATIVE

DATE: August 14, 2001

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

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

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

SUBJECT: Data Validation Report for the Organic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: J0GN6

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1142
TDN: 1050
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 2 soil samples collected from the above referenced site has been completed. The samples were analyzed for Pest/PCB in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analyses (OLM04.2) by Envirosystems, Inc. of Columbia, MD.

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the USEPA CLP SOW for Organic Analysis (OLM04.2), the USEPA CLP National Functional Guidelines for Organic Data Review (10/99) and the Region 10 Guidelines for CLP Data Review.

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

Holding Time - Acceptable

All of the samples met the method and technical (40 CFR 136) required holding times. The Holding Times Summary listing the pertinent collection, extraction, and analysis dates is attached at the end of this validation report.

Instrument Performance - Acceptable

The GC system met the SOW specified technical acceptance criteria prior to sample analyses, i.e., GC performance checks, retention times, and calibrations. The system remained stable throughout the course of analyses. Instrument blanks were all clean and there were no indications of carry-over.

Initial Calibrations - Acceptable

One Pest/PCB initial calibration was performed. The initial calibration met the SOW technical acceptance criteria.

Continuing Calibration Verification (CCVs) Standards - Acceptable

All of the CCVs met the criteria for frequency of analysis, the retention time and the percent differences (%Ds) criteria.

Compound Quantitation and Detection Limits - Acceptable

All of the samples were analyzed at the contract required quantitation limits (CRQLs). Target compounds that were detected at concentrations less than the CRQLs were qualified as estimated, "J". All of the reported results were adjusted for sample amounts analyzed.

Blanks - Acceptable

No target analytes were detected in any of the method or instrument blanks.

Analytical Sequence - Acceptable

All of the standards, blanks, samples, and QC samples were analyzed in accordance with the SOW specified analytical sequence.

Surrogate Spikes - Acceptable

All of the Pest/PCB surrogate spike recoveries met the applicable QC criteria (30-150%).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Acceptable

Pest/PCB sample J0GN6 was utilized for MS/MSD analyses. The criteria for frequency of analysis, recoveries and RPDs were met.

Sample Clean-up - Acceptable

The pesticide florisil cartridge and GPC calibration checks met the criteria for frequency of analysis and recovery.

Compound Identification

Single component pesticides and aroclors were qualified as follows: where %Ds (between two column concentrations) >30% but ≤60% - detected results were qualified as estimated, "J"; %Ds >60% with concentrations >CRQL - results were qualified as tentatively identified at the estimated concentration , "JN"; %Ds >60% with concentrations <CRQL - results were qualified as non-detects, "U", at the CRQL; %Ds >400% - results were qualified as non-detects with raised quantitation limit if >CRQL.

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 56. All data points were qualified as non-detected, "U".

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

Data Qualifiers

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

Holding Time Summary - Case 29440 SDG: J0GN6

Sample Number	Collection Date	VTSR*	Pest/PCB Extraction	Pest/PCB Analysis
J0GN6	6/28/01	6/30/01	7/10/01	7/20/01
J0GN7	6/28/01	6/30/01	7/10/01	7/20/01

*VTSR - Verified time of sample receipt in the laboratory.

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. 0470

J0GN6

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0GN6

Matrix: (soil/water) SOIL Lab Sample ID: 01061744

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 32 decanted: (Y/N) N Date Received: 06/30/01

Extraction: (Type) SONC Date Extracted: 07/10/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/20/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 7.8 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.5	U
319-85-7	beta-BHC	2.5	U
319-86-8	delta-BHC	2.5	U
58-89-9	gamma-BHC (Lindane)	2.5	U
76-44-8	Heptachlor	2.5	U
309-00-2	Aldrin	2.5	U
1024-57-3	Heptachlor epoxide	2.5	U
959-98-8	Endosulfan I	2.5	U
60-57-1	Dieldrin	4.9	U
72-55-9	4,4'-DDE	4.9	U
72-20-8	Endrin	4.9	U
33213-65-9	Endosulfan II	4.9	U
72-54-8	4,4'-DDD	4.9	U
1031-07-8	Endosulfan sulfate	4.9	U
50-29-3	4,4'-DDT	4.9	U
72-43-5	Methoxychlor	25	U
53494-70-5	Endrin ketone	4.9	U
7421-93-4	Endrin aldehyde	4.9	U
5103-71-9	alpha-Chlordane	2.5	U
5103-74-2	gamma-Chlordane	2.5	U
8001-35-2	Toxaphene	250	U
12674-11-2	Aroclor-1016	49	U
11104-28-2	Aroclor-1221	99	U
11141-16-5	Aroclor-1232	49	U
53469-21-9	Aroclor-1242	49	U
12672-29-6	Aroclor-1248	49	U
11097-69-1	Aroclor-1254	49	U
11096-82-5	Aroclor-1260	49	U

9-14-01

FORM I PEST OLM04.2

1E
PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. 0471

J0GN7

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0GN6

Matrix: (soil/water) SOIL Lab Sample ID: 01061745

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 23 decanted: (Y/N) N Date Received: 06/30/01

Extraction: (Type) SONC Date Extracted: 07/10/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/20/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 8.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.2	U
319-85-7	beta-BHC	2.2	U
319-86-8	delta-BHC	2.2	U
58-89-9	gamma-BHC (Lindane)	2.2	U
76-44-8	Heptachlor	2.2	U
309-00-2	Aldrin	2.2	U
1024-57-3	Heptachlor epoxide	2.2	U
959-98-8	Endosulfan I	2.2	U
60-57-1	Dieldrin	4.3	U
72-55-9	4,4'-DDE	4.3	U
72-20-8	Endrin	4.3	U
33213-65-9	Endosulfan II	4.3	U
72-54-8	4,4'-DDD	4.3	U
1031-07-8	Endosulfan sulfate	4.3	U
50-29-3	4,4'-DDT	4.3	U
72-43-5	Methoxychlor	22	U
53494-70-5	Endrin ketone	4.3	U
7421-93-4	Endrin aldehyde	4.3	U
5103-71-9	alpha-Chlordane	2.2	U
5103-74-2	gamma-Chlordane	2.2	U
8001-35-2	Toxaphene	220	U
12674-11-2	Aroclor-1016	43	U
11104-28-2	Aroclor-1221	87	U
11141-16-5	Aroclor-1232	43	U
53469-21-9	Aroclor-1242	43	U
12672-29-6	Aroclor-1248	43	U
11097-69-1	Aroclor-1254	43	U
11096-82-5	Aroclor-1260	43	U

CP 8-14-01

ENVIRONMENTAL SERVICES ASSISTANCE TEAM

0472

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

DELIVERABLE NARRATIVE

DATE: August 14, 2001

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

THROUGH: Dave Dobb, Team Manager, ESAT Region 10

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

SUBJECT: Data Validation Report for the Organic Analysis of Samples from the Upper Columbia River Lake Roosevelt/Mines Sites. Case: 29440 SDG: J0GL1

Account Code: 01T10P50102D106XLA00

Doc. #: ES10-0-1141
TDN: 1050
Task Order: 001
Contract: 68-W-01-027

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

The quality assurance (QA) review of 20 soil samples collected from the above referenced site has been completed. The samples were analyzed for Pest/PCB in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analyses (OLM04.2) by Envirosystems, Inc. of Columbia, MD.

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control Specifications outlined in the USEPA CLP SOW for Organic Analysis (OLM04.2), the USEPA CLP National Functional Guidelines for Organic Data Review (10/99) and the Region 10 Guidelines for CLP Data Review.

