Leroi S.F 2.1

SITE INSPECTION REPORT
LEROI COMPANY SMELTER

CERCLIS No. WAD988507323

Prepared for:

Work Assignment No. 54-17-0JZZ

Contract No. 68-W9-0054
United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF APPENDIXES

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

ARCS	Alternative Remedial Contract Strategy
ASL	above sea level
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cfs	cubic feet per second
CLP	Contract Laboratory Program
CRDL	contract-required detection limit
DL	detection limit
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
IATA	International Air Transport Association
LeRoi	LeRoi Company Smelter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MSD	matrix spike/matrix spike duplicate
MTCA	Model Toxics Control Act
NEIC	National Enforcement Investigations Center
NPL	National Priorities List
PA	preliminary assessment
QAPP	quality assurance program plan
RAS	Routine Analytical Service
SARA	Superfund Amendments and Reauthorization Act
SI	site inspection
SDL	sample detection limit
SWL	static water level
TSOP	technical standard operating procedures
URS	URS Consultants, Inc.
USDC	United States Department of Commerce
USGS	United States Geological Survey
WDH	Washington State Department of Health
WDW	Washington State Department of Wildlife

1.0 INTRODUCTION

Pursuant to United States Environmental Protection Agency (EPA) Contract No. 68-W9-0054 and Work Assignment No. 54-17-0JZZ, URS Consultants, Inc. (URS) conducted a site inspection (SI) of the LeRoi Company Smelter (LeRoi) site (CERCLIS No. WAD988507323) in Northport, Washington. This SI was conducted under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The SI process is intended to document a threat or potential threat to public health or the environment posed by a site, determine whether a potential emergency situation exists that may require an immediate response, document the presence or absence of uncontained or uncontrolled hazardous substances on a site, and confirm site characteristics and area receptor information collected during the past studies. The SI is intended to collect sufficient data to enable evaluation of the site's potential for inclusion on the National Priorities List (NPL) and, for those sites determined to be NPL candidates, establish priorities for additional action. The SI process and this SI do not include extensive or complete site characterization, contaminant fate determination, or quantitative or qualitative risk assessment.

This report is organized as follows:

Section 1.0 Introduction—description of authority and purpose

Section 2.0 Background—site-related information

Section 3.0 Exposure Pathways and Potential Targets—evaluation of specific pathways and their possible targets

Section 4.0 Sampling Program—synopsis of sampling conducted

Section 5.0 Sampling Results—discussion of sampling results and those substances determined to be "significant"

Section 6.0 References—list of cited references

2.0 BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

Site Name:	LeRoi Company Smelter
CERCLIS No.:	WAD988507323
Location:	117 Park Road Northport, Washington 99157
Latitude:	48°55'15" North
Longitude:	117°46'15" West
Legal Description:	T39N R40E S4
Site Owner:	Mr. Steve Frazier
Site Operator:	Mr. Steve Frazier SSF Building Materials 117 Park Road Northport, Washington 99157
Site Contact:	Mr. Steve Frazier Phone: (509) 732-4464

The LeRoi site, approximately 32 acres, is located just northeast of the town center of Northport, Washington, along Highway 25. The site lies within Section 4 in Township 39 North Range 40 East, with the approximate latitude 48°55'15" North and longitude 117°46'15" West. The site address is 117 Park Road, Northport, Washington 99157. The city of Northport is located along the east bank of the Columbia River approximately 7 miles south of the United States-Canadian border in Stevens County.

The Northport-Waneta Road borders the LeRoi site along the south and east. Highway 25 defines the western boundary of the site. The Burlington Northern Railroad

(formerly the Spokane Falls and Northern Railroad) runs parallel to the Columbia River and designates the northern site boundary. The Columbia River is located approximately 200 feet north of the LeRoi property. Properties west of the site are residential homes. Smelter Hill (elevation 2,026 feet above sea level [ASL]) is located directly east of the site (USGS 1982). Silver Crown Mountain (elevation 2,943 feet ASL) is south of the site. A city park with an area of approximately 10 acres is located northwest of the site along the Columbia River, approximately 50 feet from the site. Figure 2-1 shows the site vicinity.

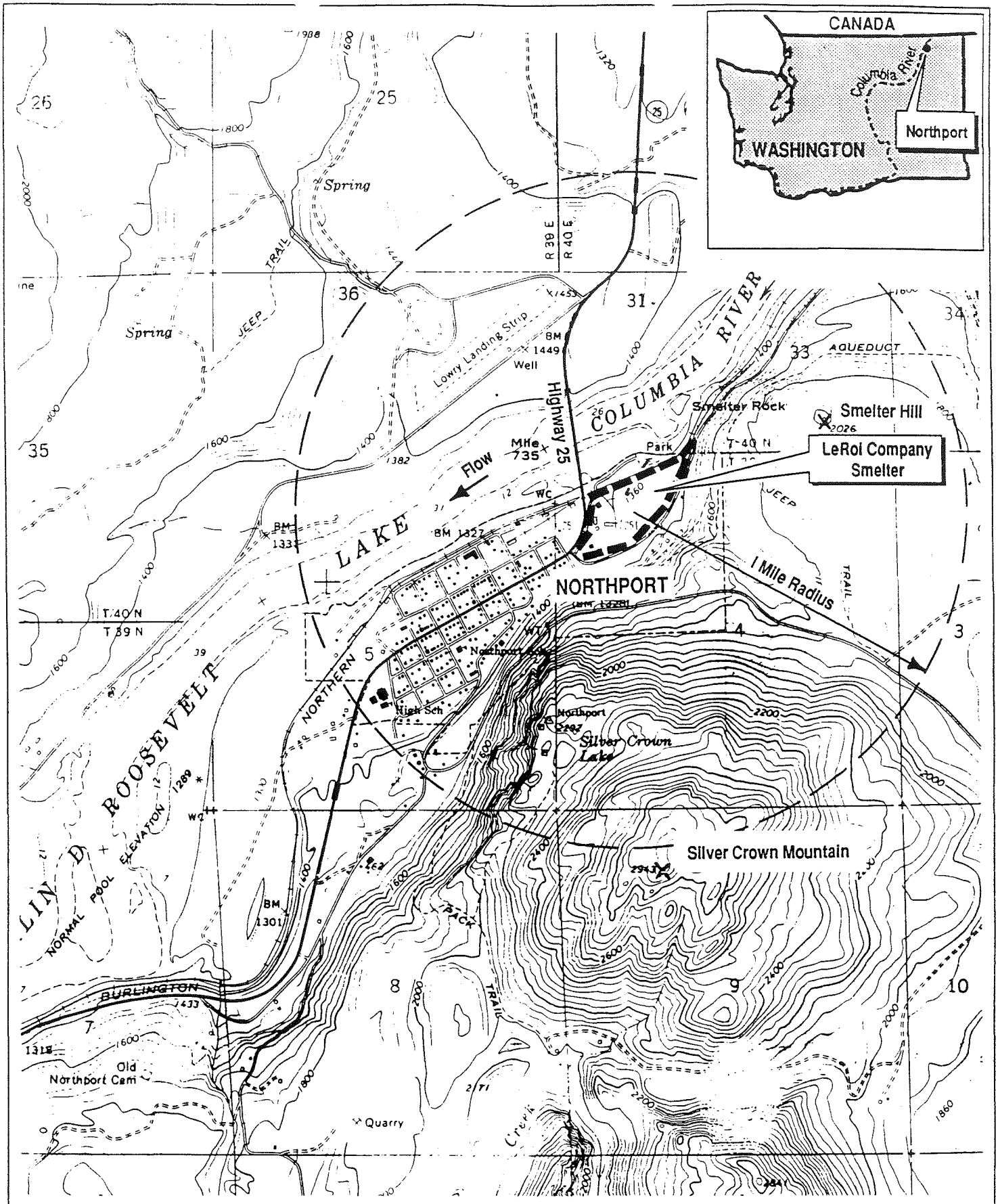
The site encompasses a total area of 32 acres, including an old smelter and an active lumber operation. The site is accessed from an unpaved road east of Highway 25 located on the south end of the site. This road also provides access to the city park. Figure 2-2 details the site and the immediate vicinity.

The site is not paved. Grasses and poplar trees grow throughout the northern portion of the property. A hill (possibly the former smelter tailings pile) with an approximate slope of 10 degrees is located on the north end of the site, resulting in an elevation change across the entire site of 50 feet. The site lies at approximately 1,360 feet ASL (USGS 1982). Site drainage appears to flow from northeast to southwest, then north toward the Columbia River (URS 1993a). The Columbia River flows southwest to the Roosevelt Lake Reservoir. The reservoir has a normal pool elevation of 1,289 feet ASL (USGS 1982).

Stone foundations and old brick walls from the former smelter facility remain on the site. Most of these remains are located on the northern portion of the property. One of the three original smokestacks is still standing. This remaining stack was reported as the second largest stack, being only half the size of the largest stack. It stands approximately 75 feet high and has a maximum width of approximately 10 feet (URS 1993a).

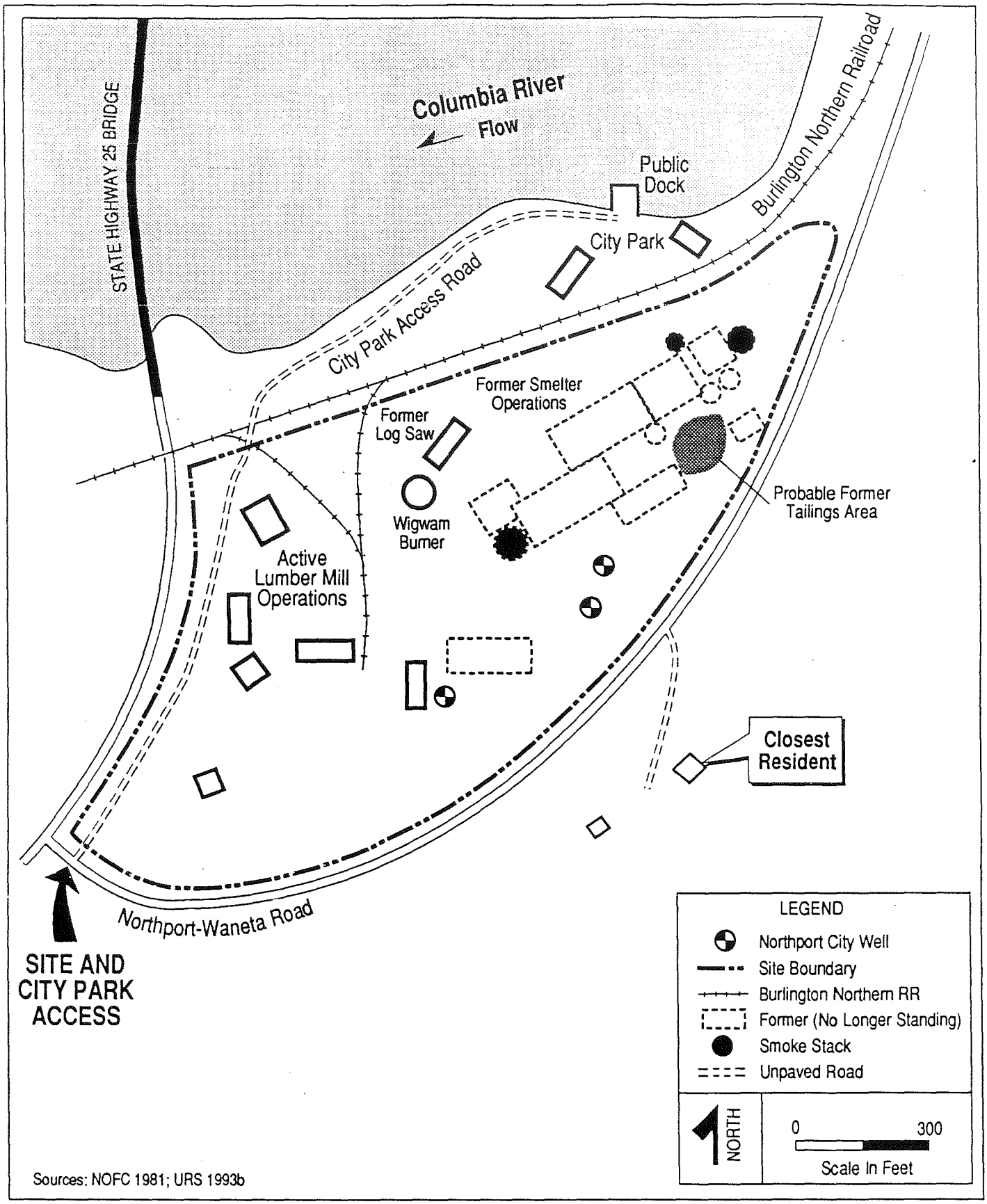
The current lumber operation is located on the southern third of the site. The majority of the structures used for the lumber operation were constructed over 20 years ago (Frazier 1993). Two lumber mill structures, an old wigwam burner, and an old log sawmill were identified on the site and are reported to be no longer in use (URS 1993a; Frazier 1993).

The former smelter buildings, which are no longer standing, included the furnace building (130 feet high, 100 feet wide, 700 feet long), the roaster building (90 feet high,



Source: U.S.G.S. Topo Map 7.5 min. Northport, WA 1969, 1982

URS CONSULTANTS, INC.	NORTH	0 1/4 1/2 Scale In Miles	Figure 2-1 Vicinity Map	LeRoi Company Smelter Northport, Washington



Sources: NOFC 1981; URS 1993b

URS Consultants, Inc.	Figure 2-2 Site Map	LeRoi Company Smelter Northport, Washington

150 feet wide, 500 feet long), and the crusher and ore building (90 feet high, 100 feet wide, 600 feet long) (Heritage 1981).

2.2 SITE HISTORY

In the 1890s, a flurry of mining activities evolved in northeastern Washington and southern British Columbia. In 1892, D.C. Corbin, owner of the Spokane Falls and Northern Railroad, built a rail line to reach the "city" of Northport, then consisting of a lumber mill and several tents. The railroad tracks were located adjacent to the LeRoi site, which at that time was owned by Mr. Corbin. The railroad proved to be of great value to the economy of northeast Washington. In 1896, Mr. Corbin donated the site to the LeRoi Mining and Smelting Company for the construction of a smelter called Breen Copper Smelter. The smelter location was chosen because the area contained large quantities of materials necessary for smelting, such as limerock for flux.

The smelter began treating copper and gold ores transported from the Rossland Mine located in British Columbia, Canada. In 1901, the LeRoi Company smelting operations reorganized as the Northport Smelting and Refining Company (NOFC 1981). By 1908, it was one of the largest smelters on the West Coast, processing 500 tons of ore per day (SCHS 1993). In 1909, the smelter closed because of competition from another smelter, the Consolidated Mining and Smelting Operations, located in Trail, British Columbia (NOFC 1981).

During World War I, the government demand for lead encouraged the Northport Mining and Smelting Company to reopen and process the lead ores that had been discovered at Leadpoint, Washington (approximately 9 miles east of Northport). In September 1914, Jerome Day purchased the smelter and renovated it to accommodate lead ores. On March 5, 1921, the government curtailed its lead purchases. A few months later, the smelter closed and never reopened (NOFC 1981). After the smelter closed in 1921, the American Smelting and Refining Company purchased the site. The company removed the smelting equipment and transported it to a smelter elsewhere. The company left the dismantled smelter inactive.

Between 1921 and 1953, the inactive site was purchased by J.D. Harms. Between 1953 and 1969, a lumber mill went into operation on the property. JB&T Lumber is the first known lumber mill company to have operated on the property. In 1975, Cecil Frazier purchased the property and operated the lumber mill. In 1985, Steve Frazier, son of

Cecil Frazier, purchased the property and business and has been operating the mill under the name SSF Building Materials (Frazier 1993; SCAO 1993). Table 2-1 summarizes the site ownership history.

Table 2-1
History of Site Ownership

Year	Owner	Operator	Activity
Prior to 1896	Mr. D.C. Corbin	Spokane Falls and Northern Railway Company	Vacant
1896 - 1901	LeRoi Mining and Smelting Company	Breen Copper Smelter	Copper and gold smelter
1901 - 1909	Northport Smelting and Refining Company	Northport Smelting and Refining Company	Copper and gold smelter
1909 - 1914	Northport Smelting and Refining Company	None	Inactive
1914 - 1921 (World War I)	Mr. Jerome Day	Day Smelter	Lead smelter
1921 - Unknown	American Smelting and Refining Company	None	Inactive; smelter machinery removed
Prior to 1953 prior to 1969	Mr. J.D. Harms	None	Inactive
Prior to 1969 - 1975	Unknown	JB&T Lumber	Lumber mill
1975 - 1985	Mr. Cecil Frazier	Frazier Lumber	Lumber mill
1985 - present	Mr. Steve Frazier	SSF Building Materials	Lumber mill

2.3 SITE OPERATIONS AND SOURCE CHARACTERISTICS

2.3.1 Copper and Gold Smelter Operations

The smelter, Breen Copper Smelter, operated from 1896 until 1901. The initial smelter operations were rudimentary and involved releases of large quantities of pollutants. The tellurium ore was more difficult to process; however, it contained high enough amounts

of copper and gold to make the process worthwhile. Tellurium is naturally occurring and belongs to the same family of elements as sulfur and selenium. Because of the tellurium, the ore had to be burned or heated to release the minerals. The burning released high amounts of sulfur dioxide into the air.

The ore was processed by heap roasting, which involves open burning of the raw ore prior to placing it in a mineral filtration furnace. The heap roasting process produced a disagreeable sulfur odor; the local citizens termed the burning piles "stink piles." Local farmers believed that the heap roasting process was poisoning the nearby soils.

A slag brick platform was used for the initial burning, or heap roasting, of the ore. The ore was piled on the brick platform to an approximate depth of 4 feet. Cord wood was then stacked on top of the ore pile and ignited. The tellurium in the ore would be vaporized during this process, thus freeing the gold and copper for smelting. The location of this brick platform is where the Northport city wells are currently located (Heritage 1981).

The burned ore was then placed into the furnace where the separation of the minerals took place. Limerock was used during the flux process. Tap holes were located at different levels in the furnace to filter the minerals and rocks (including iron, copper, and slag rock). The tap hole for the iron and slag rock was located higher than the copper tap hole. The iron and slag rock collected from this filtration was considered waste (Heritage 1981). The method used to dispose of this waste material is unknown. The copper mineral was collected and loaded into box cars for shipment to a copper refinery.