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

Holding Time - Acceptable

All of the samples met the method and technical (40 CFR 136) required holding times with the exception of samples J0GL1, J0GL2, J0GL3, J0GL4 and J0GL5. These samples were extracted 15 days from the sample collection date which only slightly exceeded the suggested technical holding time of 14 days for soils. None of the data were qualified on this basis. The Holding Times Summary listing the pertinent collection, extraction, and analysis dates is attached at the end of this validation report.

Instrument Performance - Acceptable

The GC system met the SOW specified technical acceptance criteria prior to sample analyses, i.e., GC performance checks, retention times, and calibrations. The system remained stable throughout the course of analyses. Instrument blanks were all clean and there were no indications of carry-over.

Initial Calibrations - Acceptable

One Pest/PCB initial calibration was performed. The initial calibration met the SOW technical acceptance criteria.

Continuing Calibration Verification (CCVs) Standards - Acceptable

All of the CCVs met the criteria for frequency of analysis, the retention time and the percent differences (%Ds) criteria.

Compound Quantitation and Detection Limits - Acceptable

All of the samples were analyzed at the contract required quantitation limits (CRQLs). Target compounds that were detected at concentrations less than the CRQLs were qualified as estimated, "J". All of the reported results were adjusted for sample amounts analyzed.

Blanks - Acceptable

No target analytes were detected in any of the method or instrument blanks.

Analytical Sequence - Acceptable

All of the standards, blanks, samples, and QC samples were analyzed in accordance with the SOW specified analytical sequence.

Surrogate Spikes - Acceptable

All of the Pest/PCB surrogate spike recoveries met the applicable QC criteria (30-150%).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Acceptable

Pest/PCB sample J0GN5 was utilized for MS/MSD analyses. The criteria for frequency of analysis, recoveries and RPDs were met.

Sample Clean-up - Acceptable

The pesticide florisil cartridge and GPC calibration checks met the criteria for frequency of analysis and recovery.

Compound Identification

Single component pesticides and aroclors were qualified as follows: where %Ds (between two column concentrations) >30% but ≤60% - detected results were qualified as estimated, "J"; %Ds >60% with concentrations >CRQL - results were qualified as tentatively identified at the estimated concentration , "JN"; %Ds >60% with concentrations <CRQL - results were qualified as non-detects, "U", at the CRQL; %Ds >400% - results were qualified as non-detects with raised quantitation limit if >CRQL.

0474

Laboratory Contact

The laboratory was not contacted for this review.

Overall Assessment

The total number of data points was 560. One (0.18%) was qualified as estimated and tentatively identified because the percent difference between the two analytical columns exceeded 60%. One data point was detected 4,4'-DDT in sample J0GL5 slightly above the CRQL. All other data points were qualified as non-detected, "U".

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

Data Qualifiers

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

0475

Holding Time Summary - Case 29440 SDG: J0GL1

Sample Number	Collection Date	VTSR*	Pest/PCB Extraction	Pest/PCB Analysis
J0GL1	6/25/01	6/30/01	7/10/01	7/19/01
J0GL2	6/25/01	6/30/01	7/10/01	7/19/01
J0GL3	6/25/01	6/30/01	7/10/01	7/19/01
J0GL4	6/25/01	6/30/01	7/10/01	7/19/01
J0GL5	6/25/01	6/30/01	7/10/01	7/19/01
J0GL6	6/26/01	6/30/01	7/10/01	7/19/01
J0GL7	6/26/01	6/30/01	7/10/01	7/19/01
J0GL8	6/26/01	6/30/01	7/10/01	7/19/01
J0GM0	6/26/01	6/30/01	7/10/01	7/19/01
J0GM2	6/26/01	6/30/01	7/10/01	7/19/01
J0GM3	6/27/01	6/30/01	7/10/01	7/19/01
J0GM5	6/27/01	6/30/01	7/10/01	7/19/01
J0GM7	6/27/01	6/30/01	7/10/01	7/19/01
J0GM9	6/27/01	6/30/01	7/10/01	7/20/01
J0GN0	6/27/01	6/30/01	7/10/01	7/20/01
J0GN1	6/27/01	6/30/01	7/10/01	7/20/01
J0GN2	6/28/01	6/30/01	7/10/01	7/20/01
J0GN3	6/28/01	6/30/01	7/10/01	7/20/01
J0GN4	6/28/01	6/30/01	7/10/01	7/20/01
J0GN5	6/28/01	6/30/01	7/10/01	7/20/01

*VTSR - Verified time of sample receipt in the laboratory.

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. **0476**

J0GL1

Lab Name: ENVIROSYSTEMS Contract: 68W99023

Lab Code: ENVSYS Case No.: 29440 SAS No.: SDG No.: J0GL1

Matrix: (soil/water) SOIL Lab Sample ID: 01061724

Sample wt/vol: 30.0 (g/mL) G Lab File ID:

% Moisture: 24 decanted: (Y/N) N Date Received: 06/30/01

Extraction: (Type) SONC Date Extracted: 07/10/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 07/19/01

Injection Volume: 2.00 (uL) Dilution Factor: 1.00

GPC Cleanup: (Y/N) Y pH: 7.8 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.2	U
319-85-7	beta-BHC	2.2	U
319-86-8	delta-BHC	2.2	U
58-89-9	gamma-BHC (Lindane)	2.2	U
76-44-8	Heptachlor	2.2	U
309-00-2	Aldrin	2.2	U
1024-57-3	Heptachlor epoxide	2.2	U
959-98-8	Endosulfan I	2.2	U
60-57-1	Dieldrin	4.3	U
72-55-9	4,4'-DDE	4.3	U
72-20-8	Endrin	4.3	U
33213-65-9	Endosulfan II	4.3	U
72-54-8	4,4'-DDD	4.3	U
1031-07-8	Endosulfan sulfate	4.3	U
50-29-3	4,4'-DDT	4.3	U
72-43-5	Methoxychlor	22	U
53494-70-5	Endrin ketone	4.3	U
7421-93-4	Endrin aldehyde	4.3	U
5103-71-9	alpha-Chlordane	2.2	U
5103-74-2	gamma-Chlordane	2.2	U
8001-35-2	Toxaphene	220	U
12674-11-2	Aroclor-1016	43	U
11104-28-2	Aroclor-1221	88	U
11141-16-5	Aroclor-1232	43	U
53469-21-9	Aroclor-1242	43	U
12672-29-6	Aroclor-1248	43	U
11097-69-1	Aroclor-1254	43	U
11096-82-5	Aroclor-1260	43	U

8-14-01

MEMORANDUM

DATE: November 6, 2001

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

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

SUBJ: **Organic Data Summary Check, Upper Columbia River Mines/Mills ESI, Stevens and Pend Oreille Counties, Washington**

REF: TDD: 01-02-0028 PAN: 001281.0073.01SR

The data quality summary check of 28 solid samples collected from the Upper Columbia River Mines/Mills ESI, Stevens and Pend Oreille Counties, Washington has been completed. Semivolatile Organic Compound and Chlorinated Pesticide/Polychlorinated Biphenyl compound analysis (EPA CLP SOW OLM04.2) was performed by Laucks Testing Laboratory, Seattle, Washington.

The samples were numbered:

J0KC1	J0KC2	J0KC3	J0KC4	J0KC5	J0KC6
J0KC7	J0KC8	J0KC9	J0KD1	J0KD2	J0KD3
J0KD4	J0KH0	J0KH1	J0KH2	J0KH3	J0KH4
J0KH5	J0KH6	J0KH7	J0KJ1	J0KJ2	J0KJ3
J0KJ4	J0KK8	J0KK9	J0KL0		

No discrepancies were noted.

All sample results originally qualified "JQ" by the laboratory to indicate a result less than the CRQL were changed to "JQK" by the secondary reviewer to indicate an estimated quantity less than the CRQL with an unknown bias.

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

October 30, 2001

Reply To
Attn Of: OEA-095

MEMORANDUM

SUBJECT: Data validation report for the semi-volatile organic compound (SVOC) and pesticide/polychlorinated biphenyl (Pest/PCB) analysis of samples from the Upper Columbia River/Mines Sites ESI. Case: 29730 SDGs: J0KC1, J0KH1

FROM: Chris Pace, Chemist, OEA

TO: Monica Tonel, SAM, OEC

CC: Mark Woodke, Ecology and Environment, Inc.
Bruce Woods, CLP PO, OEA
Ginna Grepo-Grove, Chemist, OEA

The quality assurance (QA) review of 28 soil samples collected from the above referenced site has been completed. Six samples were analyzed for SVOCs (all in SDG J0KH1) and twenty three for Pest/PCBs in accordance with the USEPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analyses (OLM04.2) by Laucks Testing Laboratory of Seattle, WA.

The following sample numbers were validated in this report:

SDG: J0KC1

J0KC1	J0KC3	J0KC5	J0KC7	J0KC9	J0KD2	J0KD4
J0KC2	J0KC4	J0KC6	J0KC8	J0KD1	J0KD3	J0KH0

SDG: J0KH1

J0KH1*	J0KH3	J0KH5	J0KH7*	J0KJ2	J0KJ4*	J0KK9
J0KH2*	J0KH4	J0KH6*	J0KJ1	J0KJ3	J0KK8*	J0KL0

* Analyzed for SVOCs.

DATA QUALIFICATIONS

The following comments refer to the laboratory performance in meeting the Quality Control (QC) Specifications outlined in the USEPA CLP SOW for Organic Analysis (OLM04.2) and the USEPA CLP National Functional Guidelines for Organic Data Review (10/99).

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

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0479

Holding Time - Acceptable

The samples were collected between 9/10 and 9/13/01. All samples extracted within 9 days of sample collection and analyzed within 12 days of extraction. All of the samples met the technical required holding times for all analyses.

Instrument Performance Check - Acceptable

All of the GC/MS instrument performance checks met the ion abundance criteria. All of the GC instrument performance checks met the resolution, percent differences (%Ds) and percent breakdown criteria.

Initial Calibrations - Acceptable

One SVOC and one Pest/PCB initial calibration was performed. The initial calibrations met the SOW acceptance criteria for the percent relative standard deviations (%RSDs) and response factors for all target compounds and surrogates.

Continuing Calibration Verification (CCV)

All of the SVOC and Pest/PCB CCV checks met the criteria for frequency of analysis, minimum response factors and %Ds with the following exceptions:

- The %Ds for the following SVOC compounds exceeded the QC limits:

Date/Time of Analysis	Compound	%D	Qualifier Detect/Non-detect
9/26/01 (0935)	benzaldehyde	-36	J/UJ
	2,2'-oxybis(1-chloropropane)	-37	J/UJ
	hexachlorobutadiene	-27	J/UJ
	hexachlorocyclopentadiene	-61	J/UJ
	atrazine	-55	J/UJ
	benzo(k)fluoranthene	27	J/none
	2,4,6-tribromophenol (surr.)	43	none

Quantitation Limits

SVOC samples J0KH1, J0KH2, J0KH6 and J0KH7 required medium level preparation due to sample matrix. The quantitation limits (QLs) were based on the lowest standard concentration analyzed in the initial calibrations. Target compounds that were detected at concentrations less than the contract required quantitation limits (CRQLs) were qualified as estimated, "J". All of the reported results were adjusted for sample amounts analyzed.

Blanks

Bis(2-ethylhexyl)phthalate was detected below the CRQL in the SVOC blanks SBLKL3and SBLKL4. Bis(2-ethylhexyl)phthalate detected in the samples at concentrations less than ten times the value in their associated blank were qualified as non-detects, "U".

No target Pest/PCBs were detected in the method or instrument blanks.

0480

Analytical Sequence - Acceptable

All of the standards, blanks, samples, and QC samples were analyzed in accordance with the SOW specified analytical sequence.

Surrogate Spikes - Acceptable

All of the SVOC and Pest/PCB surrogate spike recoveries met the applicable QC criteria.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) - Acceptable

SVOC samples J0KJ4 (low level preparation) and J0KH7 (medium level preparation) were utilized for MS/MSD analyses. The criteria for frequency of analysis, recoveries and relative percent differences (RPDs) were met.

Pest/PCB samples J0KD2 (SDG J0KC1) and J0KH3 (SDG J0KH1) were utilized for MS/MSD analyses. The criteria for frequency of analysis, recoveries and relative percent differences (RPDs) were met.

Internal Standards - Acceptable

The acceptance criteria for internal standards (IS) are ±30 seconds for retention time (RT) shifts and -50% to +100% of the IS area as compared to the IS RT and area of the daily continuing calibration standard. All of the SVOC GC/MS analyses met the IS area and RT shift criteria.

Compound Identification

All of the compounds detected in the SVOC GC/MS analyses were within the retention time windows, met the USEPA spectral matching criteria and were judged to be acceptable.

Single component pesticides and Aroclors are qualified as follows: where %Ds (between two column concentrations) >30% but ≤60% - detected results were qualified as estimated, "J"; %Ds >60% with concentrations >CRQL - results were qualified as tentatively identified at the estimated concentration, "JN"; %Ds >60% with concentrations <CRQL - results were qualified as non-detects, "U"; %Ds >400% - results were qualified as non-detects with raised quantitation limit if >CRQL. In cases where target compounds were less than the CRQL and the result of chromatographic "noise" or interference the results are qualified as non-detected, "U".

Tentatively Identified Compounds

Peaks that were detected in the samples at areas >10% of the internal standards and were not part of the target compound lists were identified as tentatively identified compounds (TICs). TICs that were both found in the sample and in the associated method blank(s) were qualified as unusable, "R." Peaks that were identified as common laboratory contaminants, solvent preservatives, column bleed or aldol condensation products were qualified as unusable, "R". The rest of the peaks identified as TICs were qualified "NJ", tentatively identified at an estimated concentration.

SVOC samples J0KH1, J0KH2, J0KH6 and J0KH7 had chromatographic peaks present that were unaccounted for on the Form I TIC and/or reported as alkanes. See laboratory contact.

Laboratory Contact

The laboratory was contacted concerning the following:

SVOC samples J0KH1, J0KH2, J0KH6 and J0KH7 had chromatographic peaks present that were unaccounted for on the Form I TIC and/or reported as alkanes. Each of these samples had chromatograms displaying hydrocarbon type patterns. The reported TICs failed to account for many of the later eluting peaks on the hydrocarbon "hump". It was requested that the laboratory provide resubmitted raw data and CLP Forms concerning this issue.

Resolution: The laboratory responded by FAX (hard copy to follow) stating the HP Chemstation software appears to have problems with samples that have severe matrix problems and the only solution is to manually integrate and process. They then state that Lauck's purchased software for CLP inhibits them from manually processing and producing the actual CLP Forms and EDD.