Because gold is heavy, it settled to the bottom of the furnace and formed a gold matte. After the gold accumulated to a thickness of 14 inches, the furnace was shut down. Once the furnace and materials cooled, the sides of the furnace were removed to gain access to the gold matte, which was then pried from the furnace and cut into pieces before being loaded into boxcars and shipped to a gold refinery (Heritage 1981).

2.3.2 Lead Smelter Operations

During World War I, because of an anticipated demand for lead, the government encouraged the Northport Mining and Smelting Company to reopen and to process lead ore that had been discovered at Leadpoint, a few miles east of Northport. In September 1914, Jerome Day arrived in the Northport area as the new owner of the smelter. He

purchased the smelter from Northport Mining and Smelting Company and announced that the smelter would be reconstructed to process lead ore. During the smelter's prime, nearly 500 workers were employed.

For security, an 8-foot-high wooden fence was initially constructed around the entire perimeter of the smelter. A guard tower was located every 300 feet along the fence. The guard towers were used during World War I. Security measures included locked gates for the railway (Heritage 1981).

The smelter was constructed of stone, brick, wood, and steel. Stone was used for the building foundations (URS 1993a) and brick was used for most walls. The brick was obtained from a nearby brick factory that supplied the town of Northport (URS 1993a; NOFC 1981). Steel and wood were used to frame and roof the buildings (URS 1993a; NOFC 1981).

During the smelter operations, fires plagued the town of Northport. Perhaps because of a water-supply system for fire fighting and the mostly brick construction, the smelter was spared from the prevalent fires. During the URS 1993 site visit an old fire hydrant was observed on the west wall of the furnace building.

Additional railroad tracks were added to the site for receiving the ore and mineral product. A railroad track, raised approximately 50 feet above the ground, ran the full length of the ore building (Heritage 1981).

The lead smelter used a process more sophisticated than that used in the copper and gold process of the previous decade, although a large quantity of sulfur (approximately 30 tons per day) was still being discharged into the air. This emission was reportedly considered tolerable by the residents. Filters for the smokestacks were added later (NOFC 1981).

In the days of the copper and gold smelter, two large steam engines, fueled by coal, provided power. Both flywheel steam engines (flywheels were 28 feet in diameter) were hooked onto one long line shaft. On the other end of the line shaft, a dynamo produced 10,000 volts of electricity prior to being boosted by a generator that provided up to 100,000 volts. Once the smelter reopened to process lead ores, a high-voltage line from Canada supplied the power, and the steam plant was shut down.

After 1921, the abandoned and dismantled smelter remained inactive. The town of Northport demolished the buildings for the usable brick. One building retained enough walls to provided an ice-skating rink during the winter (NOFC 1981). The railroad was abandoned and the tracks were salvaged. By 1929, only half of the upper Stevens County population remained and the entire upper Stevens County was suffering great economic hardship.

2.3.3 Lumber Mill Operations

Current operations on the site involve a lumber mill, SSF Building Materials, owned by Steve Frazier. It is one of the largest businesses of Northport, employing from 18 to 25 people. The entire site is used for the mill. The southern half of the property holds the main lumber operations. The northern half of the site, which contains the smelter remnants, is used to store lumber products and old metal parts (cars, piping, and roofing).

The current lumber mill processes mostly cedar wood from rough-dimension lumber into exterior siding and exterior paneling. The mill process includes cutting the wood, drying the cut wood, and shipping it. Mill operations are run on propane. All water used for mill operations is obtained from the city water supply. The mill does not discharge to or collect water from the Columbia River.

The scrap wood materials, including sawdust, are sent to Kettle Falls for the Kettle Falls Water Power Company, which burns the material for energy. Originally, the lumber mill burned the scrap wood on site inside a wigwam burner (Frazier 1993). Although the on-site burning has been eliminated for years, the wigwam burner was observed on the site (URS 1993a). No wood treatment or chemical use is reported in the current and past mill operations (Frazier 1993).

2.3.4 Source Characteristics

Smelting operations produce a tailing waste referred to as slag. The slag was usually placed in piles near the smelter for temporary or permanent disposal. Historical photographs (1914-1921) indicate possible tailing piles located on the northeast portion of the LeRoi property (URS 1993b). During the 1993 site visit, there was no visible evidence of tailing piles (URS 1993a). However, the slag piles could be covered by topsoil and vegetation, thus preventing their identification. The estimated location of the former tailings area is shown on Figure 2-2. This is based on historical photographs and

site topography. The exact location or process of disposal of the slag piles is unknown. Steve Frazier, the current site owner, indicated that the slag may have been deposited directly into the river. At the time of the 1993 URS site visit, brick masonry was observed in the river adjacent to the property. The brick appeared to be the remnants of the large smokestack (URS 1993b).

Konrad Hartbauer, a long-time resident of Northport, stated that the smelter slag was used for bricks in residents' homes (Hartbauer 1993). The slag was broken into blocks approximately 9 by 12 inches. Being glossy black, they offered unique character for residents' basements (NOFC 1981).

The chemicals of concern in the slag would be gold, copper, lead, and tellurium. No surface impoundments were observed in the historical documentation of the site. Surface impoundments are commonly used in the smelting process for the collection of wastewater and could be a potential source of heavy metals (Larkin 1993). However, mining operations in the early 1900s likely discharged wastewater directly to the Columbia River.

No spills of any hazardous substances are known to have occurred on the property. No areas on the site were observed to be distressed. The site and nearby hills contained an abundance of young poplar trees, apparently replacing the logged coniferous trees (URS 1993a).

2.4 INVESTIGATIVE AND REGULATORY HISTORY

2.4.1 Regulatory History for LeRoi

One regulatory investigation previously occurred at the LeRoi site. This investigation was conducted in 1993 by the EPA and involved a preliminary assessment of the site. This SI is the second stage of the EPA investigation.

2.4.2 Overall Regulatory History

Environmental concerns in the Northport area have been investigated since 1925. Because of its proximity to the Canadian border, the Northport area is potentially impacted by both air and water pollutants from Canadian mining, smelting, and milling operations. In 1925, the area became involved in the first international case concerning

air pollution, the Trail Smelter Case (see Section 2.4.3). Recently, furan and dioxin pollutants from a pulp mill located in Castleguard, British Columbia, have been found in the Columbia River near Northport. The Northport area has shown increased incidence of colitis and related intestinal disease, multiple sclerosis, diabetes, heavy metals poisoning, Parkinsons disease and related neurological problems, and immune and respiratory problems (WDH 1992; Walen 1993). The Washington State Department of Health (WDH) and Washington State Department of Ecology (Ecology) are conducting an investigation of the furan and dioxin reported in the Columbia River (Fields 1993). Additionally, a lead smelter in Trail, British Columbia, is a potential source of high lead concentrations in the air. WDH is monitoring the air in the area and testing blood lead level (Fields 1993). See Appendix A for further information on the investigation by WDH.

Concerned citizens of the region have formed an organization, Citizens for a Clean Columbia. The organization is involved with the investigations concerning the health and environmental problems of the region.

2.4.3 The Trail Smelter Case of 1926 to 1934

A smelter in Trail, British Columbia, prospered during the 1920s and 1930s. The Trail smelter discharged sulfides into the air through a brick stack 409 feet high. The air pollution traveled south and remained trapped in the northern Stevens County Columbia River Valley. In 1925, the Trail smelter increased the discharge of sulfur dioxide into the air from 4,700 to 10,000 tons a month—11 times that of the old Northport smelter. The citizens of Northport complained that sulfur pollution was threatening their health and environment. They insisted that area soils and forests were becoming sulfur poisoned, causing their crops and forest land to die. They formed a "Citizens Protective Association" that worked with local governments to try to save the community (NOFC 1981).

The United States State Department opened negotiations to collect damages from the Canadian government for the citizens of Northport. On February 28, 1931, the International Joint Commission recommended that the Canadian government stop polluting the atmosphere. This dispute is known as the Trail Smelter Case of 1926 to 1934. It was the first case of air pollution to come before an international tribunal.

3.0 EXPOSURE PATHWAYS OF CONCERN AND POTENTIAL TARGETS

3.1 GROUNDWATER PATHWAY

3.1.1 Geology and Hydrogeology

The geology of the Upper Columbia River Valley in Stevens County is composed of lacustrine and till deposits varying between medium- and coarse-size rocks (BCNRC 1956). Limestone is prevalent in the area (Ecology 1993a). Glacial movement caused the deposits of till, which provide high percolation rates of surface water. The top of the aquifer (approximate elevation 1,280 feet ASL) supplying the community water is nearly the same elevation as the bottom of the Columbia River (approximately 1,290 feet ASL) (Schwab 1993; USGS 1982). Because of its proximity, the Columbia River provides most of the recharge for the aquifer. Although the area has high percolation rates, rainwater causes little recharge for the aquifer because of an annual average net precipitation of only 9.55 inches (Appendix B).

Table 3-1 summarizes the general lithology of the site obtained from one of the on-site community wells (Ecology 1993a).

Table 3-1
Stratigraphy of the LeRoi Site

Depth (feet bgs)	Description
0-25	Clay with medium to coarse sand
25-75	Fine sand (limestone)/silt/some clay
75-100	Very fine sand (limestone)/water bearing
100-180	Very fine sand (limestone)
180-190	Fine sand (limestone)
190-230	Sand/some coarse sand

Source: Well listings for on-site well from the Washington State Department of Ecology, Spokane office (Ecology 1993a)

3.1.2 Groundwater Targets

A total of 65 wells are located within a 4-mile radius of the LeRoi site (Schwab 1993; USGS 1993; Ecology 1993a). Of the 65 wells, 62 supply domestic drinking water and 3 supply community drinking water. The total drinking water population is 494 people within a 4-mile radius of the site (Schwab 1993; Ecology 1993a). A breakdown of these wells is shown in Table 3-2.

Table 3-2
Groundwater Drinking Populations Within 4 Miles of the LeRoi Site

Distance From Site (miles)	Number of Domestic Wells	Domestic Population	Number of Community Wells	Community Population	Total Population[a]
On site	0	0	3	325	325
0-¼	0	0	0	0	0
¼-½	4	11	0	0	11
½-1	8	22	0	0	22
1-2	21	57	0	0	57
2-3	21	57	0	0	57
3-4	8	22	0	0	22
Total	62	169	3	325	494

[a]Based on 2.71 people per household using each domestic well and a total population of 325 for Northport, Washington, using the community wells (USDC 1990; Ecology 1993a; USGS 1993)

The town of Northport has three drinking water wells with 202 connections supplying water to approximately 325 residents. The total production for these wells is 100,000 gallons per day. Well production ranges between 70 to 150 hundred gallons per minute. The wells are located on the LeRoi site just east of the former furnace building. The depths of the three wells range from 101 feet to 226 feet below ground surface (bgs). The depth to water is approximately 75 feet bgs (Ecology 1993a). The wells supply a storage tank (100,000-gallon capacity) located on the hill southeast of town. This system has been in place since 1969 (WDF 1993).

According to Joe Schwab, the water manager for the Northport Water System, there have been no problems with the city water. Well water is not chlorinated prior to

distribution. In accordance with WDH quality control, the water is tested monthly for water bacteria, quarterly for inorganics, and yearly for radiation. A review of the latest analysis indicated all potential contaminants are below the detection levels (URS 1993a; Schwab 1993). The wells supplying the system have never run dry. Mr. Schwab expressed no concern that the water quality of the wells might be affected by the former smelter. He believes the depth of the wells is adequate to prevent leaching of potential contaminants to the aquifer (Schwab 1993). A summary of the Northport city wells is shown in Table 3-3.

Table 3-3
Northport Water System

Well Name	Total Depth (feet bgs)	Average Production (gallons/minute)	Year Installed
Well #1	157	70	1969
Well #2	226	150	1971
Well #3	101	130	1978

Source: WDH 1993

3.2 SURFACE WATER PATHWAY

3.2.1 Surface Water Flow and Quality

The LeRoi site is located along the upper Columbia River in northeastern Washington. This area is fairly dry, with an average annual precipitation of 20.29 inches (NOAA 1991) and a 2-year 24-hour precipitation of 1.2 inches (UW 1993). The average temperature during the winter months is approximately 30°F. Precipitation accumulates in the form of snow during these months.

Most surface water runoff would travel directly north from the southern half of the property and northwest from the northern half of the property to the Columbia River approximately 90 to 200 feet from the northern boundary, with an elevation decrease of approximately 50 feet. The site is not located within the 100-year floodplain.

The Columbia River is the only surface water body identified within 15 miles downstream of the site. The river flow and elevation are controlled by several dams located both upstream in Canada and downstream in the United States. An upstream dam is located approximately 15 miles upstream. The first downstream dam, Coulee Dam, is located approximately 50 miles downstream. The 50-mile stretch along the Columbia River from Coulee Dam to Northport is considered Lake Roosevelt.

A gauging station is located at the State Highway 25 bridge in Northport, near the site. The gauging station is maintained by the United States Geological Survey (USGS) in conjunction with the national stream quality accounting network program. Monthly, the flow and water quality samples are taken from this gauge. The average flow for the river is 89,325 cubic feet per second (cfs). From 1985 through 1986, the maximum flow for the river was 113,000 cfs and the minimum flow was 57,500 cfs (USGS 1986). At the time of the URS 1993 sampling event, the river appeared to be at its normal height.

The surface water quality results from the 1986 and 1987 USGS summaries indicate unacceptable colony counts of bacteria (coliform fecal and streptococci fecal) during various months of the year. Results for other months indicate no problems with bacteria (Appendix C).

Samples of Columbia River water in the region have shown detectable concentrations of dioxins and furans possibly from a pulpmill located in Canada. Testing is currently underway to determine the source of the chemicals and the effect the pollutants may have on the environment (see Section 2.3.5).

3.2.2 Surface Water Targets

Twelve surface water intakes are located 15 miles downstream of the site along the Columbia River. One surface water intake (Permit #4638), approximately 15 miles downstream, is used for both domestic and irrigation purposes. The surface water right was obtained May 20, 1946. See Appendix D for a copy of the surface water right. The remaining surface water intakes are used for irrigation with the exception of one intake used for mining operations. No other surface water intakes were identified (Ecology 1993a).

Fisheries identified along the Columbia River within the 15-mile target distance consist of only nonanadromous species. No anadromous fish are found above the Chief Joseph Dam in Bridgeport, approximately 100 miles downstream from Northport. The fish

species in this portion of the Columbia River include Rocky Mountain white fish (*Prosopium williamsoni)*, Kokanee (*Oncorhynchus nerka kennerlyi*), rainbow trout (*Salmo gairdneri*), walleye pike (*Stizostedio vitreum*), and white sturgeon (*Acipenser transmontanus*) (BCNRC 1956; Scott 1973). The white sturgeon is anadromous in most large rivers but landlocked in the upper Columbia River (Scott 1973). The white fish and the Kokanee are similar to their anadromous counterpart (Scott 1973). No information concerning the annual fish harvest was available for the northern Columbia River from the Washington State Department of Fisheries or the Washington State Department of Wildlife (WDW) (URS 1993a).

According to Larry Lavoy, a fish biologist with the Washington State Department of Fisheries, many residents fish near Kettle Falls, approximately 23 miles downstream from Northport along the Columbia River. The WDH has issued precautions concerning the consumption of fish collected from Lake Roosevelt (Columbia River above Coulee Dam) because of dioxins and furans. The Tellgard Mill in Castleguard, British Columbia, is suspected to be responsible for the dioxin and furan contamination of the Columbia River (Lavoy 1993).

The total wetland frontage for 15 miles downstream is approximately 5 miles of palustrine environments (URS 1993a). No other sensitive environments were identified within a 15-mile downstream segment of the Columbia River (URS 1993; WDW 1993).

3.3 SOIL PATHWAY

3.3.1 Soil Description

The surface soils in the region are brown podzolic, gray wooded soils. These soils are light colored, relatively infertile, and poor sources of lime and iron. They are typically found in coniferous forests.

Subsurface soils in the region consist of intermingled glacial deposits that vary between medium and coarse sizes (BCNRC 1956). See Section 3.1.1 for a more complete description of soils.

3.3.2 Soil Targets

The LeRoi site is located within the city limits of Northport. All the residents of Northport, approximately 358 people, live within a 1-mile radius of the site (USGS 1982; USDC 1990). No residents live on the LeRoi property. Six people are estimated to reside within 200 feet of the east boundary of the site (USGS 1982; Schwab 1993). There are no daycares or schools within 200 feet of the site. A city park is located approximately 50 feet from the north site boundary. The park is accessed by means of a road on the southwest corner of the site. Access to the LeRoi site is not restricted. The total number of residents within a 4-mile radius of the site is 494. Residential populations identified within a 4-mile radius are summarized in Table 3-4.

Table 3-4
Resident Populations Within 4 Miles of the LeRoi Site

Distance From Site (miles)	Resident Population
0 to ¼	20
¼ to ½	261
½ to 1	77
1 to 2	57
2 to 3	57
3 to 4	22
Total	494

Sources: USGS 1982; USDC 1990; Ecology 1993a; URS 1993b

3.3.3 On-Site Concerns

Between 18 and 25 full-time employees work at the active lumber mill located on site. Site access is not restricted and the city park located north of the site requires residents to cross the property.

3.4 AIR PATHWAY

3.4.1 Regional Characteristics

The LeRoi site is located on the north side of Northport in a rural area. No other communities are within a 4-mile radius of the site. This area is within a valley that has been reported to collect air pollutants from the north. This area has a relatively cold and dry climate, with a monthly average rainfall of 1.7 inches (NOAA 1991).

3.4.2 Air Targets

The residential population within 4 miles of the site is detailed in Table 3-4. The closest resident is located within 200 feet of the LeRoi site (see Section 3.3.2).

Approximately 120 acres of palustrine wetlands are located within 4 miles of the site (WDW 1993). Three osprey breeding and nesting grounds are located within a 4-mile radius of the site (at distances of 1 mile, 2 miles, and 3 miles) (WDW 1993). All nests, however, are north of the site (upstream and upwind). Osprey are currently being monitored by WDW and are not listed as endangered species with either the state or federal governments (WDW 1993).

Other sensitive areas that may be impacted by air releases include Sheep Creek, located 2 miles upstream of the site on the Columbia River, which is identified as a critical spawning habitat for resident fish species (WDW 1993). No other sensitive areas were identified. No endangered species were identified in the area.

4.0 SAMPLING PROGRAM

On July 13, 1993, URS collected surface soil samples from the LeRoi site and off-site locations. The sampling objectives, sampling methods, and analytical and handling requirements are discussed in the following sections. The analytical results of this sampling event are summarized in Section 5. Photodocumentation of the field sampling event is included in Appendix E.