Overall Assessment

The total number of SVOC data points was 390. Four (1.0%) were qualified as non-detected due to blank contamination. Thirty three (8.5%) were qualified as estimated due to values reported below the CRQL and continuing calibrations. The total number of Pest/PCB data points was 644. Two (0.3%) were qualified as non-detected due values reported above the CRQL with high %Ds between analytical columns and chromatographic interference.

All of the samples were analyzed in accordance with technical specifications outlined in the SOW (with the exception of the TIC reporting difficulties discussed above). The data, as qualified, are acceptable and can be used for all purposes.

Data Qualifiers

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

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J0KK8

0483

Lab Name: LAUCKS TESTING LABORATORIES Contract: 68-W-00-075

Lab Code: LAUCKS Case No.: 29730 SAS No.: SDG No.: J0KH1

Matrix: (soil/water) SOIL Lab Sample ID: 0109281-12

Sample wt/vol: 30 (g/mL) G Lab File ID: L0926015.D

Level: (low/med) LOW Date Received: 09/17/01

% Moisture: 35 Decanted: (Y/N) Y Date Extracted: 09/19/01

Concentrated Extract Volume: 500 (µL) Date Analyzed: 09/26/01

Injection Volume: 2 (µL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 7.0 Extraction: (Type) PFEX

CONCENTRATION UNITS:
(µg/L or µg/Kg) UG/KG

CAS NO.	COMPOUND		Q
100-52-7	Benzaldehyde	130	J Q K
108-95-2	Phenol	510	U
111-44-4	bis(2-Chloroethyl)ether	510	U
95-57-8	2-Chlorophenol	510	U
95-48-7	2-Methylphenol	510	U
108-60-1	2,2'-oxybis(1-Chloropropane)	510	U J K
98-86-2	Acetophenone	60	J Q K
106-44-5	4-Methylphenol	81	J Q K
621-64-7	N-Nitroso-di-n-propylamine	510	U
67-72-1	Hexachloroethane	510	U
98-95-3	Nitrobenzene	510	U
78-59-1	Isophorone	510	U
88-75-5	2-Nitrophenol	510	U
105-67-9	2,4-Dimethylphenol	510	U
111-91-1	Bis(2-Chloroethoxy)methane	510	U
120-83-2	2,4-Dichlorophenol	510	U
91-20-3	Naphthalene	510	U
106-47-8	4-Chloroaniline	510	U
87-68-3	Hexachlorobutadiene	510	U J K
105-60-2	Caprolactam	510	U
59-50-7	4-Chloro-3-methylphenol	510	U
91-57-6	2-Methylnaphthalene	510	U
77-47-4	Hexachlorocyclopentadiene	510	U J K
88-06-2	2,4,6-Trichlorophenol	510	U
95-95-4	2,4,5-Trichlorophenol	1300	U
92-52-4	1,1'-Biphenyl	510	U
91-58-7	2-Chloronaphthalene	510	U
88-74-4	2-Nitroaniline	1300	U
131-11-3	Dimethylphthalate	510	U
606-20-2	2,6-Dinitrotoluene	510	U
208-96-8	Acenaphthylene	510	U
99-09-2	3-Nitroaniline	1300	U
83-32-9	Acenaphthene	510	U

CP 10-25-01

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

J0KK8

0484

Lab Name: LAUCKS TESTING LABORATORIES Contract: 68-W-00-075

Lab Code: LAUCKS Case No.: 29730 SAS No.: SDG No.: J0KH1

Matrix: (soil/water) SOIL Lab Sample ID: 0109281-12

Sample wt/vol: 30 (g/mL) G Lab File ID: L0926015.D

Level: (low/med) LOW Date Received: 09/17/01

% Moisture: 35 Decanted: (Y/N) Y Date Extracted: 09/19/01

Concentrated Extract Volume: 500 (µL) Date Analyzed: 09/26/01

Injection Volume: 2 (µL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 7.0 Extraction: (Type) PFEX

CONCENTRATION UNITS:
(µg/L or µg/Kg) UG/KG

CAS NO.	COMPOUND		Q
51-28-5	2,4-Dinitrophenol	1300	U
100-02-7	4-Nitrophenol	1300	U
132-64-9	Dibenzofuran	510	U
121-14-2	2,4-Dinitrotoluene	510	U
84-66-2	Diethylphthalate	190	J Q K
86-73-7	Fluorene	510	U
7005-72-3	4-Chlorophenyl-phenylether	510	U
100-01-6	4-Nitroaniline	1300	U
534-52-1	4,6-Dinitro-2-methylphenol	1300	U
86-30-6	N-Nitrosodiphenylamine (1)	510	U
101-55-3	4-Bromophenyl-phenylether	510	U
118-74-1	Hexachlorobenzene	510	U
1912-24-9	Atrazine	510	U J K
87-86-5	Pentachlorophenol	1300	U
85-01-8	Phenanthrene	510	U
120-12-7	Anthracene	510	U
86-74-8	Carbazole	510	U
84-74-2	Di-n-butylphthalate	510	U
206-44-0	Fluoranthene	510	U
129-00-0	Pyrene	510	U
85-68-7	Butylbenzylphthalate	510	U
91-94-1	3,3'-Dichlorobenzidine	510	U
56-55-3	Benzo(a)anthracene	510	U
218-01-9	Chrysene	510	U
117-81-7	Bis(2-Ethylhexyl)phthalate	510 ~~70~~	~~JB~~ U
117-84-0	Di-n-octylphthalate	510	U
205-99-2	Benzo(b)fluoranthene	510	U
207-08-9	Benzo(k)fluoranthene	510	U
50-32-8	Benzo(a)pyrene	510	U
193-39-5	Indeno(1,2,3-cd)pyrene	510	U
53-70-3	Dibenzo(a,h)anthracene	510	U
191-24-2	Benzo(g,h,i)perylene	510	U

(1) Cannot be separated from Diphenylamine

CP 10-25-01

EPA SAMPLE NO. 0485

J0KK8

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: LAUCKS TESTING LABORATORIES Contract: 68-W-00-075

Lab Code: LAUCKS Case No.: 29730 SAS No.: SDG No.: J0KH1

Matrix: (soil/water) SOIL Lab Sample ID: 0109281-12

Sample wt/vol: 30 (g/mL) G Lab File ID: L0926015.D

Level: (low/med) LOW Date Received: 09/17/01

% Moisture: 35 Decanted: (Y/N) Y Date Extracted: 09/19/01

Concentrated Extract Volume: 500 (µL) Date Analyzed: 09/26/01

Injection Volume: 2 (µL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 7.0 Extraction: (Type) PFEX

Number TICs found: 30 CONCENTRATION UNITS:

(µg/L or µg/Kg) UG/KG

	CAS NUMBER	COMPOUND NAME	RT	EST.CONC.	Q
1.		unknown organic acid	9.56	430	JN
2.	120-40-1	Dodecanamide, N,N-bis(2-hydr	11.10	520	JN
3.	112-72-1	1-Tetradecanol	11.21	590	JN
4.	544-63-8	Tetradecanoic acid	12.55	1200	JN
5.	1002-84-2	Pentadecanoic acid	13.22	1000	JN
6.	112-39-0	Hexadecanoic acid, methyl es	13.61	430	JN
7.	2091-29-4	9-Hexadecenoic acid	13.81	7600	JN
8.	57-10-3	Hexadecanoic acid	13.92	4500	JN
9.		unknown	14.37	550	JN
10.		unknown	14.49	870	JN
11.	112-80-1	Oleic Acid	14.98	2200	JN
12.		unknown	15.93	2200	JN
13.	57-11-4	Octadecanoic acid	16.16	440	JN
14.		unknown	16.67	690	JN
15.		unknown	17.20	640	JN
16.	18435-45-5	1-Nonadecene	17.96	780	JN
17.	112-85-6	Docosanoic acid	18.43	540	JN
18.	638-66-4	Octadecanal	18.87	1000	JN
19.	629-96-9	1-Eicosanol	19.23	2000	JN
20.		unknown	19.56	1800	JN
21.		unknown	19.58	580	JN
22.	77899-10-6	(Z)14-Tricosenyl formate	20.03	1000	JN
23.		10-Heneicosene (c,t)	20.41	1000	JN
24.	57-88-5	Cholesterol	20.91	1600	JN
25.	474-67-9	Ergosta-5,22-dien-3-ol, (3.b	21.22	510	JN
26.	83-47-6	.gamma.-Sitosterol	22.41	1300	JN
27.		unknown	22.94	520	JN
28.	22611-26-3	D:C-Friedoolean-8-en-3-one	23.09	1100	JN
29.	1058-61-3	Stigmast-4-en-3-one	23.70	480	JN
~~30.~~		~~unknown~~	~~24.94~~	~~600~~	~~JB~~

BC

10-25-01

1E

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO. 0486

J0KK8

Lab Name: LAUCKS TESTING LABORATORIES Contract: 68-W-00-075

Lab Code: LAUCKS Case No.: 29730 SAS No.: SDG No.: J0KH1

Matrix: (soil/water) SOIL Lab Sample ID: 0109281-12

Sample wt/vol: 30 (g/mL) G Lab File ID: A930120.d

% Moisture: 36 Decanted: (Y/N) Y Date Received: 09/17/01

Extraction: (Type) PFEX Date Extracted: 09/19/01

Concentrated Extract Volume: 5000 (uL) Date Analyzed: 10/01/01

Injection Volume: 1 (uL) Dilution Factor 1

GPC Cleanup: (Y/N) Y pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (µg/L or µg/Kg) UG/KG	Q
319-84-6	alpha-BHC	2.7	U
319-85-7	beta-BHC	2.7	U
319-86-8	delta-BHC	2.7	U
58-89-9	gamma-BHC (Lindane)	2.7	U
76-44-8	Heptachlor	2.7	U
309-00-2	Aldrin	2.7	U
1024-57-3	Heptachlor epoxide	2.7	U
959-98-8	Endosulfan I	2.7	U
60-57-1	Dieldrin	5.2	U
72-55-9	4,4'-DDE	5.2	U
72-20-8	Endrin	5.2	U
33213-65-9	Endosulfan II	5.2	U
72-54-8	4,4'-DDD	5.2	U
1031-07-8	Endosulfan sulfate	5.2	U
50-29-3	4,4'-DDT	5.2	U
72-43-5	Methoxychlor	27	U
53494-70-5	Endrin ketone	5.2	U
7421-93-4	Endrin aldehyde	5.2	U
5103-71-9	alpha-Chlordane	2.7	U
5103-74-2	gamma-Chlordane	2.7	U
8001-35-2	Toxaphene	270	U
12674-11-2	Aroclor-1016	52	U
11104-28-2	Aroclor-1221	100	U
11141-16-5	Aroclor-1232	52	U
53469-21-9	Aroclor-1242	52	U
12672-29-6	Aroclor-1248	52	U
11097-69-1	Aroclor-1254	52	U
11096-82-5	Aroclor-1260	52	U

CP 10-25-01

ecology and environment, inc.
International Specialists in the Environment
2101 Fourth Avenue, Suite 1900, Seattle, WA 98121
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: July 24, 2001

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

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

SUBJ: **Organic Data Quality Assurance Review, Upper Columbia River Mines Site, Northeast Washington**

REF: TDD: 01-02-0028

The data quality assurance review of 33 soil samples collected from the Upper Columbia River Mines site located in Northeast Washington has been completed. Analysis for Total Organic Carbon (Lloyd Kahn Method) was performed by the Ecology and Environment, Inc., Analytical Services Center, Lancaster, New York.

The samples were numbered:

ORSP01SD	ORSP02SD	BBPPO1SD	BBPP02SD	TCBK01SD ~~POBK01SD~~	~~POCR01SD~~ POCK01SD
VSPP01SD	VSPP02SD	PRRS01SD	PRTB01SD	PRRS02SD	PRTB02SD
PRTB03SD	PRTB04SD	PRTB05SD	PRRS03SD	POPP02SD	POPP03SD
POSP02SD	POSP01SD	PRTB10SD	JOPP01SD	POBK01SD	~~POPP04SD~~ GMPP04SD
MPPO5SD ~~POPP05SD~~	PRBK01SD	PRBK02SD	PRBK03SD	PRBK04SD	PRTB06SD
PRTB07SD	PRTB08SD	PRTB09SD			

Data Qualifications:

1. **Sample Holding Times: Satisfactory.**

All samples were maintained at 4°C (± 2°C). The samples were collected between June 22 and June 28, 2001, and were analyzed on July 9 or 10, 2001. All samples were analyzed within QC holding time limits except samples VSPP01SD, VSPP02SD, PRTB01SD and PRRS02SD; the reported reanalyses for these samples were qualified as estimated quantities (J).

2. **Calibration: Acceptable.**

A four-point initial calibration was performed daily prior to sample analysis with all correlation coefficients greater than 0.995. Continuing calibrations were performed a minimum of every 10 samples with all results within 10% of the true values.

3. **Blanks: Acceptable.**

A method blank was analyzed at the required frequency of every 20 samples. There were no detections in the method blanks above the method reporting limit.

4. **Laboratory Control Samples (LCS): Acceptable.**

All LCS recoveries were within QC limits of 71% to 125%.

5. **Quadruplicate Analysis: Satisfactory.**

All method quadruplicate results were within QC limits except the analysis of sample POBK01SD; this outlier was due to matrix interferences. No action was taken based on the quadruplicate outlier alone.

6. **Quantitation: Acceptable**

TOC concentrations were correctly calculated.

7. **Laboratory Contact: Not Required**

No laboratory contact was required.

8. **Overall Assessment**

The overall usefulness of the data is based on the criteria outlined in the analytical method. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

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

Ecology and Environment, Inc.

Laboratory Results

Analytical Services Center
4493 Walden Avenue
Lancaster, New York 14086-

NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	ORSP01SD
Lab Order:	0107001	**Alt. Client ID:**	ORSP01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/27/01 12:40:00 PM
Lab ID:	0107001-01A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 17.40

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	19500		2410	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

Definitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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Laboratory Results

Analytical Services Center
4493 Walden Avenue
Lancaster, New York 14086-

NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	ORSP02SD
Lab Order:	0107001	**Alt. Client ID:**	ORSP02SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/27/01 2:05:00 PM
Lab ID:	0107001-02A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 32.70

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	19200		2850	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

Definitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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Laboratory Results

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	BBPP01SD
Lab Order:	0107001	**Alt. Client ID:**	BBPP01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 1:00:00 PM
Lab ID:	0107001-03A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 11.40

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	3530		2160	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

Definitions:

ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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Laboratory Results

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Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	BBPP02SD
Lab Order:	0107001	**Alt. Client ID:**	BBPP02SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 1:05:00 PM
Lab ID:	0107001-04A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 51.20

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	56300		3930	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

efinitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	~~POBK01SD~~ TCBK01SD
Lab Order:	0107001	**Alt. Client ID:**	POBK01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/25/01 3:50:00 PM
Lab ID:	0107001-05A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 40.90