4.1 SAMPLING OBJECTIVES

The field sampling conducted at the LeRoi site was intended to gather data to evaluate potential soil problems associated with previous smelting operations conducted on site. Sampling locations were selected to assess on-site conditions and possible release to the adjacent properties. The following samples were collected and analyzed for metals (including mercury and cyanide):

- On-site surface soils (near the probable former tailings area)
- Surface soils of adjacent city park
- Off-site (background) surface soils

The specific environmental samples collected to accomplish these objectives are described in Section 4.2.

Samples collected during the LeRoi field sampling event are summarized in Table 4-1, including the sampling locations and rationale. Figure 4-1 shows the sample locations.

4.2 SAMPLING METHODS

The media-specific sampling procedures used during the field sampling at the LeRoi site were consistent with methodologies described in the quality assurance program plan (QAPP) (URS 1990a), technical standard operating procedures (TSOP) for Alternative Remedial Contracts Strategy (ARCS) contract activity (URS 1990b), and the draft health

Table 4-1
Sample Descriptions

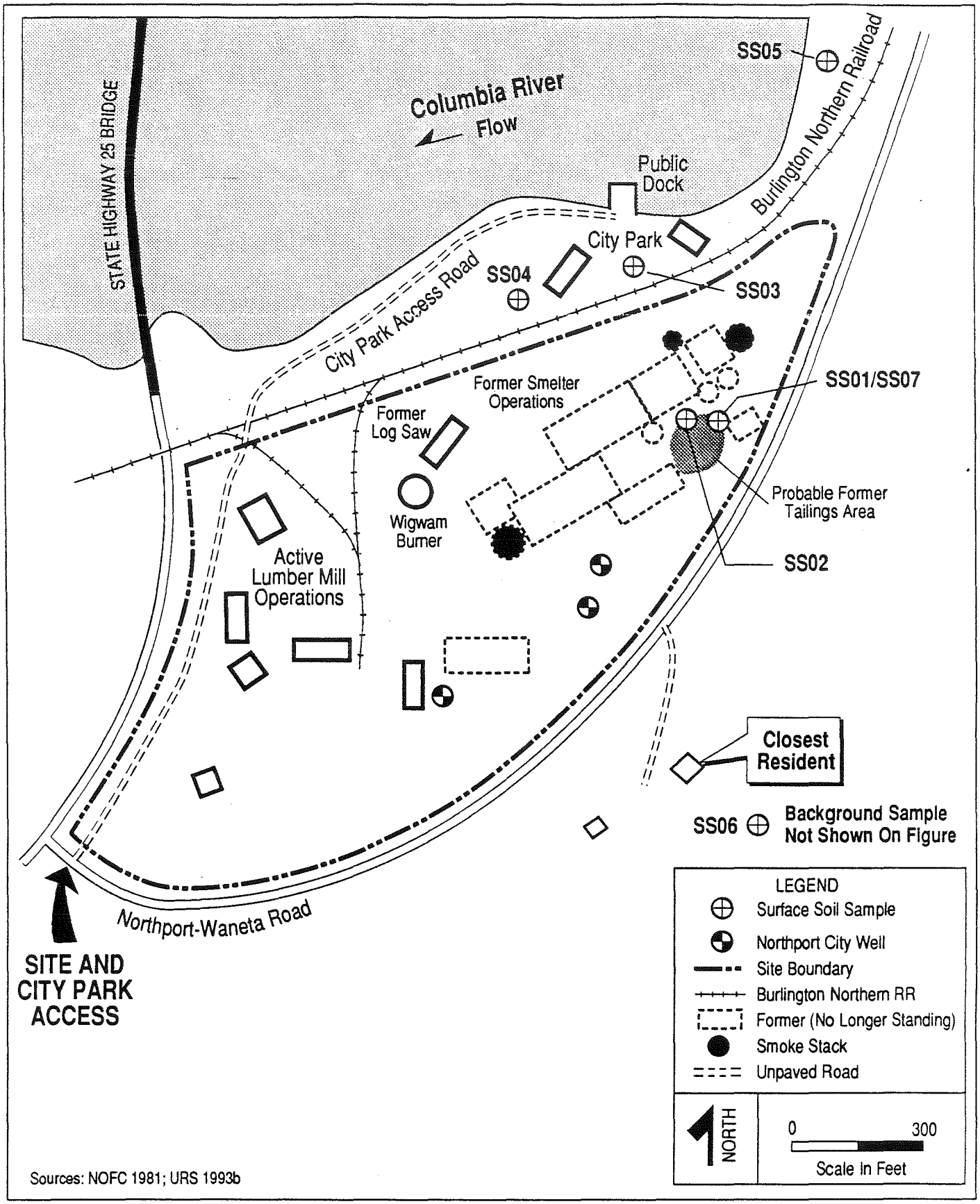
Sample Number	Location	Rationale	Date and Time Collected
SS01[a]	On site (tailings pile east)	Characterize surface soil	7/13/93:1150
SS02	On site (tailings pile west)	Characterize surface soil	7/13/93:1206
SS03	Adjacent city park	Characterize surface soil	7/13/93:1033
SS04	Adjacent city park	Characterize surface soil	7/13/93:1142
SS05	~500 feet upstream along Columbia River	Characterize background surface soil	7/13/93:1338
SS06	~2 miles upstream along Columbia River	Characterize background surface soil	7/13/93:1300
SS07	On site (tailings pile east)	Quality control—duplicate of SS01	7/13/93:1150
ER01	Equipment rinsate	Quality assurance	7/13/93:1010

[a]Sample collected for laboratory matrix spike/matrix spike duplicate (MS/MSD) analysis.

and safety program manual for ARCS (URS 1990c), as well as those described in the EPA's *Compendium of Superfund Field Operations Methods* (U.S. EPA 1987). All dedicated sampling equipment was decontaminated before and after each sample was taken.

Soil Samples (TSOP 5.4 Surface and Shallow Depth Soil Sampling)

Seven surface soil samples were collected to assess the possible release by former smeltering operations of total metals to on-site and off-site soils. On-site samples were collected from the possible former tailings area, which was determined from historical photographs and field observation. The surface soil samples were collected from 0 to 6 inches bgs with a decontaminated stainless steel trowel and placed into a decontaminated stainless steel bowl, homogenized, and placed in the sample container. Sticks, rocks, and other debris were removed from the soil prior to homogenization. One 8-ounce jar of soil was collected at each sample location.



Sources: NOFC 1981; URS 1993b

URS Consultants, Inc.	Figure 4-1 Sample Location Map	LeRoi Company Smelter Northport, Washington

4.3 ANALYTICAL AND HANDLING REQUIREMENTS

EPA Region 10 chain-of-custody procedures were followed in accordance with requirements outlined in the URS TSOP (URS 1990b) and QAPP (URS 1990a) for ARCS contract activity. Table 4-2 summarizes the requirements for sample analysis. Because the data collected during this project are potential evidence, all samples intended for analysis through the EPA Region 10 laboratory were handled and documented in accordance with procedures specified in the EPA *User's Guide to the Contract Laboratory Program* (U.S. EPA 1988), the URS QAPP (URS 1990a), and *National Enforcement Investigations Center Policies and Procedures* (U.S. EPA 1985). Sample packaging conformed with applicable Washington State Department of Transportation regulations (49 CFR 171-177) and International Air Transport Association (IATA) guidelines (IATA 1987).

Table 4-2
Sample Analytical Requirements for Soil

Parameter	Requirement
Method	CLP-RAS
Parameters of interest	Total metals/cyanide/mercury
Number of samples collected	7
Volume collected	1 8-ounce jar
Preservation	Maintain at 4°C
Holding time—total metals	Analytical—180 days Contractual—35 days
Holding time—cyanide	Analytical—14 days Contractual—12 days
Holding time—mercury	Analytical—28 days Contractual—26 days

Note:
CLP-RAS - Contract Laboratory Program Routine Analytical Service

5.0 SAMPLING RESULTS

The conditions used to define an "observed release" of a particular substance to any of the matrices sampled during the data evaluation process are summarized in Table 5-1. Discussions of data results in this report use the term "significant" to classify concentrations of detected chemicals based on the criteria described in Table 5-1. The results discussed in the following sections are limited to those substances determined to be significant (as defined in Table 5-1).

Table 5-1
Significance Criteria for Chemical Analysis

Sample Measurement < Sample Detection Limit (SDL)	Sample Measurement > Sample Detection Limit (SDL)
If no observed release is established, the result is not identified as "significant."	An observed release or "significant" result is established as follows: If the background concentration is not detected (or is less than the detection limit), an observed release or significant result is established when the sample measurement equals or exceeds the sample detection limit. If the background concentration equals or exceeds the detection limit, an observed release or significant result is established when the sample measurement is three times or more above the background concentration.

Notes:
If the SDL cannot be established, determine if there is an observed release as follows:
If the sample analysis was performed under the EPA Contract Laboratory Program (CLP), use the EPA contact-required detection limit (CRDL) in place of the SDL
If the sample analysis was not performed under the EPA CLP, use the detection limit (DL) in place of the SDL

Source: 40 CFR Part 300, Section 2.3

The tables provided in the following discussion include all reported concentrations of metals/cyanide/mercury analyte detected in at least one sample collected July 13, 1993. The laboratory data results and data validation reports are provided in Appendix F. A summary table of the target and actual data quality objectives of the LeRoi field sampling are also presented in Appendix F.

The following discussion addresses background surface soils, on-site surface soils, city park surface soils, and then quality control samples.

5.1 BACKGROUND SURFACE SOIL

Background surface soil samples were collected at two locations, SS05 at 500 feet northeast (upstream) of the site and SS06 at 2 miles northeast (upstream) of the site, both along the Columbia River. The analytical results are presented in the tables discussed in Section 5.2 On-Site Surface Soil and Section 5.3 City Park Surface Soil. In general, the two background soil samples reported analytes at concentrations less than the samples collected on site or at the city park. Of the two background samples, sample SS06, collected 2 miles from the site, generally reported lower concentrations of analytes. Sample SS06 was used in this report to determine the significant concentrations (Table 5-1) of total metal analytes in on-site and city park samples. The analytes antimony, cyanide, selenium, and thallium were reported as not detected in background sample SS06.

5.2 ON-SITE SURFACE SOIL

Data results that satisfy the criteria listed in Table 5-1—described in this section as significant—are highlighted in Table 5-2. All samples collected during this investigation were analyzed for metals/cyanide/mercury as described in the field sampling plan (URS 1993c). Bias (high or low) of the qualified "J" sample results identified in Table 5-2 was determined from the data validation reports and the results of the laboratory MS/MSD analyses.

5.2.1 Total Metals Analysis

Total metals detected in the three soil samples (SS01, SS07, SS02) collected from the LeRoi site are summarized in Table 5-2. Nine analytes were detected with significant concentrations in at least one of the three on-site soil samples. Four of these analytes (cadmium, copper, lead, and silver) were detected at significant concentrations in all on-site soil samples. These four analytes were the only analytes detected in sample SS02 at significant concentrations. The concentrations of cadmium in samples SS01, SS07, and SS02 are estimated at 26.8 mg/kg, 20.5 mg/kg, and 11.6 mg/kg, respectively. The concentrations of copper in these samples are 1,600 mg/kg, 991 mg/kg, and 165 mg/kg,

Table 5-2
Results From On-Site Surface Soil Samples and Comparison to Off-Site Background

	Off-Site Background		On-Site		
	500 Feet Upstream	2 Miles Upstream	Tailings Pile East	Duplicate of SS01	Tailings Pile West
	SS05	SS06	SS01	SS07	SS02
Total Metals	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	2.5 UJ	3.2 UJ	**48.4**	**46 J**	2.5 UJ
Arsenic	17.8	7.53	**140**	**126**	18.1
Barium	858	120	151	146	125
Beryllium	0.28 J	0.28 J	0.31 J	0.32 J	0.29 J
Cadmium	8.16 J	2.18 J	**26.8 J**	**20.5 J**	**11.6 J**
Chromium	51.8	36.9	36.2	25.8	46.3
Cobalt	10.6	44.9	54.6	20.4	14.3
Copper	146	15.4	**1,600**	**991**	**165**
Lead	699	202	**39,000**	**37,100**	**2,180**
Manganese	532	344	651	820	366
Mercury	0.33	0.02 J	**0.65 J**	**0.87 J**	0.38 J
Nickel	33.8	59.3	44	21.6	27.7
Selenium	0.81 J	0.2 UJ	**3.3 J**	**2.42 J**	0.42 J
Silver	0.59 J	0.31 J	**93.9**	**90.4**	**4.87**
Thallium	0.25 U	0.25 U	**0.43 J**	0.34 J	0.25 UJ
Vanadium	26	17.7	22.7	23.8	20.9

Notes:
mg/kg - milligrams per kilogram
J - The analyte was positively identified; the concentration is an estimate.
UJ - The analyte was not detected above the detection limit. The associated concentration is an estimate.
U - The analyte was analyzed for but not detected above the detection limit.
Highlighted values indicate the detected concentration of the analyte was significant based on the criteria in Table 5-1.

respectively. The concentrations of lead are 39,000 mg/kg, 37,100 mg/kg, and 2,180 mg/kg, respectively. The concentrations of silver are 93.9 mg/kg, 90.4 mg/kg and 4.87 mg/kg, respectively.

Sample SS07 is a duplicate sample of SS01. The analytes detected with significant concentrations were similar for samples SS01 and SS07 with the exception of thallium. Thallium was not detected at a significant concentration in sample SS07. Analytes reported in samples SS01 and SS07 included antimony (estimated at 48.4 mg/kg and 46 mg/kg, respectively), arsenic (140 mg/kg and 126 mg/kg, respectively), mercury (0.65 mg/kg and 0.87 mg/kg, respectively), and selenium (3.3 mg/kg and 2.42 mg/kg, respectively). Thallium was detected in sample SS01 at the estimated concentration of 0.43 mg/kg.

Three analytes, antimony, arsenic, and lead, exceeded either state or federal regulations for soil concentrations. The Washington State Model Toxics Control Act (MTCA) concentration in soil for antimony is 32 mg/kg (MTCA Method B Residential) and arsenic is 20 mg/kg (MTCA Method A). Antimony was detected in samples SS01 and SS07 with a maximum concentration of 48.4 mg/kg. Arsenic was detected in samples SS01 and SS07 with a maximum concentration of 140 mg/kg. The MTCA concentration for lead in soils is 250 mg/kg (MTCA Method A). Lead was detected with significant concentrations in all three on-site soil samples with a maximum concentration of 39,000 mg/kg.

5.2.2 Cyanide Analysis

Cyanide was reported as undetected in all background and on-site soil samples.

5.3 CITY PARK SURFACE SOIL

Data results that satisfy the criteria listed in Table 5-1—described in this section as significant—are highlighted in Table 5-3. All samples collected during this investigation were analyzed for total metals/cyanide/mercury as described in the field sampling plan (URS 1993c). Bias (high or low) of the qualified "J" sample results identified in Table 5-3 was determined from the data validation reports and the results of the laboratory MS/MSD.

Table 5-3
Results from City Park Surface Soil Samples and Comparison to Background

Total Metals	Off-Site Background		City Park	
	500 Feet Upstream	2 Miles Upstream	East	West
	SS05	SS06	SS03	SS04
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Antimony	2.5 UJ	3.2 UJ	2.5 UJ	4.8 J
Arsenic	17.8	7.53	5.64	61.1
Barium	858	120	109	312
Beryllium	0.28 J	0.28 J	0.38 J	0.753
Cadmium	8.16 J	2.18 J	1.59 J	0.72 J
Chromium	51.8	36.9	51.3	28.3
Cobalt	10.6	44.9	25.3	19.1
Copper	146	15.4	35.4	355
Lead	699	202	112	64.2
Manganese	532	344	375	350
Mercury	0.33	0.02 J	0.02 J	0.06 J
Nickel	33.8	59.3	32	25.1
Selenium	0.81 J	0.2 UJ	0.4 UJ	0.4 UJ
Silver	0.59 J	0.31 J	0.3 U	0.96 J
Thallium	0.25 U	0.25 U	0.25 U	0.25 U
Vanadium	26	17.7	41.5	43.4

Notes:
mg/kg - milligrams per kilogram
J - The analyte was positively identified; the concentration is an estimate.
UJ - The analyte was not detected above the detection limit. The associated concentration is an estimate.
U - The analyte was analyzed for but not detected above the detection limit.
Highlighted values indicate the detected concentration of the analyte was significant based on the criteria in Table 5-1.

5.3.1 Metals Analysis

Metals detected in the two off-site soil samples (SS03 and SS04) collected from the city park are summarized in Table 5-3. Two analytes, arsenic and copper, were detected with significant concentrations in sample SS04. Arsenic was detected at 61.1 mg/kg, which exceeds the MTCA cleanup level for soil of 20 mg/kg. Copper was detected at 355 mg/kg. Sample SS03 received no detections with significant concentrations.

5.3.2 Cyanide Analysis

Cyanide was reported as undetected for all background and on-site soil samples.

5.4 QUALITY CONTROL SAMPLES

Duplicate sample SS07 (duplicate of SS01) was collected during this field sampling event to evaluate the environmental variability at a sampling location and the consistency of sample collection. The results from the duplicate collected at the LeRoi site showed detections of similar compounds.

During the field sampling conducted at LeRoi, an equipment rinsate sample (ER01) was collected. The results of this sample are provided in Table 5-4. The equipment rinsate sample was collected after decontamination of dedicated equipment. Total metals reported include barium at 0.1 mg/kg, copper estimated at 0.24 mg/kg, and manganese estimated at 0.18 mg/kg. Copper was detected in significant concentrations in the on-site soil samples. This analyte was also detected in the two background samples. The data provided in Table 5-4 indicate that the decontamination procedures prior to sampling did not introduce contaminants into the samples collected.

The laboratory quality control sample (S930720A) did not report detectable concentrations of any analytes of concern.

Table 5-4
Results from Quality Control Sample

Total Metals	Equipment Rinsate[a] ER01	Laboratory Blank S930720A (mg/kg)
Antimony	2.5 mg/kg UJ	2.5 U
Arsenic	0.15 µg/l U	0.15 U
Barium	0.1 mg/kg	0.1 U
Beryllium	0.1 mg/kg U	0.1 U
Cadmium	0.2 mg/kg UJ	0.2 U
Chromium	0.4 mg/kg U	0.4 U
Cobalt	0.6 mg/kg U	0.6 U
Copper	0.24 mg/kg J	0.2 U
Lead	3 mg/kg U	3 U
Manganese	0.18 mg/kg J	0.1 U
Mercury	0.02 µg/l UJ	0.02 U[b]
Nickel	1 mg/kg U	1 U
Selenium	0.20 µg/l UJ	0.2 U
Silver	0.3 mg/kg U	0.3 U
Thallium	0.25 µg/l U	0.25 U
Vanadium	0.4 mg/kg U	0.4 U

mg/kg - milligrams per kilogram
U - The analyte was analyzed for but not detected above the detection limit.
UJ - The analyte was not detected above the detection limit. The associated concentration is an estimate.
J - The analyte was positively identified; the concentration is an estimate.
[a]ICP scan laboratory results reported in units of mg/kg to allow direct comparison to soil sample results.
[b]Mercury result from laboratory blank S930803A.