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	18800		3330	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

Definitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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CLIENT:	E and E Seattle Office	**Client Sample ID:** ~~POCR01SD~~ POCK01SD	
Lab Order:	0107001	**Alt. Client ID:** POCR01SD	
Project:	Upper Columbia River Phase I	**Collection Date:** 6/25/01 4:28:00 PM	
Lab ID:	0107001-06A **Sample Type:** SAMP	**Matrix:** SOIL	**% Moist:** 37.90

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	36100		3100	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

initions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GL0
Lab Order:	0107001	**Alt. Client ID:**	PRRS01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/25/01 11:00:00 AM
Lab ID:	0107001-09A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 23.10

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	7610		2500	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

Definitions:

ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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Laboratory Results

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GL1
Lab Order:	0107001	**Alt. Client ID:**	PRTB01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/25/01 12:00:00 PM
Lab ID:	0107001-10A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 64.50

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	74800	J	11000	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

nitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GL3
Lab Order:	0107001	**Alt. Client ID:**	PRRS02SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/25/01 12:30:00 PM
Lab ID:	0107001-11A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 22.70

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	595	J	2520	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

finitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GL4
Lab Order:	0107001	**Alt. Client ID:**	PRTB02SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/25/01 1:45:00 PM
Lab ID:	0107001-12A **Sample Type:** SAMP	**Matrix:** SOIL	**% Moist:** 43.20

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN I_LK_TOC_S								
Total Organic Carbon	28900		3490	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

nitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GL5
Lab Order:	0107001	**Alt. Client ID:**	PRTB03SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/25/01 2:15:00 PM
Lab ID:	0107001-13A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 55.60

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	48200		4370	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

efinitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GL6
Lab Order:	0107001	**Alt. Client ID:**	PRTB04SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 10:10:00 AM
Lab ID:	0107001-14A **Sample Type:** SAMP	**Matrix:** SOIL	**% Moist:** 63.30

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	77300		5350	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7/24/01

initions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GL7
Lab Order:	0107001	**Alt. Client ID:**	PRTB05SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 10:45:00 AM
Lab ID:	0107001-15A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 22.30

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	14100		2440	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW 7-24-01

Definitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GL8
Lab Order:	0107001	**Alt. Client ID:**	PRRS03SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 11:40:00 AM
Lab ID:	0107001-16A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 22.60

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	581	J	2450	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

finitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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NYS ELAP ID#: 10486
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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GM0
Lab Order:	0107001	**Alt. Client ID:**	POPP02SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 1:40:00 PM
Lab ID:	0107001-17A **Sample Type:** SAMP	**Matrix:** SOIL	**% Moist:** 53.50

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	46100		4120	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

efinitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0GM2
Lab Order:	0107001	**Alt. Client ID:**	POPP03SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 2:25:00 PM
Lab ID:	0107001-18A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 16.80

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	541	J	2300	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

Initions: ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0FK5
Lab Order:	0107001	**Alt. Client ID:**	POSP02SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 9:35:00 AM
Lab ID:	0107001-19A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 26.20

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	36100		2600	mg/Kg-dry	1	7/9/01	TOC 5050A_SSM_010709	RLG

MW
7-24-01

Definitions:

ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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CLIENT:	E and E Seattle Office	**Client Sample ID:**	MJ0FL7
Lab Order:	0107001	**Alt. Client ID:**	POSP01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/26/01 9:11:00 AM
Lab ID:	0107001-20A **Sample Type:** SAMP	**Matrix:** SOIL	**% Moist:** 25.00

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	62000		5100	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

finitions: ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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CLIENT:	E and E Seattle Office	**Client Sample ID:**	PRTB10SD
Lab Order:	0107001	**Alt. Client ID:**	PRTB10SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/28/01 2:55:00 PM
Lab ID:	0107001-21A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 25.90

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	1520	J	2630	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

Definitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	JOPP01SD
Lab Order:	0107001	**Alt. Client ID:**	JOPP01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/28/01 9:35:00 AM
Lab ID:	0107001-22A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 11.40

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	1050	J	4420	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

finitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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Laboratory Results

NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	POBK01SD
Lab Order:	0107001	**Alt. Client ID:**	POBK01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/27/01 1:00:00 PM
Lab ID:	0107001-23A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 27.80

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	13700		4780	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7/24/01

Definitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	~~POPP04SD~~ GMPP04SD
Lab Order:	0107001	**Alt. Client ID:**	POPP04SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/27/01 12:10:00 PM
Lab ID:	0107001-24A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 29.30

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	8670		4560	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

finitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

Ecology and Environment, Inc.

Laboratory Results

Analytical Services Center
4493 Walden Avenue
Lancaster, New York 14086-

NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	~~POPP05SD~~ GMPP05SD
Lab Order:	0107001	**Alt. Client ID:**	POPP05SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/27/01 12:35:00 PM
Lab ID:	0107001-25A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 14.10

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	10200		2320	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

Definitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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Laboratory Results

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	PRBK01SD
Lab Order:	0107001	**Alt. Client ID:**	PRBK01SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/28/01 1:55:00 PM
Lab ID:	0107001-26A **Sample Type:** SAMP	**Matrix:** SOIL	**% Moist:** 15.30

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN I_LK_TOC_S								
Total Organic Carbon	2570		2300	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

Definitions:

ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	PRBK02SD
Lab Order:	0107001	**Alt. Client ID:**	PRBK02SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/28/01 2:05:00 PM
Lab ID:	0107001-27A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 27.50

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	7090		2760	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW 7-24-01

Definitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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Laboratory Results

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	PRBK03SD
Lab Order:	0107001	**Alt. Client ID:**	PRBK03SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/28/01 2:15:00 PM
Lab ID:	0107001-28A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 20.90

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	4550		2470	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

Definitions:

ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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Laboratory Results

0515

Analytical Services Center
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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	PRRS04SD
Lab Order:	0107001	**Alt. Client ID:**	PRRS04SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/27/01 11:45:00 AM
Lab ID:	0107001-29A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 43.30

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	45600		3530	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

Definitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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Laboratory Results

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Lancaster, New York 14086-

NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	**PRTB06SD**
Lab Order:	0107001	**Alt. Client ID:**	PRTB06SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/27/01 5:15:00 PM
Lab ID:	**0107001-30A** **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 31.20

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	5490		2800	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW 7-24-01

finitions:	ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
	J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
	B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
	H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	PRTB07SD
Lab Order:	0107001	**Alt. Client ID:**	PRTB07SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/27/01 6:05:00 PM
Lab ID:	0107001-31A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 30.70

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	38100		2850	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW 7-24-01

Definitions:

ND - Not Detected at the Reporting Limit	* - Recovery outside limits	M -Matrix Spike recovery outside limits
J - Analyte detected below Reporting limits	R - RPD outside recovery limits	Q - Qualifier A -Result by Method of Std. Addition
B - Analyte detected in the associated Method Blank	E - Value above quantitation range	D - Diluted due to matrix or extended target compounds
H - Value exceeds Maximum Contaminant Level	Surr - Denotes Surrogate Compound	N - Single Column Analysis

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	PRTB08SD
Lab Order:	0107001	**Alt. Client ID:**	PRTB08SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/28/01 12:35:00 PM
Lab ID:	0107001-32A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 21.60

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	599	J	2500	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

Definitions:

ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

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Laboratory Results

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NYS ELAP ID#: 10486
Phone: (716) 685-8080