5.5 SUMMARY

Arsenic, antimony, lead, and copper, which were potentially deposited on site as a result of the former smelter operations, were detected on site at significant concentrations. However, arsenic and copper were detected at a significant level off site in the adjacent city park soil sample.

6.0 REFERENCES

British Columbia Natural Resource Conference (BCNRC). 1956. *British Columbia Natural Resource Atlas.*

Fields, K. 1993. (Washington State Department of Health and Washington State Department of Ecology). Telephone conversation with M. Wittenbrink, URS Consultants, Inc., re: Environmental Health Problems in Northport Region. March 1993.

Frazier, S. 1993. (Site owner of LeRoi site and SSF Building Materials) Interview with M. Wittenbrink, URS Consultants, Inc., re: History of LeRoi Company Smelter. March 1993.

Hartbauer, K. 1993. (Long-time resident of Northport) Interview with M. Wittenbrink, URS Consultants, Inc., re: History of LeRoi Company Smelter. March 1993.

Heritage, B. 1981. (Long-time resident of Northport) "Bill Heritage Story." *Northport Pioneers.* pp. 185-194. LeRoi site history.

International Air Transport Association (IATA). 1987. Dangerous Goods Regulations, 29th ed.

Larkin, V. 1993. (Chemist, URS Consultants, Inc.) Interview with M. Wittenbrink, URS Consultants, Inc., re: Technical Description of Smelters. April 1993.

Lavoy, L. 1993. (Washington State Department of Fisheries) Interview with M. Wittenbrink, URS Consultants, Inc., re: Columbia River in Northport Area. March 1993.

National Oceanic and Atmospheric Administration (NOAA). 1991. *Climatological Data for Washington Jan-Dec 1991* 95:1-12. Government Publications.

Northport Over Forty Club (NOFC). 1981. *Northport Pioneers: . . . Echoes of the past from the Upper Columbia Country.* Washington: Statesman Examiner, Inc., Spokane, Washington.

Schwab, J. 1993. (Water Manager, Northport Water System) Interview with M. Wittenbrink, URS Consultants, Inc., re: Northport Water Quality.

Scott. 1973. *Freshwater Fish of Western Canada.*

Stevens County Assessor's Office (SCAO). 1993. Current property ownership for LeRoi site. March 1993.

Stevens County Historical Society (SCHS). 1993. Historical information for LeRoi. March 1993.

United States Department of Commerce (USDC), Bureau of the Census. 1990. *Summary Population and Housing Characteristics for Washington, 1990.* U.S. Government Printing Office, Washington, D.C.

United States Environmental Protection Agency (U.S.EPA). 1989. *Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. OSWER Directive # 9355.4-02.* Memorandum from H.L. Longest II, Director OERR, and B. Diamond, Director OWPE, to Regional Directors. September 1989.

———. 1988. *User's Guide to the Contract Laboratory Program.* Office of Emergency and Remedial Response, Washington, D.C. December 1988.

———. 1987. *A Compendium of Superfund Field Operations Methods.* EPA/540/P-87/001. Office of Emergency and Remedial Response.

———. 1985. *National Enforcement Investigations Center Policy and Procedures.* EPA-330/9-78-001-R. Office of Enforcement and Compliance Monitoring.

United States Geological Survey (USGS). 1993. Well listings for the Northport, Washington, area. March 1993.

———. 1986. *Water Resources Data, Washington, 1985-86.* 1986.

———. 1982. 7.5 minute topographic map for Northport, Washington. 1982.

University of Washington, Department of Atmospheric Sciences (UW). 1993. Telephone conversation with M. Wittenbrink, URS Consultants, Inc., re: Two-year, 24-hour precipitation.

URS Consultants, Inc. (URS). 1993a. Site visit and information gathering conducted for the LeRoi preliminary assessment. March 1993.

———. 1993b. *Preliminary Assessment Report for LeRoi Company Smelter.* April 1993.

———. 1993c. *Field Sampling Plan for the LeRoi Company Smelter Site Inspection.* June 1993.

———. 1990a. *Quality Assurance Program Plan (QAPP) for Alternative Remedial Contracting Strategy (ARCS).* Contract No. 68-W9-0054.

———. 1990b. *Technical Standard Operating Procedures (TSOP) for ARCS.* Contract No. 68-W9-0054.

———. 1990c. *Draft Health and Safety Manual for ARCS.* Contract No. 68-W9-0054.

Walen, T. 1993. (Concerned citizen residing in the Northport area) Correspondence with M. Wittenbrink, URS Consultants, Inc., re: Northport environmental problems. March 1993.

Washington State Department of Ecology (Ecology). 1993a. Spokane Office. Well listings for the Northport, Washington, area. March 1993.

———. 1993b. Olympia Office. National Wetland Inventory Maps for Northport, Washington. April 1993.

Washington State Department of Wildlife (WDW). 1993. Map of Priority Habitats and Species and Nongame Information. Re: Sensitive Information for Northport Region. March 1993.

Washington State Department of Health (WDH), Environmental Health. 1993. Water facilities inventory.

———. 1992. *Citizens Working with Government and Industry for a Healthy Environment and Strong Economy*. WDH announcement for meeting held in Northport, Washington, on May 28, 1992.

Appendix A
Washington State Department of Health Investigations

CITIZENS FOR A CLEAN COLUMBIA
Telephone 509-725-5024

"Committed to protecting the Columbia River and its tributaries"

CITIZENS WORKING WITH GOVERNMENT AND INDUSTRY FOR A HEALTHY ENVIRONMENT AND STRONG ECONOMY

DATE: May 28th, 1992 - 7:00 p.m.

PLACE: Northport School

PURPOSE: Washington State Department of Health Study

Citizens for a Clean Columbia believe that from a healthy environment will come a strong economy and a strong economy is essential to a healthy environment. While working with various agencies to create a healthier Columbia River it was brought to our attention that there are a host of illnesses suffered by area residents.

Do you, members of your family, children or friends have vague health problems that seem to defy diagnoses? Do you know someone who has had to move from our area because they were sick? Do they seem to feel fine living somewhere else? Do you, or do you know someone with serious of life threatening health problems that seem to be more prevalent here than in other areas considering the population base? How many people do you know that are disabled?

(1) The Northport area has shown increased incidence of colitis and related intestinal disease, multiple sclerosis, diabetes, heavy metals poisoning, Parkinsons and related neurological problems, immune and respiratory problems. Symptoms may include chronic constipation or diarrhea, muscle cramps, muscle tics or twitching, arthritic conditions, double vision, ringing in the ears, headaches and chronic allergies, etc.

Plan to attend the May 28 Washington State Department of Health meeting in Northport for an open discussion of these regional health issues.

British Columbia Governmental Officials and businesses have been invited to attend this meeting. We support their efforts to develop alternate slag disposal and zero-discharge of dioxins in the future.

C.C.C. members have cor cted a health survey in Northport a been instrumental in encouraging the D.O.H. to hold the meeting in Northport. C.C.C. funds have financed this public service mailing and your support for this will be greatly appreciated in order to keep the public informed of future mailings. All donors will be placed on our mailing list. Meetings are open to the public.

Name _____

Address _____

Phone _____

Yearly Membership: $25.00
Please send membership or any tax deductible donation to:

Citizens for a Clean Columbia
3918 Haag Road
Kettle Falls, WA 99141

Citizens for a Clean Columbia
Box 588
Northport, WA 99157

Citizens for a Clean Columbia
Rt. 1, Box 716
Davenport, WA 99122

Important Washington State Department of Health Announcement

POSTAL PATRON

BULK RATE
U.S. POSTAGE
PAID
Permit No. 43
Kettle Falls, Wash.

Appendix B
Calculations

URS CONSULTANTS, INC.

[redacted]

Calculation for Net Precipitation

Calculation performed according to HRS Final Rule
(40 CFR Part 300), Section 3.1.2.2 using formulas:

Date: 04/05/93
Site: LeRoi Company Smelter
Latitude: 48 55' 15" N
Longitude: 117 46' 15" W

Individual of Data Entry: Michelle Wittenbrink
Type of Temperture (C or F): F
DATA Available Temperture or Evap. (D or E): D
>Latitude (50,45,40,35,30,20,10,0): 45.00

Net Precipitation = Monthly Precipitation - Evapotranspiration (E)
E(Jan..Dec) = 0.6*F(Jan..Dec)[10T(Jan..Dec)/I]^a
Variables:

E(Jan.Dec) = Monthly potential evapotranspiration, if E<0 then E=0 is used

F(Jan.Dec) = Monthly latitude adjusting value

T(Jan.Dec) = Mean monthly Temperature (Centigrade)

I = Sum[T(Jan.Dec)/5]^1.514

a = 6.75*(10^-7)*(I^3)-7.71*(10^-5)*(I^2)+1.79*(10^-2)*I+0.49239

(Fill in only the shaded spaces)

	Monthly Variables: Enter what is available				Calculated Variables					Difference Variables	
Month	Degree (C or F)	Precipitation	Evaporation		Variable T	Variable I	Variable a	Variable F	Variable E	Precip-Evap.	Positive P-E
Jan	25.60	2.33		#	-3.56	-0.31		0.80	-0.42	2.33	2.33
Feb	32.00	1.64		#	0.00	0.00		0.81	0.00	1.64	1.64
March	38.90	1.35		#	3.83	0.67		1.02	0.59	0.76	0.76
April	48.00	1.28		#	8.89	2.40		1.13	1.69	-0.41	0.00
May	57.80	1.87		#	14.17	4.89		1.28	3.25	-1.38	0.00
June	64.00	1.92		#	17.78	6.91		1.29	4.24	-2.32	0.00
July	69.80	0.98		#	21.00	8.91		1.31	5.20	-4.22	0.00
Aug	68.10	1.36		#	20.06	8.31		1.21	4.56	-3.20	0.00
Sept	59.70	1.16		#	15.39	5.55		1.04	2.90	-1.74	0.00
Oct	47.60	1.64		#	8.67	2.31		0.94	1.37	0.27	0.27
Nov	35.50	2.11		#	1.94	0.24		0.79	0.21	1.90	1.90
Dec	28.90	2.65		#	-1.72	-0.15		0.75	-0.17	2.65	2.65
Average Annual Precipitation		20.29									

Total I	Variable a
39.72	7110.61

TOTAL
9.55

[redacted]

NET PRECIPITATION = 9.55 INCHES

[redacted]

URS Consultants, Inc.

Calculation of Well Population

Site Name LeRoi

Work Assignment No. 54-16-0JZZ

CERCLIS Id. No. WAD988507323

(PA) SI SIP (circle one)

Calculation by Michelle Wetterlund 4/20/93
Date

Checked by [signature] 4/21/93
Date

Radius (mi)	No. of City Wells	City Well Population	No. of Comm. Wells	Comm. Well Pop.	No. Of Private Wells	Private Well Pop.	Total Well Pop.
onsite	3	325	Ø	Ø	Ø	Ø	325
0-1/2	Ø	Ø	Ø	Ø	4	11	11
1/2-1	Ø	Ø	Ø	Ø	8	22	22
1-2	Ø	Ø	Ø	Ø	21	57	57
2-3	Ø	Ø	Ø	Ø	21	57	57
3-4	Ø	Ø	Ø	Ø	8	22	22
Total					62	169	494

Residents/Household in ~~city/county~~ ~~(circle one)~~ 2.71 Kettle Falls area

Total Population in city/county (circle one) _____

Notes: _____

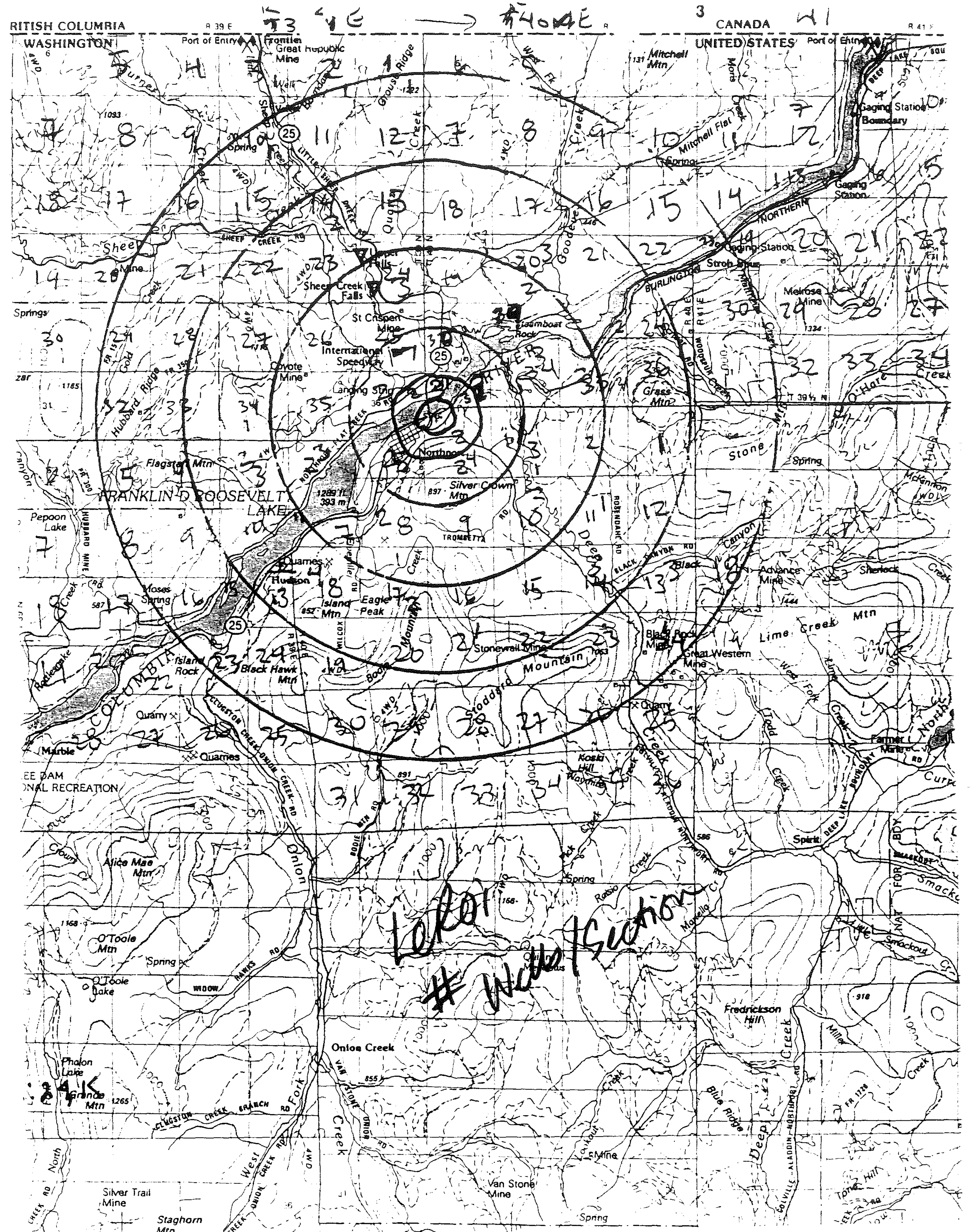
References: City of Northport 1993; Ecology 1993

SITE: LeRoi Smelter COUNTY: Stevens WA

TOWNSHIP	RANGE	SECTION	DW	MW	IRRI	INDUS
T39N	R41E					
	- NONE					
T40N	R40E	12	𝍸 II			
		20	𝍸			
		25	II			
		31	III			
		34	III			
		13	I			
		35	III			
T40N	R39E	1	I			
		2	.			
		3	I			
		10	I			
		14	II			
		15				I
		24	III			
		25	I			
		30	I			
		34	I			
		36	IIII			

SITE: LeRoi >MEAD COUNTY: Stevens WA

TOWNSHIP	RANGE	SECTION	DW	MW	IRRI	INDUS
T 39N	R 40 E	S 3	II			
		4	IIII			
		5	II			
		8	II			
		10	III			
		11	I			
		13	III			
		14	III			
		17	III			
		18	IIII			
		21	I			
		24	I			
T 39N	R 39 E	S 2	III			
		3	II			


BRITISH COLUMBIA
WASHINGTON
CANADA
UNITED STATES
R 39 E
R 41 E
Port of Entry
Frontier
Great Republic Mine
Mitchell Mtn
Gaging Station
Boundary
Mitchell Flat
Sheep Creek
Little Sheep Creek
Sheep Creek Rd
Sheep Creek Falls
Northern
Burlington
Stroh Spur
Melrose Mine
St Crispen Mine
International Speedway
Steamboat Rock
Coyote Mine
Landing Strip
Grass Mtn
Hubbard Ridge
Flagstaff Mtn
Northport
Silver Crown Mtn
Franklin D Roosevelt Lake
1289 ft
393 m
Pepoon Lake
Hubbard Mine Rd
Trombetta Rd
Rosendahl Rd
Black Canyon Rd
Advance Mine
Sherlock
McKinnon
Quarries
Hudson
Moses Spring
Island Mtn
Eagle Peak
Lime Creek Mtn
Stonewall Mine
Black Rock Mine
Great Western Mine
Island Rock
Black Hawk Mtn
Stoddard Mountain
Rattlesnake
Columbia
Quarry
Marble
Clugston Creek Rd
Onion Creek Rd
Koski Hill
Farmer Mine
Deep Lake Boundary Rd
Alice Mae Mtn
Spirit
Smackout
O'Toole Mtn
O'Toole Lake
Spring
Widow
Hawks Rd
Onion Creek
Van Stone Onion Rd
Fredrickson Hill
Phalon Lake
Grande Mtn
Clugston Creek Branch Rd
Blue Ridge
Colville - Aladdin - Northport Rd
Van Stone Mine
Silver Trail Mine
Staghorn Mtn
T 39½ N

Appendix C
Surface Water Flow and Quality

Water Resources Data Washington Water Years 1985-86

12400520 COLUMBIA RIVER AT NORTHPORT, WA
(National stream quality accounting network station)

LOCATION.--Lat 48°55'21", long 117°46'32", in SW¼SW¼ sec.33, T.40 N., R.40 E., Stevens County, Hydrologic Unit 17020001, at State Highway 25 bridge at Northport, 9.9 mi downstream from gaging station at international boundary, and at mile 735.1.

DRAINAGE AREA.--60,200 mi², approximately.

PERIOD OF RECORD.--Water years 1910-11, 1952 to current year. Prior to November 1951 published as "at Northport." November 1951 to September 1957 published as 12399500 "at international boundary," October 1957 to September 1963 as "at Northport," October 1963 to September 1973 as "at international boundary."

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1951 to September 1975, April 1976 to September 1981.
pH: November 1951 to September 1969.
WATER TEMPERATURES: November 1951 to September 1981.
SUSPENDED-SEDIMENT DISCHARGE: February 1910 to January 1911.

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD-NESS (MG/L AS CACO3)
NOV											
13...	1100	81700	150	8.30	7.5	1.6	11.2	100	62	26	75
FEB											
12...	1200	110000	141	8.30	1.5	0.5	13.0	97	K3	K11	80
MAR											
18...	1100	72300	164	8.10	4.0	0.8	12.8	--	31	K6	88
MAY											
22...	1100	107000	133	8.00	10.5	2.9	10.9	102	24	K10	64
JUL											
17...	1100	88100	117	8.10	18.5	1.2	9.1	102	K5	K7	57
SEP											
18...	1200	60800	133	8.00	15.0	1.0	9.9	103	38	160	69

DATE	HARD-NESS NONCAR-BONATE (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY WH WAT TOTAL FIELD MG/L AS CACO3	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
NOV											
13...	7	22	4.9	2.1	6	0.1	0.7	68	11	1.3	<0.1
FEB											
12...	13	24	4.8	1.4	4	0.1	0.7	67	9.6	0.8	0.1
MAR											
18...	18	26	5.5	2.1	5	0.1	0.8	70	17	1.1	0.2
MAY											
22...	11	19	4.1	1.9	6	0.1	0.8	53	10	0.9	0.1
JUL											
17...	6	17	3.6	1.4	5	0.1	0.8	51	10	0.7	0.1
SEP											
18...	3	20	4.7	2.0	6	0.1	0.9	66	9.8	1.0	0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
NOV											
13...	4.7	95	88	0.13	21000	<0.10	0.07	0.4	0.03	0.01	0.03
FEB											
12...	4.6	85	86	0.12	25200	0.17	0.03	<0.2	0.02	0.02	0.03
MAR											
18...	5.0	100	100	0.14	19500	1.30	0.16	0.3	0.06	0.04	0.05
MAY											
22...	6.0	70	75	0.09	20200	<0.10	0.08	0.8	0.04	0.03	0.02
JUL											
17...	4.1	62	68	0.08	14700	<0.10	0.06	0.2	0.02	<0.01	<0.01
SEP											
18...	4.0	80	82	0.11	13100	<0.10	0.06	0.3	0.01	0.01	0.02

K - Results based on colony count outside the acceptable range (non-ideal colony count).

Flow max 113000
min 57500
mean 89325

12400520 COLUMBIA RIVER AT NORTHPORT, WA--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1984 TO SEPTEMBER 1985

DATE	ALUMINUM, DISSOLVED (UG/L AS AL)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
NOV 13...	<10	<1	37	<0.5	18	<1	<3	8	6	6	<4
FEB 12...	<10	<1	31	<0.5	<1	<1	<3	7	5	1	<4
MAR 18...	--	--	--	--	--	--	--	--	--	--	--
MAY 22...	20	<1	35	<0.5	17	8	<3	9	11	3	<4
JUL 17...	--	--	--	--	--	--	--	--	--	--	--
SEP 18...	10	<1	41	<0.5	8	<1	<3	5	<3	2	<4

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)
NOV 13...	7	<0.1	<10	<1	<1	<1	93	<6	25	2	441
FEB 12...	<1	<0.1	<10	<1	<1	<1	110	<6	24	6	1780
MAR 18...	--	--	--	--	--	--	--	--	--	0	--
MAY 22...	3	<0.1	<10	1	<1	<1	81	<6	24	10	2890
JUL 17...	--	--	--	--	--	--	--	--	--	4	951
SEP 18...	<1	<0.1	<10	1	<1	<1	84	<6	12	2	328

12400520 COLUMBIA RIVER AT NORTHPORT, WA
(National stream quality accounting network station)

LOCATION.--Lat 48°55'21", long 117°46'32", in SW¼SW¼ sec.33, T.40 N., R.40 E., Stevens County, Hydrologic Unit 17020001, at State Highway 25 bridge at Northport, 9.9 mi downstream from gaging station at international boundary, and at mile 735.1.

DRAINAGE AREA.--60,200 mi², approximately.

PERIOD OF RECORD.--Water years 1910-11, 1952 to current year. Prior to November 1951 published as "at Northport." November 1951 to September 1957 published as 12399500 "at international boundary," October 1957 to September 1963 as "at Northport," October 1963 to September 1973 as "at international boundary."

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WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (US/CM)	PH (STAND-ARD UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (NTU)	OXYGEN, DIS-SOLVED (MG/L)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS NONCARB MG/L AS CACO3
DEC												
18...	1100	97600	140	8.1	3.0	0.6	13.3	102	K3	K8	72	12
JAN												
29...	1100	57500	169	8.1	2.5	1.0	12.7	99	K6	K2	83	14
MAR												
12...	1200	76000	169	8.4	4.0	1.5	14.2	115	K7	K5	79	8
MAY												
20...	1100	110000	142	8.0	8.5	2.0	11.3	102	K6	K2	66	6
JUL												
15...	1100	113000	124	8.1	15.5	1.2	10.0	106	K6	K17	57	6
SEP												
03...	1200	97900	114	8.1	17.5	0.6	10.0	109	K4	360	54	3

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L - CACO3)	BICAR-BONATE IT-FLD (MG/L AS HCO3)	CAR-BONATE IT-FLD (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
DEC												
18...	21	4.6	1.6	5	0.1	0.8	60	73	0	12	0.9	<0.1
JAN												
29...	24	5.5	2.3	6	0.1	0.7	69	84	0	12	1.8	0.2
MAR												
12...	23	5.3	2.3	6	0.1	0.5	71	85	0	14	1.1	0.1
MAY												
20...	19	4.4	1.8	6	0.1	0.7	60	73	0	9.9	0.8	0.1
JUL												
15...	17	3.6	1.4	5	0.1	0.7	51	63	0	9.3	0.8	0.1
SEP												
03...	16	3.5	1.1	4	0.1	0.7	51	62	0	9.0	0.6	0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
DEC												
18...	4.8	72	82	0.1	19000	<0.01	0.12	0.03	0.3	0.03	0.02	0.02
JAN												
29...	5.1	86	93	0.12	13400	<0.01	0.11	0.05	0.3	0.04	0.03	0.03
MAR												
12...	5.6	94	94	0.13	19300	<0.01	<0.10	0.03	0.4	0.05	0.03	0.02
MAY												
20...	5.6	80	79	0.11	23800	0.02	0.24	0.03	0.2	0.04	0.04	0.04
JUL												
15...	4.2	67	68	0.09	20400	<0.01	<0.10	0.03	0.3	0.01	0.01	<0.01
SEP												
03...	3.7	88	65	0.12	23300	<0.01	<0.10	<0.01	<0.2	<0.01	0.01	<0.01

K - Results based on colony count outside the acceptable range (non-ideal colony count).

12400520 COLUMBIA RIVER AT NORTHPORT, WA--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1985 TO SEPTEMBER 1986

DATE	ALUMINUM, DISSOLVED (UG/L AS AL)	ARSENIC DISSOLVED (UG/L AS AS)	BARIUM, DISSOLVED (UG/L AS BA)	BERYLLIUM, DISSOLVED (UG/L AS BE)	CADMIUM DISSOLVED (UG/L AS CD)	CHROMIUM, DISSOLVED (UG/L AS CR)	COBALT, DISSOLVED (UG/L AS CO)	COPPER, DISSOLVED (UG/L AS CU)	IRON, DISSOLVED (UG/L AS FE)	LEAD, DISSOLVED (UG/L AS PB)	LITHIUM DISSOLVED (UG/L AS LI)
DEC											
18...	10	<1	35	<0.5	<1	<1	<3	4	3	4	<4
JAN											
29...	20	<1	37	<0.5	<1	<1	<3	1	4	3	<4
MAR											
12...	--	--	--	--	--	--	--	--	--	--	--
MAY											
20...	20	<1	35	<0.5	21	<1	<3	10	22	16	7
JUL											
15...	--	--	--	--	--	--	--	--	--	--	--
SEP											
03...	--	--	--	--	--	--	--	--	--	--	--

DATE	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY DISSOLVED (UG/L AS HG)	MOLYBDENUM, DISSOLVED (UG/L AS MO)	NICKEL, DISSOLVED (UG/L AS NI)	SELENIUM, DISSOLVED (UG/L AS SE)	SILVER, DISSOLVED (UG/L AS AG)	STRONTIUM, DISSOLVED (UG/L AS SR)	VANADIUM, DISSOLVED (UG/L AS V)	ZINC, DISSOLVED (UG/L AS ZN)	SEDIMENT, SUSPENDED (MG/L)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY)
DEC											
18...	4	<0.1	<10	<1	<1	<1	100	<6	29	6	1580
JAN											
29...	6	<0.1	<10	<1	<1	<1	110	<6	26	4	621
MAR											
12...	--	--	--	--	--	--	--	--	--	4	821
MAY											
20...	3	<0.1	<10	1	<1	<1	93	<6	20	6	1780
JUL											
15...	--	--	--	--	--	--	--	--	--	4	1220
SEP											
03...	--	--	--	--	--	--	--	--	--	2	529

Appendix D
Surface Water Right for Domestic Uses

S. F. No. 369—6-49—124. 22856.

CERTIFICATE RECORD NO. 8, PAGE NO. 3510

STATE OF WASHINGTON, COUNTY OF Stevens

CERTIFICATE OF SURFACE WATER RIGHT

(In accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the State Supervisor of Hydraulics thereunder.)

This is to certify that JOHN E. MC DOWALD *of* Evans, *State of* Washington, *has made proof to the satisfaction of the State Supervisor of Hydraulics of Washington, of a right to the use of the waters of* Roosevelt Lake, *a tributary of* Columbia River, *with point or points of diversion within* Government Lot 1 *Sec.* 29 & 32, *Twp.* 38 *N., R.* 38 *E. W. M., under* Appropriation *Permit No.* 4638 *issued by the State Supervisor of Hydraulics, and that said right to the use of said waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Hydraulics of Washington and entered of record in Volume* 8, *at Page* 3510, *on the* 2nd *day of* March, 1950; *that the priority date of the right hereby confirmed is* May 20, 1946; *that the amount of water under the right hereby confirmed, for the following purposes is limited to an amount actually beneficially used and shall not exceed*

0.01 of a cubic foot per second for the purpose of domestic supply; and 0.07 of a cubic foot per second for the irrigation of 4 acres

A description of the lands under such right to which the water right is appurtenant, and the place where such water is put to beneficial use, is as follows:

W½ of Lots 14, 15, 16, Block 2, Lots 17 to 20 inc., Block 2, Tax Nos. 795 to 796, Block 2, Lots 5 to 12 inc., Block 4, Lots 14, 16, to 20 inc., Block 4, S½ Lot 24, 25 to 35 inc., Block 4, Lots 16 and N½ Lot 17, Block 5, all in Town of Millington (now Bossburg).

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in Sections 6 and 7, Chapter 122, Laws of 1929.

WITNESS the seal and signature of the State Supervisor of Hydraulics affixed this 2nd *day of* March, 1950

Wes J. Matthews
State Supervisor of Hydraulics.

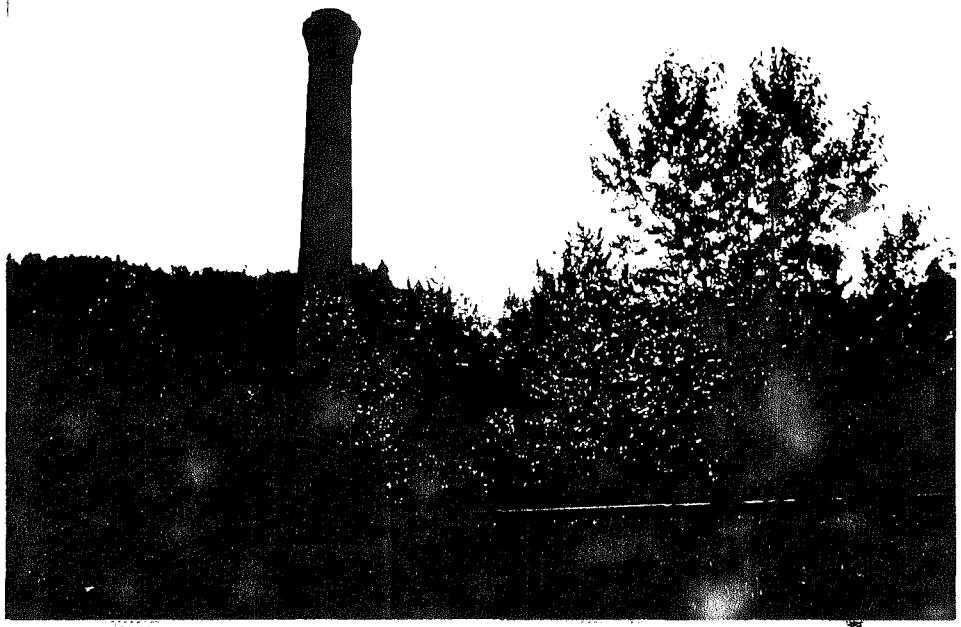
EXAMINED
MRW

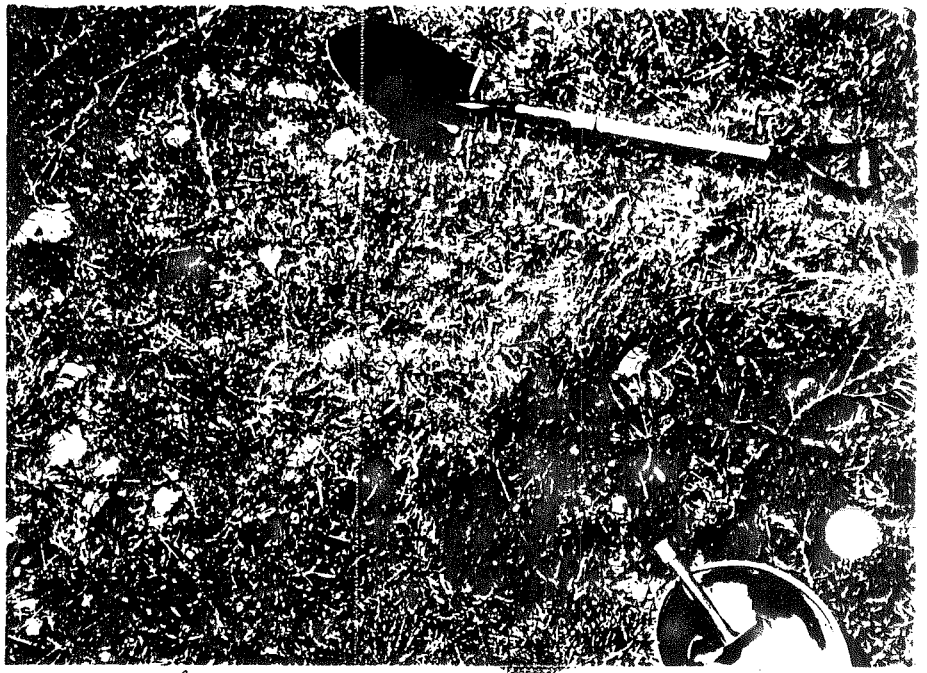
Appendix E
Photodocumentation of July 13, 1993, URS Sampling Event

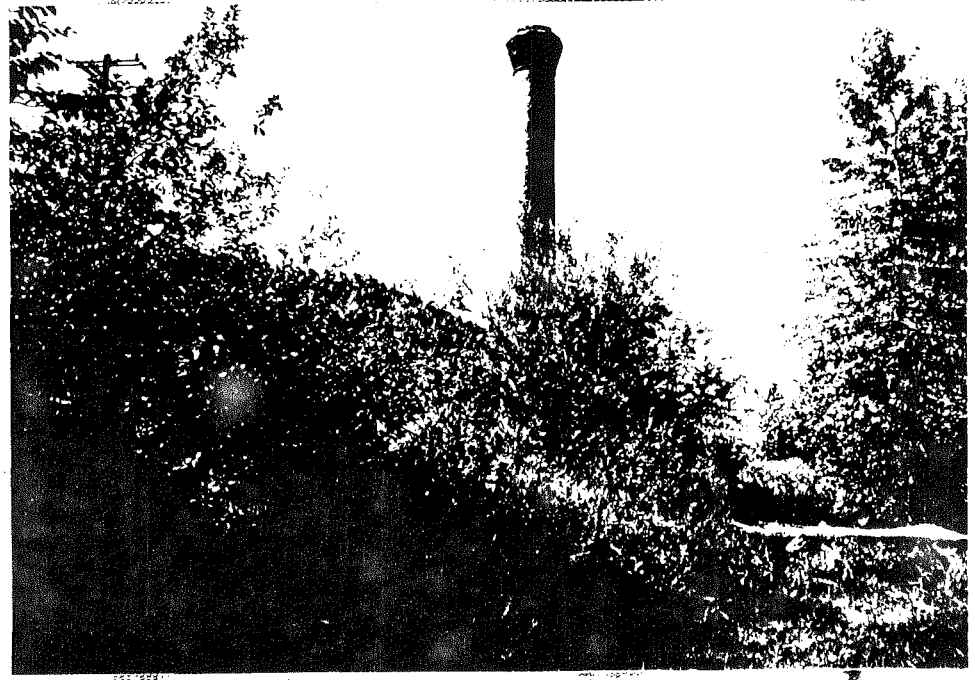
URS Consultants, Inc.	ARCS Photograph Log	DCL # 62760.14.20.364	
Project Number 4162760.14	Project/Site Name LeRoi Company Smelter SI	Photographer(s) Signatures(s) Larry Namba	
Camera Type	Film Type/Speed 35 mm/200	Roll Number One	Date 7/13/93