CLIENT:	E and E Seattle Office	**Client Sample ID:**	PRTB09SD
Lab Order:	0107001	**Alt. Client ID:**	PRTB09SD
Project:	Upper Columbia River Phase I	**Collection Date:**	6/28/01 1:10:00 PM
Lab ID:	0107001-33A **Sample Type:** SAMP	**Matrix:**	SOIL **% Moist:** 22.90

Analyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
TOTAL ORGANIC CARBON BY METHOD LLOYD KAHN 1_LK_TOC_S								
Total Organic Carbon	4270		2590	mg/Kg-dry	1	7/10/01	TOC 5050A_SSM_010710	RLG

MW
7-24-01

Definitions:

ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

ecology and environment, inc.
International Specialists in the Environment
2101 Fourth Avenue, Suite 1900, Seattle, WA 98121
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: October 5, 2001

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

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

SUBJ: **Total Organic Carbon Data Quality Assurance Review, Upper Columbia River Mines/Mills ESI, Stevens & Pend Oreille Counties, WA**

REF: TDD: 01-02-0028 PAN: 001281.0073.01SR

The data quality assurance review of 23 sediment samples collected from the Upper Columbia River Mines/Mills ESI in Stevens and Pend Oreille Counties, Washington, has been completed. Total Organic Carbon (TOC) analysis (Method Lloyd Kahn) was performed by the Ecology and Environment, Inc., Analytical Services Center, Lancaster, New York.

The samples were numbered:

01090401	01090402	01090403	01090404	01090405	01090406
01090407	01090408	01090409	01090410	01090411	01090412
01090413	01090426	01090427	01090428	01090429	01090430
01090431	01090432	01090441	01090442	01090443	

Data Qualifications:

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

The samples maintained within the QC limits of 4°C ± 2°C. The samples were collected between September 10 and 13, 2001, and were analyzed by September 25, 2001, therefore meeting QC holding time criteria.

2. **Calibration: Acceptable.**

A four-point initial calibration was performed prior to each analysis sequence with a correlation coefficient ≥ 0.995. A minimum of one calibration standard and a blank were analyzed after every 10 samples with all recoveries within the QC limits of 90 % to 110 %.

3. **Blanks: Satisfactory.**

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each initial or continuing calibration. There were the following detections in method blanks:

Batch / Date	Analyte	Concentration
010924101R / 9-24-01	TOC	600 mg/kg
010925101R / 9-25-01	TOC	300 mg/kg

Sample results less than five times the associated blank concentration were qualified as not detected (U).

4. Laboratory Control Sample (LCS): Acceptable.

A LCS was analyzed with each batch of 20 samples with all recoveries within QC limits of 71 % to 125 %.

5. Quadruplicate Analysis: Acceptable.

A quadruplicate analysis was performed per 20 samples per matrix. Both sets of quadruplicate results had relative percent differences greater than the QC limit of < 30 %. No action was taken based on these outliers as the initial sample results were less than two times the sample quantitation limit.

6. Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004) and the analytical method. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

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

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

The following bias qualifier was added to estimated quantities:

Q - The sample result is less than the sample quantitation limit.

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nalytical Services Center
·93 Walden Avenue
ıncaster, New York 14086-

Laboratory Results

NYS ELAP ID#: 10486
Phone: (716) 685-8080

ient: E and E Seattle Office
ıb Order: 0109123
·oject: Upper Columbia River Phase I
ıb ID: 0109123-04A Sample Type: SAMP Matrix: Soil

Client Sample ID: 01090441
Alt. Client ID: MDSB01SD
Collection Date: 9/12/01 9:30:00 AM % Moist:33.70
Test Code: 1_LK_TOC_S

)TAL ORGANIC CARBON BY METHOD LLOYD KAHN Method: LLOYD KAHN Prep Method: NA

ıalyte	Result	Q	Limit	Units	DF	Date Analyzed	Run Batch ID	Analyst
tal Organic Carbon	17100		2760	mg/Kg-dry	1	9/24/01	TOC 5050A_SSM_010924	MYO

MW
10-5-01

ıitions:
ND - Not Detected at the Reporting Limit
J - Analyte detected below Reporting limits
B - Analyte detected in the associated Method Blank
H - Value exceeds Maximum Contaminant Level
* - Recovery outside limits
R - RPD outside recovery limits
E - Value above quantitation range
Surr - Denotes Surrogate Compound
M -Matrix Spike recovery outside limits
Q - Qualifier
A -Result by Method of Std. Addition
D - Diluted due to matrix or extended target compounds
N - Single Column Analysis

0523 1.8

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 LABORATORY
7411 Beach Dr. East
Port Orchard, Washington 98366

July 25, 2001

MEMORANDUM

SUBJECT: Field Screening Metals Results for the Upper Columbia River - Mining Area Analyses

FROM: Gerald H. Dodo
USEPA

TO: Monica Tonel
USEPA

cc: Leatta Dahlhoff
Ecology and Environment

Attached to this memo are the field screening analysis results for lead, zinc, and mercury acquired by ESAT for 84 samples at the Upper Columbia River mining areas. This work was performed under site account code 01T10P50102D106XLA00. The samples were analyzed in-situ using a Niton XL-723. Reference sample analyses were performed during each day of sample analyses using NIST SRM 2710. The reference sample results were within 20% of the stated true value, however, mercury was present at a concentration too low to be detected for this sample. All results were qualified F, acquired by a field screening method.

If you have any questions, please contact me at (360)871-8728.

151756

USEPA SF
1133724

Summary of XRF Screening Results
Lake Roosevelt Mine Study

Results in mg/Kg

No	Location	Sample ID	Date/Time	Zn	Pb	Hg
6	Red Top Rock Pile		6/18/01	1720 F	758 F	<26 F
7	Red Top Rock Pile	RDWR01SS	6/18/01	12896	15091	<96
8	Red Top Rock Pile		6/18/01	600	187	<18
9	Red Top Rock Pile	RDWR02SS	6/18/01	24589	8275	158
10	Red Top Rock Pile	RDWR03SS	6/18/01	7136	2640	<53
17	Copper King WR	CKWR01SS	6/19/01	434	327	<34
18	Copper King WR		6/19/01	159	103	<23
19	Copper King WR	CKWR02SS	6/19/01	< 225	226	<37
20	Copper King WR		6/19/01	< 240	121	<45
21	Copper King WR		6/19/01	< 144	173	<29
23	Black Rock Mine	BRWR01SS	6/19/01	181965	3709	216
24	Black Rock Mine	BRWR02SS	6/19/01	126976	698	<93
25	Black Rock Mine		6/19/01	12499	44	<31
26	Black Rock Mine		6/19/01	40294	417	<48
27	Black Rock Mine	BRWR03SS	6/19/01	358810	1130	286
32	Last Chance TP	LCTP05SS	6/20/01	124928	84070	<360
33	Last Chance TP	LCTP06SS	6/20/01	99994	41984	<270
34	Last Chance TP		6/20/01	43699	16192	<116
35	Last Chance Interfac	LCTP07SS	6/20/01	26394	7578	<85
36	Last Chance TP		6/20/01	21094	10694	<82
49	Great Western		6/21/01	39475	2570	75
50	Great Western	GWWR02SS	6/21/01	48077	3978	<70
51	Great Western		6/21/01	16691	1890	<42
53	Great Western		6/21/01	20595	1880	<48
54	Great Western		6/21/01	97792	10995	<195
55	Great Western	GWWR01SS	6/21/01	38784	2890	<74
57	Gladstone TP	GLTP01SS	6/21/01	14989	43085	<210
58	Gladstone TP		6/21/01	8608	18099	<134
59	Gladstone TP	GLTP02SS	6/21/01	17894	53965	<285
60	Gladstone TP		6/21/01	15898	30285	<195
61	Gladstone TP	GLTP03SS	6/21/01	16294	44493	<300
71	Electric Point Upper		6/22/01	1030	3920	<58
72	Electric Point Upper	EPWR03SS	6/22/01	1810	4867	<44
73	Electric Point Upper		6/22/01	1380	3808	<41
74	Electric Point Upper	EPWR02SS	6/22/01	2739	4218	<75
75	Electric Point Upper	EPWR01SS	6/22/01	2789	4067	<48
77	Electric Point Lower		6/22/01	12096	10298	<94
78	Electric Point Lower	EPWR07SS	6/22/01	32589	17600	147
79	Electric Point Lower	EPWR08SS	6/22/01	23693	19098	<195