Frame	Date	Time	Orientation	Subject
1	7/13/93	10:30	S	VIEW OF STACK FROM CITY PARK
2	7/13/93	10:30	D	SAMPLE LOCATION SS03
3	7/13/93	10:35	S	VIEW OF STACK FROM SAMPLE LOCATION SS03
4	7/13/93	10:35	S	VIEW OF STACK AND SAMPLE LOCATION SS03
5	7/13/93	10:36	N	VIEW OF LARGE SHELTOR AND SAMPLE LOCATION SS03
6	7/13/93	10:36	E	VIEW OF SMALL SHELTER AND SAMPLE LOCATION SS03
7	7/13/93	10:46	E	VIEW OF SAMPLE LOCATION SS04
8	7/13/93	10:47	D	SAMPLE LOCATION SS04
9	7/13/93	11:52	D	SAMPLE SSO1 AND SS07
10	7/13/93	11:52	N	VIEW OF STACK AND SAMPLES SS01, SS07
11	7/13/93	11:52	W	VIEW OF MILL FROM SAMPLE LOCATION SS01, SS07
12	7/13/93	12:07	D	SAMPLE SS02
13	7/13/93	12:07	E	SAMPLE LOCATION SS02 WHERE SHOVEL LOCATED
14	7/13/93	12:07	W	VIEW OF STACK FROM SAMPLE LOCATION SS02
15	7/13/93	13:07	SE	SAMPLE LOCATION SS06
16	7/13/93	13:07	NE	SAMPLE LOCATION SS06
17	7/13/93	13:41	D	SAMPLE LOCATION SS05
18	7/13/93	13:41	E	VIEW OF SMELT ISLAND FROM SAMPLE SS05
19	7/13/93	13:42	NW	VIEW OF DOCK AND HIGHWAY 25 FROM SAMPLE SS05

Date Delivered to Processor	Date Received from Processor	Comments







2	7/13/93	10:30	D

SAMPLE LOCATION SS03

1	7/13/93	10:30	S

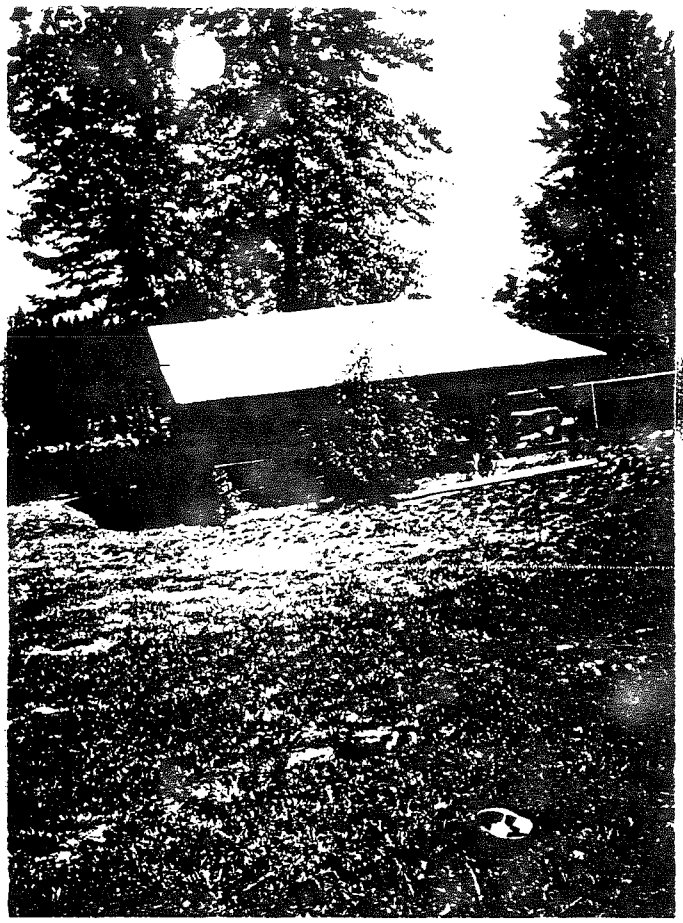
VIEW OF STACK FROM CITY PARK

4	7/13/93	10:35	S

VIEW OF STACK AND SAMPLE LOCATION SS03

3	7/13/93	10:35	S

VIEW OF STACK FROM SAMPLE LOCATION SS03



6	7/13/93	10:36	E

VIEW OF SMALL SHELTER AND SAMPLE LOCATION SS03

5	7/13/93	10:36	N

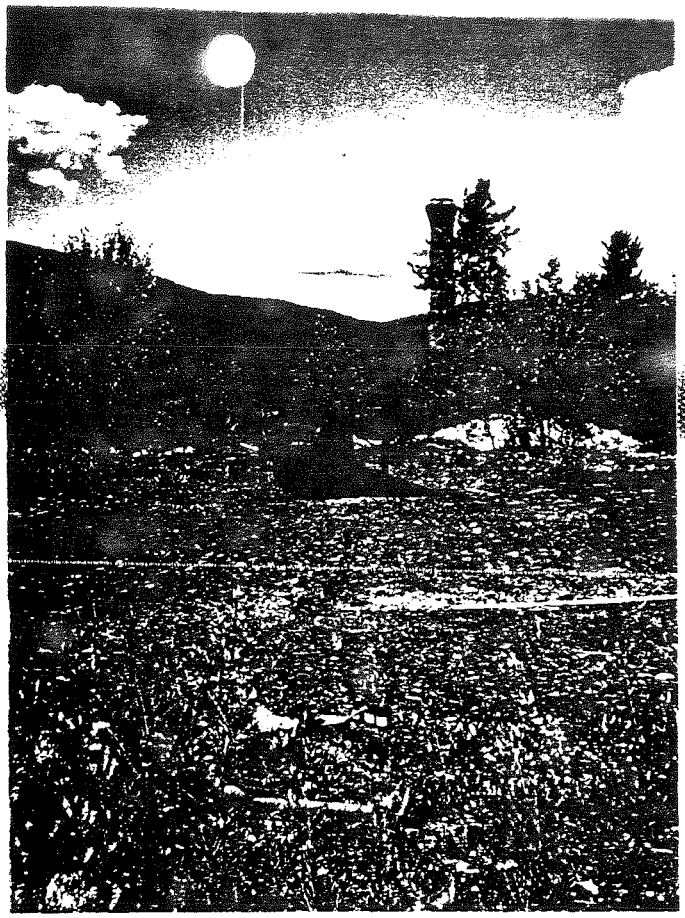
VIEW OF LARGE SHELTER AND SAMPLE LOCATION SS03

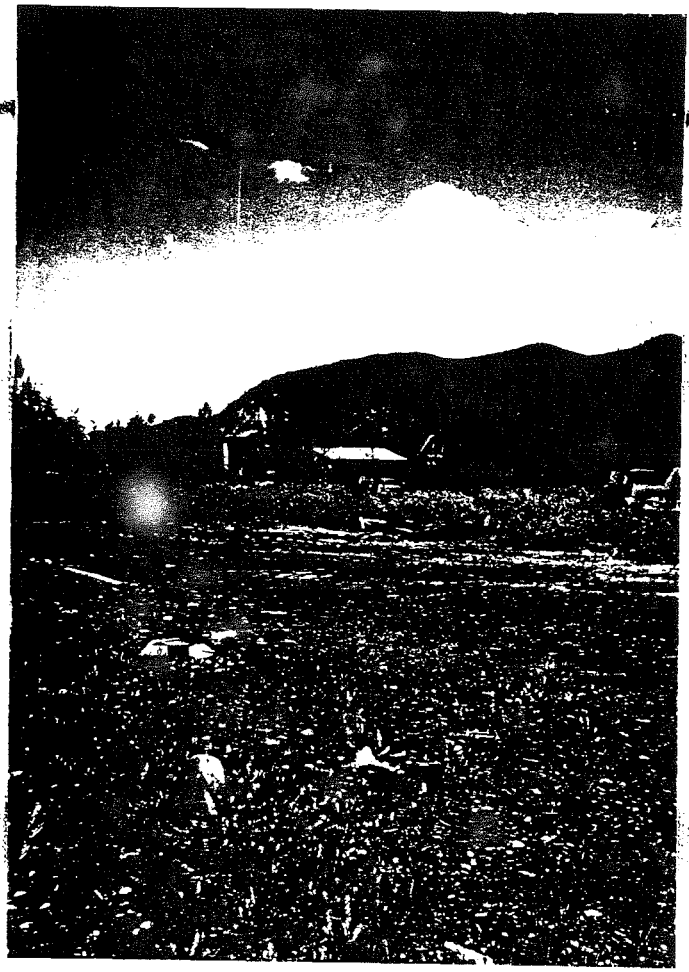
8	7/13/93	10:47	D

SAMPLE LOCATION SS04

7	7/13/93	10:46	E

VIEW OF SAMPLE LOCATION SS04





10	7/13/93	11:52	N

VIEW OF STACK AND SAMPLES SS01, SS07

9	7/13/93	11:52	D

SAMPLE SSO1 AND SS07

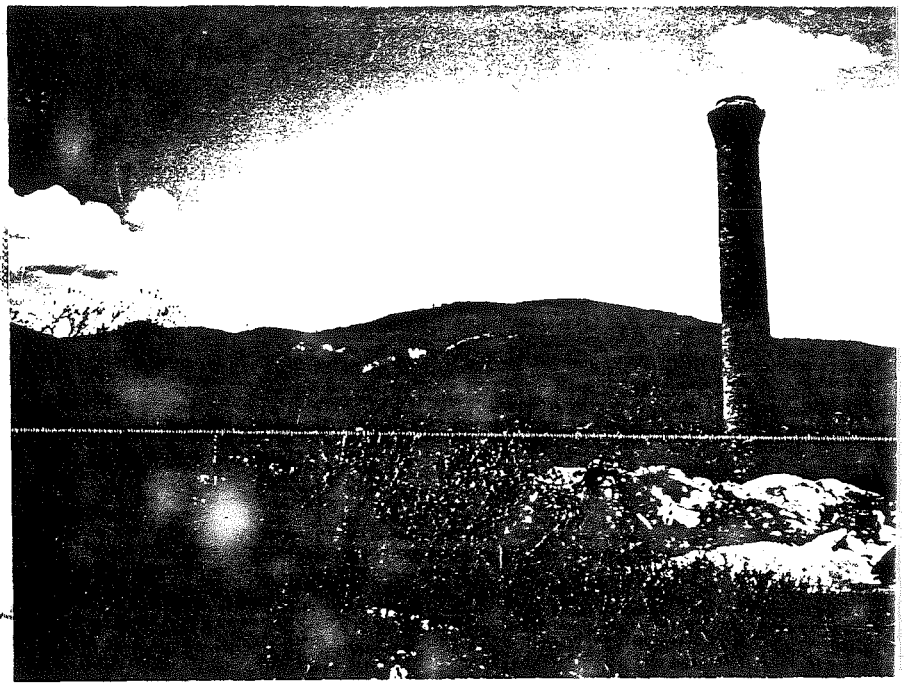
12	7/13/93	12:07	D

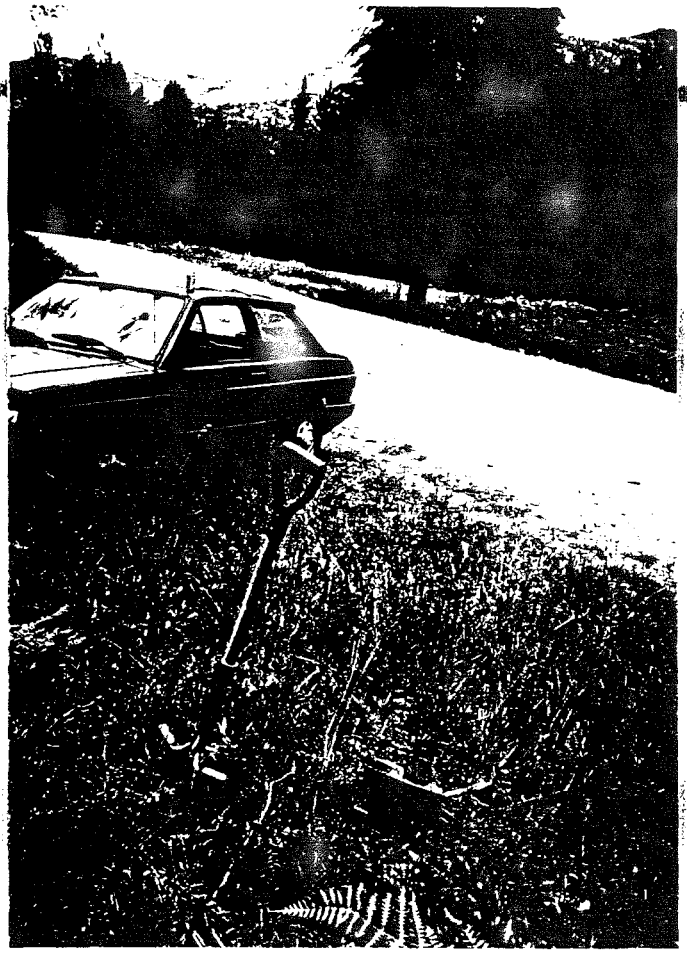
SAMPLE SS02

(11)

11	7/13/93	11:52	W

VIEW OF MILL FROM SAMPLE LOCATION SS01, SS07





14	7/13/93	12:07	W

VIEW OF STACK FROM SAMPLE LOCATION SS02

13	7/13/93	12:07	E

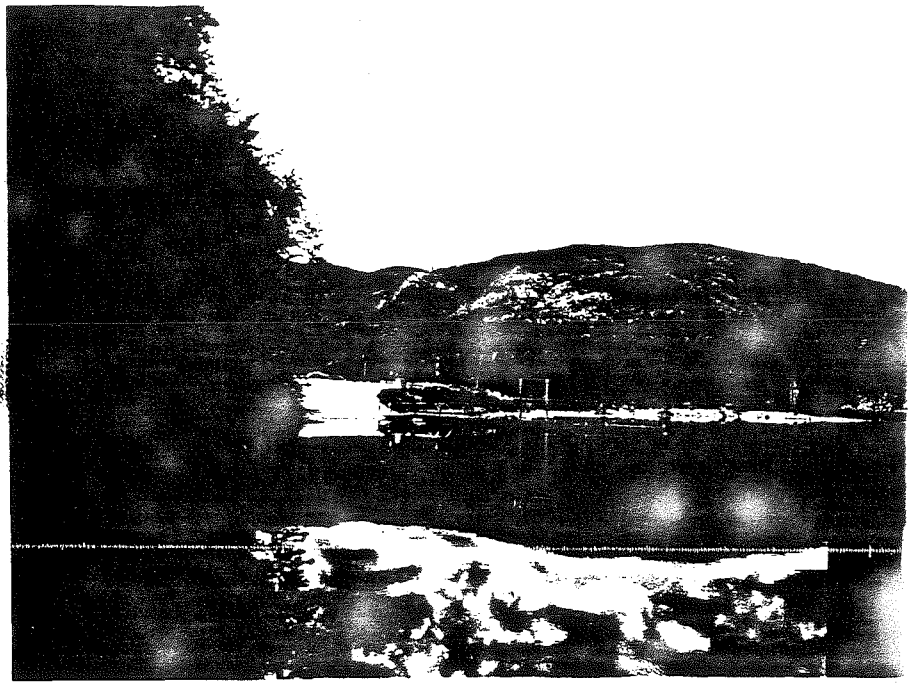
SAMPLE LOCATION SS02 WHERE SHOVEL LOCATED

16	7/13/93	13:07	NE

SAMPLE LOCATION SS06

15	7/13/93	13:07	SE

SAMPLE LOCATION SS06



19	7/13/93	13:42	NW

19

VIEW OF DOCK AND HIGHWAY 25 FROM SAMPLE SS05

17	7/13/93	13:41	D

SAMPLE LOCATION SS05

18	7/13/93	13:41	E

VIEW OF SMELT ISLAND FROM SAMPLE SS05

CC

Appendix F
Field Sampling Results from URS 1993 Sampling Event

Table F-1
Summary of Target and Actual Data Quality Objectives for LeRoi Company Smelter

Compound or Analyte of Interest	Accuracy		Precision		Completeness	
	Target (%)	Actual (%)	Target (%)	Actual (%)	Target (%)	Actual (%)
Total metals	75-125	29-164	20	<20	95	100
Cyanide	75-125	75-125	20	0.0	95	100

ENVIRONMEN.AL SERVICE ASSISTANCE .EAMS - ZONE 2

ESAT Region 10
ICF Technology Inc.
7411 Beach Drive East
Port Orchard, WA 98366
Phone (206) 871-8760

ICF Technology Inc.
ManTech Environmental

MEMORANDUM

DCL#: 62760.14.60.356 1993
FILE NO. 24.a
CC:
PM__ DPM__ SM X C/SM__ FILE X

DATE: July 29, 1993

TO: Jerry Muth, Regional Project Officer, USEPA, Region 10
Phil Davis, Task Monitor, USEPA, Region 10 P Davis
David Bennett, Project Officer, USEPA, Region 10

THROUGH: Barry Pepich, Team Manager, ESAT, Region 10 Barry V. Pepich

FROM: Stacey Butler, Chemist, ESAT, Region 10
Paul Swift, Senior Chemist, ESAT, Region 10

SUBJECT: Data Validation Report of LeRoi Company Smelter - Cyanide Analysis
Sample Nos: 93294420 - 93294427
Project Code: TEC-597A; Account Code: 3TFA10PUZZ

TID#: 10-9303-231
DOC#: ESAT-10A-6113
WUD#: 1285

CC: Bruce Woods, RQAMO, USEPA, Region 10
John Alexander, Inorganic Group Leader, ESAT, Region 10

The following is a data review for the conventionals analysis of seven soil samples and one water sample from the LeRoi Company Smelter inspection site in Northport, WA. Cyanide analysis was performed for samples 93294420 - 93294427 (sample numbers inclusive) at the Manchester Laboratory.

The actual sample numbers included with this review are as follows:

93294420, 93294421, 93294422, 93294423, 93294424, 93294425, 93294426, 93294427

DATA QUALIFICATIONS

The following comments refer to the ESAT Team's performance in meeting quality control specifications outlined in the QAPjP (06/04/93), USEPA Standard Methods for the Analysis of Water and Wastewater Method 335.2 (Standard Methods 335.2), and Manchester Environmental Laboratory (MEL) Guidelines.

1.0 **TIMELINESS** - Acceptable

The suggested holding time for cyanide analysis is 14 days. The sample set was collected on 07/13/93. Analyses were completed on 07/23/93, 10 days from collection of the first sample.

All analyses were completed within acceptable holding time limits; therefore, no qualification of the data was required on this basis.

2.0 **SAMPLE PREPARATION** - Acceptable

The samples were prepared for cyanide analysis on 07/21/93 and 07/22/93 following *Manchester Laboratory Guidelines* and *USEPA Standard Methods for the Examination of Water and Wastewater*. No qualification of the data was necessary on this basis.

3.0 **CALIBRATION** - Acceptable

The samples were analyzed for cyanide on 07/23/93. The Technicon II Autoanalyzer was calibrated with a blank and seven standards.

All calibrations/standardizations met acceptable criteria; therefore, no qualification of the data was necessary on this basis.

4.0 **REFERENCE CONTROL SAMPLES/CALIBRATION VERIFICATION** - Acceptable

Analysis of a reference control sample is required before sample analysis. Control recovery values were not specified in the QAPjP; therefore the more stringent (of the commonly requested method acceptance windows) *SW-846 Method 9010/9010A* acceptance range, 85 - 115% of the true value in the control sample, was used.

All reported sample results had reference control parameters within range on the days of analyses; therefore, no qualification of the data was necessary on this basis.

5.0 **BLANKS** - Acceptable

Procedural blanks are required for each group of samples analyzed. If cyanide is present in any of the associated procedural blanks at concentrations greater than 0.010 mg/L, the sample results fail this criterion and are qualified (B).

All blank values were lower than the method detection limits; therefore, no qualification of the data was necessary on this basis.

6.0 DUPLICATE ANALYSIS - Acceptable

Duplicate analysis was performed on sample 93294420, with an RPD value of zero, as both the sample and its duplicate were non-detects. No qualification of the data was required on this basis.

7.0 FIELD DUPLICATE ANALYSIS - Not Applicable

Field duplicate analysis was not performed for these samples.

8.0 MATRIX SPIKE ANALYSIS - Acceptable

Matrix spike sample analyses are performed to provide information about the effect of the sample matrix on measurement methods. In this study the QAPjP guidelines require that matrix spike recoveries be within 75% - 125% of the spike added prior to analysis. Duplicate matrix spike analyses are performed in order to provide an estimate of the precision of the spiking procedure.

Matrix and duplicate spike analysis was performed on sample 93294420. The MS/MSD recoveries were 86% / 85%. Matrix spike recoveries were within the 75 - 125% acceptance window. Duplicate spike analyses agreed within 20% RPD.

All matrix spike analysis parameters met the control criteria; therefore, no qualification of the data was required on this basis.

9.0 OVERALL ASSESSMENT OF THE DATA

The following is a summary of the qualification required for the LeRoi Company Smelter soil samples - cyanide, samples numbered 93294420 - 93294426 and water sample, 93294427. The (U) qualifier was attached to sample results below the minimum level of detection. The result for sample 93294424 was qualified (E) due to possible interference by sulfides determined to be present in this sample.

In order to better characterize sample 93294424, analysis of this sample was performed in duplicate with two separate sets of QC. In the first set, the sample distillate was collected directly; in the second set, the distillate was passed through a lead acetate scrubber in order to reduce sulfide interference. A laboratory control standard was included in each distillation set, and analyses of these check standards indicated low bias resulting from the scrubbing procedure. In each case, sample results for sample 93294424 were below detection limit. Since cyanide was not present in any of the samples, and in each case sample results for sample 93294424 were below the detection limit, it is the opinion of the reviewer that cyanide was not present in sample 93294424, and furthermore, the low bias introduced by the lead acetate scrubber did not have a negative effect on the sample result.

Below are the definitions for the qualifiers used in the inorganics area when qualifying data from inorganics analysis.

DATA QUALIFIERS

U	-	Element was analyzed but not detected. The associated numerical value is the instrument detection limit/method detection limit.
P	-	The analyte was detected above the Instrument Detection Limit, but not quantified within expected limits of precision. The laboratory has established minimum quantitation limits having a relative standard deviation of no more than 10%
H	-	The samples were analyzed after the suggested holding time limit.
E	-	The reported value is an estimate because of the presence of interference. An explanatory note will be included with the report.
B	-	Analyte is found in the analytical blank as well as the sample indicating possible/probable blank contamination. If analytes are found in any of the associated procedural blanks the concentration in the samples must be at least ten times the quantity observed in the blank. If the sample result fails these criteria the sample result is qualified (B).
N	-	Spiked sample recovery not within control limits.
NAR	-	There is no analysis result for this analyte.
NA	-	Not Applicable/Not Required.
S	-	Sample was analyzed by method of standard additions.
+	-	Sample was analyzed by method of standard additions and the correlation coefficient was less than 0.995.
*	-	The analyte was present in the sample.
W	-	Post spike out of specified range, and sample was less than 50% the spike added.

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294420 Description: SS01 (MS/MSD) Source: Soil (General)

Begin Date: 93/07/13 11:50

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

Gen Inorg/Phys-Speci Matrix Spike #1		Sediment Result	Units
Cyanide	Sedmt	86	% Recov

Gen Inorg/Phys-Speci Matrix Spike #2		Sediment Result	Units
Cyanide	Sedmt	85	% Recov

Gen Inorg/Phys-Speci Duplicate #1		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294421 Description: SS02 Source: Soil (General)

Begin Date: 93/07/13 12:06

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294422 Description: SS03 Source: Soil (General)

Begin Date: 93/07/13 10:33

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294423 Description: SS04 Source: Soil (General)

Begin Date: 93/07/13 11:42

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294424 Description: SS05 Source: Soil (General)

Begin Date: 93/07/13 13:38

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0UE	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294425 Description: SS06 Source: Soil (General)

Begin Date: 93/07/13 13:00

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294426 Description: SS07 Source: Soil (General)

Begin Date: 93/07/13 11:50

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294427 Description: ER01 Source: Water (General)

Begin Date: 93/07/13 10:10

Gen Inorg/Phys-Speci	Water-Total Result	Units
Cyanide Total	0.010U	mg/l

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER

Officer: DMB

Account: FA10PUZZ

Blank ID: BK3202A

Gen Inorg/Phys-Speci Blank #1		Water-Total Result	Units
Cyanide	Total	0.010U	mg/l

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER

Officer: DMB

Account: FA10PUZZ

Blank ID: BK3203A

Gen Inorg/Phys-Speci	Water-Total	
Blank #2	Result	Units
Cyanide Total	0.010U	mg/l

(Sample Complete)

ICF Technology Inc.
ManTech Environmental

ESAT Region 10
ICF Technology Inc.
7411 Beach Drive East
Port Orchard, WA 98366
Phone (206) 871-8760

MEMORANDUM

DCL#: 62760.14. .358 1993
FILE NO. 14.a
CC:
PM DPM SM C/SM FILE

DATE: August 27, 1993

TO: Jerry Muth, Regional Project Officer, USEPA, Region 10
Isa Chamberlain, Task Monitor, USEPA, Region 10 Received 8/27/93
David Bennett, Project Officer, USEPA, Region 10

THROUGH: Barry Pepich, Team Manager, ESAT, Region 10

FROM: Katie Adams, Chemist, ESAT, Region 10

SUBJECT: Data Validation Report of LeRoi Smelter CLP-RAS Metals in Soils
Sample Nos.: 93294420 - 93294427
Project Code: TEC-597A; Account Code: 3TFA10PUZZ

TID#: 10-9303-227
DOC#: ESAT-10A-6188
WUD#: 1306

cc: Bruce Woods, RQAMO, USEPA, Region 10

The following is a data review of the CLP-RAS metals analyses of seven soil samples and one water sample from the LeRoi Smelter Site in Northport, Washington. The analyses were performed following CLP and laboratory guidelines by the ESAT Team at the USEPA Manchester Environmental Laboratory (MEL), Port Orchard, WA. This review covers the following samples:

93294420	93294421	93294422	93294423	93294424	93294425
93294426	93294427				

DATA QUALIFICATIONS

The following comments refer to the ESAT Team's performance in meeting Quality Control Specifications outlined in the *CLP Statement of Work (CLP-SOW) for Inorganic Analysis, rev. ILMO3.0*, the *Manchester Environmental Laboratory Quality Assurance Manual, revision 5/88*, and the *Quality Assurance Project Plan (QAPP), revised June 1993.*

1.0 TIMELINESS - Acceptable

The suggested holding time for metals in soil and water is 180 days from the date of collection, with the exception of mercury, which has a holding time of 28 days. The samples were collected on 07/13/93 and mercury analysis was completed by 08/03/93, twenty-one days after sample collection. The remaining metals analyses were completed by 08/09/93, twenty-seven days after collection. Qualification was not necessary based on these criteria.

2.0 SAMPLE PREPARATION - Acceptable

The samples were prepared for ICP and GFAAS analysis on 07/20/93 by hotplate digestion. The samples were prepared for CVAAS (mercury) analysis on 07/22/93, 07/27/93, and 08/03/93 following Method 245.5. The water sample, an equipment rinsate, was prepared in the same manner and with the same reagents as the soil samples, and is reported with the same units (mg/Kg). Qualification was not necessary on this basis.

3.0 CALIBRATION - Acceptable

The samples were analyzed by ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) on 07/23/93. The instrument was standardized with a blank and a series of calibration standards, as specified in the analytical method.

The samples were analyzed for arsenic, selenium, and thallium by GFAAS (Graphite Furnace Atomic Absorption Spectroscopy) between 07/28/93 and 08/09/93. On each day, the instrument was calibrated with a blank and four standards, as required in the method. Analytical curves were linear and had correlation coefficients greater than the minimum required 0.995.

The samples were analyzed for mercury by CVAAS (Cold Vapor Atomic Absorption Spectroscopy) on 07/23/93, 07/28/93, and 08/03/93. The instrument was calibrated using a blank and at least four standards, as required. The curves were linear with a correlation coefficients greater than 0.995. Due to the relatively high levels of mercury present in the samples, additional mercury analyses were necessary in order to generate calibration curves with standards of high enough concentrations to adequately bracket the samples. All samples were within the calibration range on 08/03/93.

All calibrations met acceptable criteria therefore no qualification was necessary.

4.0 REFERENCE CONTROL SAMPLES/CALIBRATION VERIFICATION - Acceptable

Laboratory reference control samples are required before and after sample analysis and after every 10 samples during analysis. All control samples met frequency and recovery criteria of 90 - 110% for ICP-AES and GFAAS analyses, and 80 - 120% for CVAA (mercury) analysis. Qualification was not necessary on this basis.

5.0 BLANKS

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

Aluminum, calcium, iron, magnesium, and zinc were detected in the procedural blank associated with the ICP-AES analysis. These analytes were qualified (B) for the rinsate sample 93294427 based on the above criterion. No other qualification of the data was necessary based on this criterion.

6.0 ICP-AES INTERFERENCE CHECK SAMPLE - Acceptable

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. The acceptance criterion for the ICS is 80% - 120%. All results met frequency and recovery requirements on the day of analysis, 07/23/93.

7.0 DUPLICATE ANALYSIS - Acceptable

Duplicate analysis was performed on sample 93294420. All results displayed acceptable precision as demonstrated by RPD values less than 20%. No qualification was necessary on this basis.

8.0 FIELD DUPLICATE ANALYSIS

According to the QAPP, samples 93294420 and 93294426 were field duplicates, although this was not mentioned in the Chain of Custody forms. Analytical results for the two samples demonstrated acceptable precision (within 20% RPD) with the exception of Cd (27%), Cr (34%), Co (91%), Cu (47%), Mg (23%), Mn (23%), Ni (68%), Zn (45%), Hg (29%), and Se (31%). No qualification was assigned on this basis.

9.0 MATRIX SPIKE ANALYSIS

Matrix spike sample analyses are performed to provide information about the effect of the sample matrix on digestion and measurement methods. Manchester Laboratory and CLP guidelines specify that the matrix spike recovery must be within the limits of 75 - 125%. However, spike recovery limits do not apply when the sample concentration exceeds the spike concentration by a factor of four or more.

Matrix spike analysis was performed on sample 93294420 for both standard metals and mercury analyses. In addition, matrix spike analysis was performed on sample 93294424 for mercury analysis. All matrix spike recoveries were acceptable according to the above criteria, with the exceptions of antimony, cadmium, mercury, and selenium.

Matrix spike recoveries were low for antimony (34% and 29%). The antimony post spike recovery for the same sample was within limits at 97%. All results for antimony were qualified (N) to indicate possible loss during digestion or analysis.

Cadmium matrix spike recoveries were mixed, one being within range at 106%, the other slightly low at 73%. Although the percent recoveries are quite different, the RPD between the spike results was only 9%. The cadmium results for all samples were qualified (N) to indicate that spike recoveries were outside of acceptable limits.

The selenium spike recoveries for sample 93294420 were 74% and 75%, although a low post spike recovery (80%) indicated that these results might be affected by matrix interference. Subsequent analysis of the native and spiked sample, both diluted 1:2, demonstrated similar spike recoveries (72% and 76%), but in this case the post spike recovery was acceptable (99%). Samples which did not recover post spikes in the original analysis were reported from 1:2 dilutions to reduce matrix interference. However, because of low matrix spike recoveries, all selenium results were qualified (N) to indicate possible loss during digestion or analysis.

The mercury spike recoveries for sample 93294420 (129% and 164%) were outside acceptable limits; however, the spike recoveries for sample 93294424 were within range (93% and 110%). The mercury results for all samples except 93294424 were qualified (N) to indicate that matrix spike recoveries were outside of acceptable limits.

10.0 GRAPHITE FURNACE ATOMIC ABSORPTION (GFAAS) QC

Results from duplicate injections and furnace post digestion spikes are used to establish the precision and accuracy of the individual analytical determinations. For duplicate injections, results above the laboratory's quantitation limit must agree within 10% RPD, as specified by the laboratory's guidelines. Post spike recoveries must fall within 85% and 115%.

Post spike recoveries for thallium for samples 93294420 and 93294421 were low (77% and 84%). Diluting these samples two-fold resulted in acceptable post spikes, but also reduced the thallium concentration in these samples to levels below the instrument detection limit. The undiluted results were judged more useful to the data user, but are qualified (E) to indicate a possible low bias to the results due to matrix interference.

All other sample results met the acceptance criteria; therefore, no other qualification was necessary on this basis.

11.0 ICP-AES SERIAL DILUTION - Acceptable

Sample 93294420 was analyzed by serial dilution to check for potential interferences. All results were required to be within 10% if the analyte was present at greater than 50 times the instrument detection limit.

The ICP serial dilution results for all elements agreed within 10%. No qualification was necessary on this basis.

12.0 DETECTION LIMITS - Acceptable

Sample results which fall below the instrument detection limit (IDL) are reported at the instrument detection limit and qualified (U). Any sample result falling between the detection limit and the quantitation limit are qualified as an estimate (P). This notifies the data user that the element was detected, but below the minimum level within the limits of precision of 10% relative standard deviation.

13.0 OVERALL ASSESSMENT OF THE DATA

The usefulness of the data is based on the criteria outlined in the *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (7/88).*

The following is a summary of the qualification required for the LeRoi Smelter Soil Samples - CLP-RAS Metals Analysis, samples numbered 93294420 - 93294427.

The (U) qualifier was attached to sample results below the minimum level of detection.

The (P) qualifier was attached to sample results less than the laboratory's quantitation limit (see Section 12.0).

The (B) qualifier was attached to aluminum, calcium, iron, magnesium and zinc results for sample 93294427 to indicate possible contamination from the digestion or analysis procedure.

The (N) qualifier was attached to antimony, cadmium, and selenium for all samples, and to mercury for all samples except 93294424, to indicate matrix spike recoveries outside of acceptable limits.

The (E) qualifier was attached to thallium results for samples 93294420 and 93294421 to indicate a possible low bias to the results due to matrix interference.

No further qualification was required based on this review.

Definitions of laboratory data qualifiers are attached.

USEPA Region 10 Laboratory

Below are the definitions for the qualifiers used in the metals area when qualifying data from metals analysis.

DATA QUALIFIERS

U	-	Element was analyzed but not detected. The associated numerical value is the instrument detection limit/method detection limit.
P	-	The analyte was detected above the Instrument Detection Limit, but not quantified within expected limits of precision. The laboratory has established minimum quantitation limits having a relative standard deviation of no more than 10%
H	-	The samples were analyzed after the suggested holding time limit.
E	-	The reported value is an estimate because of the presence of interference. An explanatory note will be included with the report.
B	-	Analyte is found in the analytical blank as well as the sample indicating possible/probable blank contamination. If analytes are found in any of the associated procedural blanks the concentration in the samples must be at least ten times the quantity observed in the blank. If the sample result fails these criteria the sample result is qualified (B).
N	-	Spiked sample recovery not within control limits.
NAR	-	There is no analysis result for this analyte.
NA	-	Not Applicable/Not Required.
S	-	Sample was analyzed by method of standard additions.
+	-	Sample was analyzed by method of standard additions and the correlation coefficient was less than 0.995.
*	-	The analyte was present in the sample.
W	-	Post spike out of specified range, and sample was less than 50% the spike added.