No	Location	Sample ID	Date/Time	Zn	Pb	Hg
				7-25-01	7-25-01	7-25-01
85	Van Stone Mine		6/23/01	8467 F	379 F	<27 F
87	Van Stone Mine	VSWR01SS	6/23/01	17293	1440	<45
88	Van Stone Mine		6/23/01	1520	62	<17
90	Van Stone Mine		6/23/01	236	30	<14
91	Van Stone Mine	VSWR02SS	6/23/01	6944	344	<28
92	Van Stone Mine		6/23/01	5059	91	<25
94	Van Stone Mine		6/23/01	112	43	<13
95	Van Stone Mine	VSWR03SS	6/23/01	5827	154	<29
96	Van Stone Mine		6/23/01	3290	271	<24
97	Van Stone Mine		6/23/01	2629	299	<21
98	Van Stone Mine		6/23/01	5878	363	<27
99	Van Stone Mine	VSWR04SS	6/23/01	10797	847	<44
100	Van Stone Mine	VSWR05SS	6/23/01	11898	1730	<49
101	Van Stone Mine		6/23/01	4048	143	<26
102	Van Stone Mine		6/23/01	3920	687	<37
104	Van Stone Mine		6/23/01	18394	2210	<63
105	Van Stone Mine	VSWR06SS	6/23/01	34586	3878	<74
106	Van Stone Mine		6/23/01	29082	2629	<64
107	Van Stone Mine		6/23/01	4029	879	<28
108	Van Stone Mine	VSWR07SS	6/23/01	20890	6739	<68
109	Van Stone Mine	VSWR08SS	6/23/01	5600	361	<37
110	Van Stone Mine		6/23/01	5389	133	<24
112	Van Stone Mine		6/23/01	4730	128	<26
113	Van Stone Mine		6/23/01	4067	116	<30
114	Van Stone Mine	VSWR09SS	6/23/01	5040	61	<20
115	Van Stone Mine		6/23/01	4490	331	<24
116	Van Stone Mine		6/23/01	3398	738	<44
117	Van Stone Mine	VSWR10SS	6/23/01	3760	796	<51
118	Van Stone Mine		6/23/01	3210	1300	<39
119	Van Stone Mine		6/23/01	3930	1540	<44
120	Van Stone Mine	VSWR11SS	6/23/01	3160	221	<25
121	Van Stone Mine		6/23/01	5139	< 24	<19
122	Van Stone Mine		6/23/01	502	38	<20
123	Van Stone Mine	VSWR12SS	6/23/01	2939	906	<35
124	Van Stone Mine		6/23/01	3099	243	<23
125	Van Stone Mine		6/23/01	944	95	<36
133	Pend Oreille TP	POTP04SS	6/25/01	852	396	<21
134	Pend Oreille TP		6/25/01	648	413	<17
135	Pend Oreille TP		6/25/01	647	298	37
137	Pend Oreille TP		6/25/01	991	410	<24
138	Pend Oreille TP		6/25/01	595	416	<26
139	Pend Oreille TP	POTP05SS	6/25/01	1709	592	<30
141	Pend Oreille TP	POTP06SS	6/25/01	1890	612	<36
142	Pend Oreille TP		6/25/01	973	381	<30
143	Pend Oreille TP		6/25/01	661	240	<24

APPENDIX E

MYERS DAM DATA

draft

Appendix E

MEYERS DAM SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY LOWER PEND OREILLE RIVER EXPANDED SITE INSPECTION PEND OREILLE COUNTY, WASHINGTON

EPA Sample ID	01374222
CLP Inorganic ID	MJ0KK8
CLP Organic ID	J0KK8
E&E Sample ID	01090123
Station Location	MDSB01SD
TAL Metals (mg/kg)	
Aluminum	**7980**
Barium	**114**
Calcium	**11900 JK**
Chromium	**11.0**
Copper	**10.2**
Iron	**13500**
Lead	**12.9**
Magnesium	**6010**
Manganese	**252**
Zinc	**52.5**
Total Organic Carbon (mg/kg)	
TOC	**17100**

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

Key:

CLP	= Contract Laboratory Program.
E&E	= Ecology and Environment, Inc.
EPA	= United States Environmental Protection Agency.
ID	= Identification.
J	= The analyte was positively identified. The associated numerical value is an estimate.
K	= Unknow bias.
MD	= Meyers Dam.
mg/kg	= milligrams per kilogram.
SB	= sand bar.
SD	= sediment.
TAL	= Target Analyte List.
TOC	= Total Organic Carbon.

draft

APPENDIX F

METALINE FALLS MUNICIPAL WATER INTAKE DATA

Appendix F

METALINE FALLS MUNICIPAL WATER INTAKE SURFACE WATER SAMPLES ANALYTICAL RESULTS LOWER PEND OREILLE RIVER EXPANDED SITE INSPECTION PEND OREILLE COUNTY, WASHINGTON

EPA Sample Number	01264429	01264430
CLP Inorganic ID	MJ0GN8	MJ0GN9
CLP Organic ID	NU	NU
E & E Sample ID	NU	NU
Station Location	MF01SW	MF02SW
TAL Metals (µg/L)		
Aluminum	112 JB	149 JB
Antimony	2.5 U	2.5 U
Arsenic	2.6 U	2.6 U
Barium	13.2 JB	14.7 JB
Beryllium	0.3 U	0.3 U
Cadmium	0.6 U	0.6 U
Calcium	**24500**	**27300**
Chromium	0.6 U	0.6 U
Cobalt	1 U	1 U
Copper	1 U	1 UJK
Iron	44.4 U	34.8 U
Lead	2.8 U	2.8 U
Magnesium	**8900**	**9560**
Manganese	6 JB	3.7 JB
Mercury	0.1 U	0.1 U
Nickel	1.1 U	1.1 U
Potassium	792 JB	889 JB
Selenium	2 U	2 U
Silver	0.5 UJK	0.5 UJK
Sodium	2200 U	2790 U
Thallium	3.4 U	3.4 U
Vanadium	1 U	1.6 JB
Zinc	3.9 JB	0.65 JB

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

Key:

CLP	= Contract Laboratory Program.
DW	= Domestic water intake.
E&E	= Ecology and Environment, Inc.
ID	= Identification.
µg/L	= micrograms per liter.
NU	= Not utilized.
SW	= surface water.
U	= The analyte was not detected. The associated numerical value is the contract required detection limit.
J	= The analyte was positively identified. The associated numerical value is an estimate.
B	= The reported concentration is between the instrument detection limit and the contract required detection limit.
EPA	= United States Environmental Protection Agency.
K	= Unknown bias.

draft

APPENDIX G

WESTON'S TRIP REPORT