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294420 Description: SS01 (MS/MSD) Source: Soil (General)

Begin Date: 93/07/13 11:50

Metals - Specified		Sediment Result	Units
Selenium	Se-Sedmt	3.30N*	mg/kg-dr
Thallium	Tl-Sedmt	0.43PE*	mg/kg-dr
Mercury	Hg-Sedmt	0.65N*	mg/kg-wt

Metals - Specified Matrix Spike #1		Sediment Result	Units
Selenium	Se-Sedmt	75	% Recov
Thallium	Tl-Sedmt	76	% Recov
Mercury	Hg-Sedmt	129	% Recov

Metals - Specified Matrix Spike #2		Sediment Result	Units
Selenium	Se-Sedmt	74	% Recov
Thallium	Tl-Sedmt	77	% Recov
Mercury	Hg-Sedmt	164	% Recov

Metals - Specified Duplicate #1		Sediment Result	Units
Selenium	Se-Sedmt	3.28N*	mg/kg-dr
Thallium	Tl-Sedmt	0.33P*	mg/kg-dr
Mercury	Hg-Sedmt	0.77N*	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	6860 *	mg/kg-dr
Mgnsium	Mg-Sedmt	3050 *	mg/kg-dr
Sodium	Na-Sedmt	132 *	mg/kg-dr
Potssium	K -Sedmt	1190 *	mg/kg-dr
Arsenic	As-Sedmt	140 *	mg/kg-dr
Barium	Ba-Sedmt	151 *	mg/kg-dr
Berylium	Be-Sedmt	0.31P*	mg/kg-dr
Cadmium	Cd-Sedmt	26.8N*	mg/kg-dr
Chromium	Cr-Sedmt	36.2 *	mg/kg-dr
Cobalt	Co-Sedmt	54.6 *	mg/kg-dr
Copper	Cu-Sedmt	1600 *	mg/kg-dr
Lead	Pb-Sedmt	39000 *	mg/kg-dr
Mangnese	Mn-Sedmt	651 *	mg/kg-dr
Nickel	Ni-Sedmt	44.0 *	mg/kg-dr
Silver	Ag-Sedmt	93.9 *	mg/kg-dr
Vanadium	V -Sedmt	22.7 *	mg/kg-dr
Zinc	Zn-Sedmt	1770 *	mg/kg-dr
Antimony	Sb-Sedmt	48.4 *	mg/kg-dr
Aluminum	Al-Sedmt	7350 *	mg/kg-dr
Iron	Fe-Sedmt	33300 *	mg/kg-dr

Metals - ICP Scan Matrix Spike #1		Sediment Result	Units
Calcium	Ca-Sedmt	NAF	% Recov
Mgnsium	Mg-Sedmt	NAF	% Recov
Sodium	Na-Sedmt	NAF	% Recov
Potssium	K -Sedmt	NAF	% Recov
Arsenic	As-Sedmt	95	% Recov
Barium	Ba-Sedmt	95	% Recov
Berylium	Be-Sedmt	100	% Recov
Cadmium	Cd-Sedmt	73	% Recov
Chromium	Cr-Sedmt	75	% Recov
Cobalt	Co-Sedmt	84	% Recov
Copper	Cu-Sedmt	116	% Recov
Lead	Pb-Sedmt	NA	% Recov
Mangnese	Mn-Sedmt	NA	% Recov
Nickel	Ni-Sedmt	93	% Recov
Silver	Ag-Sedmt	NA	% Recov
Vanadium	V -Sedmt	99	% Recov
Zinc	Zn-Sedmt	NA	% Recov
Antimony	Sb-Sedmt	34	% Recov
Aluminum	Al-Sedmt	NA	% Recov
Iron	Fe-Sedmt	NA	% Recov

Metals - ICP Scan Matrix Spike #2		Sediment Result	Units
Calcium	Ca-Sedmt	NAF	% Recov
Mgnsium	Mg-Sedmt	NAF	% Recov
Sodium	Na-Sedmt	NAF	% Recov
Potssium	K -Sedmt	NAF	% Recov
Arsenic	As-Sedmt	94	% Recov
Barium	Ba-Sedmt	96	% Recov
Berylium	Be-Sedmt	101	% Recov
Cadmium	Cd-Sedmt	106	% Recov
Chromium	Cr-Sedmt	80	% Recov
Cobalt	Co-Sedmt	89	% Recov
Copper	Cu-Sedmt	NA	% Recov
Lead	Pb-Sedmt	NA	% Recov
Mangnese	Mn-Sedmt	NA	% Recov
Nickel	Ni-Sedmt	97	% Recov
Silver	Ag-Sedmt	NA	% Recov
Vanadium	V -Sedmt	100	% Recov
Zinc	Zn-Sedmt	NA	% Recov
Antimony	Sb-Sedmt	29	% Recov
Aluminum	Al-Sedmt	NA	% Recov
Iron	Fe-Sedmt	NA	% Recov

Metals - ICP Scan Duplicate #1		Sediment Result	Units
Calcium	Ca-Sedmt	6930 *	mg/kg-dr
Mgnsium	Mg-Sedmt	3090 *	mg/kg-dr
Sodium	Na-Sedmt	121 *	mg/kg-dr
Potssium	K -Sedmt	1170 *	mg/kg-dr
Arsenic	As-Sedmt	133 *	mg/kg-dr
Barium	Ba-Sedmt	151 *	mg/kg-dr
Berylium	Be-Sedmt	0.31P*	mg/kg-dr
Cadmium	Cd-Sedmt	26.5N*	mg/kg-dr
Chromium	Cr-Sedmt	31.0 *	mg/kg-dr
Cobalt	Co-Sedmt	48.2 *	mg/kg-dr
Copper	Cu-Sedmt	1640 *	mg/kg-dr
Lead	Pb-Sedmt	39200 *	mg/kg-dr
Mangnese	Mn-Sedmt	718 *	mg/kg-dr
Nickel	Ni-Sedmt	42.7 *	mg/kg-dr
Silver	Ag-Sedmt	94.6 *	mg/kg-dr
Vanadium	V -Sedmt	22.4 *	mg/kg-dr
Zinc	Zn-Sedmt	1730 *	mg/kg-dr
Antimony	Sb-Sedmt	52.6N*	mg/kg-dr
Aluminum	Al-Sedmt	7280 *	mg/kg-dr
Iron	Fe-Sedmt	33400 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294421 Description: SS02 Source: Soil (General)

Begin Date: 93/07/13 12:06

Metals - Specified		Sediment Result		Units
Arsenic	As-Sedmt	18.1	*	mg/kg-dr
Selenium	Se-Sedmt	0.42PN	*	mg/kg-dr
Thallium	Tl-Sedmt	0.25UE		mg/kg-dr
Mercury	Hg-Sedmt	0.38N	*	mg/kg-wt

Metals - ICP Scan		Sediment Result		Units
Calcium	Ca-Sedmt	172000	*	mg/kg-dr
Mgnsium	Mg-Sedmt	11200	*	mg/kg-dr
Sodium	Na-Sedmt	129	*	mg/kg-dr
Potssium	K -Sedmt	2400	*	mg/kg-dr
Barium	Ba-Sedmt	125	*	mg/kg-dr
Berylium	Be-Sedmt	0.29P	*	mg/kg-dr
Cadmium	Cd-Sedmt	11.6N	*	mg/kg-dr
Chromium	Cr-Sedmt	46.3	*	mg/kg-dr
Cobalt	Co-Sedmt	14.3	*	mg/kg-dr
Copper	Cu-Sedmt	165	*	mg/kg-dr
Lead	Pb-Sedmt	2180	*	mg/kg-dr
Mangnese	Mn-Sedmt	366	*	mg/kg-dr
Nickel	Ni-Sedmt	27.7	*	mg/kg-dr
Silver	Ag-Sedmt	4.87	*	mg/kg-dr
Vanadium	V -Sedmt	20.9	*	mg/kg-dr
Zinc	Zn-Sedmt	305	*	mg/kg-dr
Antimony	Sb-Sedmt	2.5UN		mg/kg-dr
Aluminum	Al-Sedmt	8490	*	mg/kg-dr
Iron	Fe-Sedmt	14800	*	mg/kg-dr

(Sample Complete)

EPA Region X Lab Management System
Sample/Project Analysis Results

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294422 Description: SS03 Source: Soil (General)

Begin Date: 93/07/13 10:33

Metals - Specified		Sediment Result	Units
Arsenic	As-Sedmt	5.64 *	mg/kg-dr
Selenium	Se-Sedmt	0.40UN	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr
Mercury	Hg-Sedmt	0.02N*	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	5320 *	mg/kg-dr
Mgnsium	Mg-Sedmt	6250 *	mg/kg-dr
Sodium	Na-Sedmt	195 *	mg/kg-dr
Potssium	K -Sedmt	1960 *	mg/kg-dr
Barium	Ba-Sedmt	109 *	mg/kg-dr
Berylium	Be-Sedmt	0.38P*	mg/kg-dr
Cadmium	Cd-Sedmt	1.59N*	mg/kg-dr
Chromium	Cr-Sedmt	51.3 *	mg/kg-dr
Cobalt	Co-Sedmt	25.3 *	mg/kg-dr
Copper	Cu-Sedmt	35.4 *	mg/kg-dr
Lead	Pb-Sedmt	112 *	mg/kg-dr
Mangnese	Mn-Sedmt	375 *	mg/kg-dr
Nickel	Ni-Sedmt	32.0 *	mg/kg-dr
Silver	Ag-Sedmt	0.30U	mg/kg-dr
Vanadium	V -Sedmt	41.5 *	mg/kg-dr
Zinc	Zn-Sedmt	127 *	mg/kg-dr
Antimony	Sb-Sedmt	2.5UN	mg/kg-dr
Aluminum	Al-Sedmt	10100 *	mg/kg-dr
Iron	Fe-Sedmt	18000 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294423 Description: SS04 Source: Soil (General)

Begin Date: 93/07/13 11:42

Metals - Specified		Sediment Result	Units
Selenium	Se-Sedmt	0.40UN	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr
Mercury	Hg-Sedmt	0.06N*	mg/kg-wt

Metals - ICP Scan		Sediment Result		Units
Calcium	Ca-Sedmt	20500	*	mg/kg-dr
Mgnsium	Mg-Sedmt	3110	*	mg/kg-dr
Sodium	Na-Sedmt	453	*	mg/kg-dr
Potssium	K -Sedmt	770	*	mg/kg-dr
Arsenic	As-Sedmt	61.1	*	mg/kg-dr
Barium	Ba-Sedmt	312	*	mg/kg-dr
Berylium	Be-Sedmt	0.753	*	mg/kg-dr
Cadmium	Cd-Sedmt	0.72PN	*	mg/kg-dr
Chromium	Cr-Sedmt	28.3	*	mg/kg-dr
Cobalt	Co-Sedmt	19.1	*	mg/kg-dr
Copper	Cu-Sedmt	355	*	mg/kg-dr
Lead	Pb-Sedmt	64.2	*	mg/kg-dr
Mangnese	Mn-Sedmt	350	*	mg/kg-dr
Nickel	Ni-Sedmt	25.1	*	mg/kg-dr
Silver	Ag-Sedmt	0.96P	*	mg/kg-dr
Vanadium	V -Sedmt	43.4	*	mg/kg-dr
Zinc	Zn-Sedmt	83.0	*	mg/kg-dr
Antimony	Sb-Sedmt	4.8PN	*	mg/kg-dr
Aluminum	Al-Sedmt	10900	*	mg/kg-dr
Iron	Fe-Sedmt	13600	*	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294424 Description: SS05 Source: Soil (General)

Begin Date: 93/07/13 13:38

Metals - Specified		Sediment Result	Units
Arsenic	As-Sedmt	17.8 *	mg/kg-dr
Selenium	Se-Sedmt	0.81PN*	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr
Mercury	Hg-Sedmt	0.33 *	mg/kg-wt

Metals - Specified Matrix Spike #1		Sediment Result	Units
Mercury	Hg-Sedmt	93	% Recov

Metals - Specified Matrix Spike #2		Sediment Result	Units
Mercury	Hg-Sedmt	110	% Recov

Metals - Specified Duplicate #1		Sediment Result	Units
Mercury	Hg-Sedmt	0.38 *	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	42200 *	mg/kg-dr
Mgnsium	Mg-Sedmt	23000 *	mg/kg-dr
Sodium	Na-Sedmt	237 *	mg/kg-dr
Potssium	K -Sedmt	1230 *	mg/kg-dr
Barium	Ba-Sedmt	858 *	mg/kg-dr
Berylium	Be-Sedmt	0.28P*	mg/kg-dr
Cadmium	Cd-Sedmt	8.16N*	mg/kg-dr
Chromium	Cr-Sedmt	51.8 *	mg/kg-dr
Cobalt	Co-Sedmt	10.6 *	mg/kg-dr
Copper	Cu-Sedmt	146 *	mg/kg-dr
Lead	Pb-Sedmt	699 *	mg/kg-dr
Mangnese	Mn-Sedmt	532 *	mg/kg-dr
Nickel	Ni-Sedmt	33.8 *	mg/kg-dr
Silver	Ag-Sedmt	0.59P*	mg/kg-dr
Vanadium	V -Sedmt	26.0 *	mg/kg-dr
Zinc	Zn-Sedmt	3320 *	mg/kg-dr
Antimony	Sb-Sedmt	2.5UN	mg/kg-dr
Aluminum	Al-Sedmt	5870 *	mg/kg-dr

Metals - ICP Scan *** Continued ***		Sediment Result	Units
Iron	Fe-Sedmt	39000 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294425 Description: SS06 Source: Soil (General)

Begin Date: 93/07/13 13:00

Metals - Specified		Sediment Result	Units
Arsenic	As-Sedmt	7.53 *	mg/kg-dr
Selenium	Se-Sedmt	0.20UN	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr
Mercury	Hg-Sedmt	0.02N*	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	5890 *	mg/kg-dr
Mgnsium	Mg-Sedmt	4500 *	mg/kg-dr
Sodium	Na-Sedmt	66.9 *	mg/kg-dr
Potssium	K -Sedmt	950 *	mg/kg-dr
Barium	Ba-Sedmt	120 *	mg/kg-dr
Berylium	Be-Sedmt	0.28P*	mg/kg-dr
Cadmium	Cd-Sedmt	2.18N*	mg/kg-dr
Chromium	Cr-Sedmt	36.9 *	mg/kg-dr
Cobalt	Co-Sedmt	44.9 *	mg/kg-dr
Copper	Cu-Sedmt	15.4 *	mg/kg-dr
Lead	Pb-Sedmt	202 *	mg/kg-dr
Mangnese	Mn-Sedmt	344 *	mg/kg-dr
Nickel	Ni-Sedmt	59.3 *	mg/kg-dr
Silver	Ag-Sedmt	0.31P*	mg/kg-dr
Vanadium	V -Sedmt	17.7 *	mg/kg-dr
Zinc	Zn-Sedmt	146 *	mg/kg-dr
Antimony	Sb-Sedmt	3.2PN*	mg/kg-dr
Aluminum	Al-Sedmt	5720 *	mg/kg-dr
Iron	Fe-Sedmt	10800 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294426 Description: SS07 Source: Soil (General)

Begin Date: 93/07/13 11:50

Metals - Specified		Sediment Result		Units
Selenium	Se-Sedmt	2.42N	*	mg/kg-dr
Thallium	Tl-Sedmt	0.34P	*	mg/kg-dr
Mercury	Hg-Sedmt	0.87N	*	mg/kg-wt

Metals - ICP Scan		Sediment Result		Units
Calcium	Ca-Sedmt	6860	*	mg/kg-dr
Mgnsium	Mg-Sedmt	3830	*	mg/kg-dr
Sodium	Na-Sedmt	138	*	mg/kg-dr
Potssium	K -Sedmt	1240	*	mg/kg-dr
Arsenic	As-Sedmt	126	*	mg/kg-dr
Barium	Ba-Sedmt	146	*	mg/kg-dr
Berylium	Be-Sedmt	0.32P	*	mg/kg-dr
Cadmium	Cd-Sedmt	20.5N	*	mg/kg-dr
Chromium	Cr-Sedmt	25.8	*	mg/kg-dr
Cobalt	Co-Sedmt	20.4	*	mg/kg-dr
Copper	Cu-Sedmt	991	*	mg/kg-dr
Lead	Pb-Sedmt	37100	*	mg/kg-dr
Mangnese	Mn-Sedmt	820	*	mg/kg-dr
Nickel	Ni-Sedmt	21.6	*	mg/kg-dr
Silver	Ag-Sedmt	90.4	*	mg/kg-dr
Vanadium	V -Sedmt	23.8	*	mg/kg-dr
Zinc	Zn-Sedmt	1120	*	mg/kg-dr
Antimony	Sb-Sedmt	46.0N	*	mg/kg-dr
Aluminum	Al-Sedmt	8300	*	mg/kg-dr
Iron	Fe-Sedmt	31500	*	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294427 Description: ER01 Source: Water (General)

Begin Date: 93/07/13 10:10

Metals - Specified		Water-Total Result	Units
Arsenic	As-Total	0.15U	ug/l
Thallium	Tl-Total	0.25U	ug/l
Selenium	Se-Total	0.20UN	ug/l
Mercury	Hg-Total	0.02UN	ug/l

Metals - ICP Scan		Water-Total Result	Units
Calcium	Ca-Sedmt	23.6B*	mg/kg-dr
Mgnsium	Mg-Sedmt	35.8B*	mg/kg-dr
Sodium	Na-Sedmt	8.82 *	mg/kg-dr
Potssium	K -Sedmt	40.U	mg/kg-dr
Barium	Ba-Sedmt	0.10U	mg/kg-dr
Berylium	Be-Sedmt	0.10U	mg/kg-dr
Cadmium	Cd-Sedmt	0.20UN	mg/kg-dr
Chromium	Cr-Sedmt	0.40U	mg/kg-dr
Cobalt	Co-Sedmt	0.60U	mg/kg-dr
Copper	Cu-Sedmt	0.24P*	mg/kg-dr
Lead	Pb-Sedmt	3.0U	mg/kg-dr
Mangnese	Mn-Sedmt	0.18P*	mg/kg-dr
Nickel	Ni-Sedmt	1.0U	mg/kg-dr
Silver	Ag-Sedmt	0.30U	mg/kg-dr
Vanadium	V -Sedmt	0.40U	mg/kg-dr
Zinc	Zn-Sedmt	14.7B*	mg/kg-dr
Antimony	Sb-Sedmt	2.5UN	mg/kg-dr
Aluminum	Al-Sedmt	14.3B*	mg/kg-dr
Iron	Fe-Sedmt	6.77B*	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Blank ID: S930720A

Metals - Specified Blank #1		Sediment Result	Units
Arsenic	As-Sedmt	0.15U	mg/kg-dr
Selenium	Se-Sedmt	0.20U	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr

Metals - ICP Scan Blank #1		Sediment Result	Units
Calcium	Ca-Sedmt	5.88 *	mg/kg-dr
Mgnsium	Mg-Sedmt	13.0P*	mg/kg-dr
Sodium	Na-Sedmt	1.5U	mg/kg-dr
Potssium	K -Sedmt	40.U	mg/kg-dr
Barium	Ba-Sedmt	0.10U	mg/kg-dr
Berylium	Be-Sedmt	0.10U	mg/kg-dr
Cadmium	Cd-Sedmt	0.20U	mg/kg-dr
Chromium	Cr-Sedmt	0.40U	mg/kg-dr
Cobalt	Co-Sedmt	0.60U	mg/kg-dr
Copper	Cu-Sedmt	0.20U	mg/kg-dr
Lead	Pb-Sedmt	3.0U	mg/kg-dr
Mangnese	Mn-Sedmt	0.10U	mg/kg-dr
Nickel	Ni-Sedmt	1.0U	mg/kg-dr
Silver	Ag-Sedmt	0.30U	mg/kg-dr
Vanadium	V -Sedmt	0.40U	mg/kg-dr
Zinc	Zn-Sedmt	6.04 *	mg/kg-dr
Antimony	Sb-Sedmt	2.5U	mg/kg-dr
Aluminum	Al-Sedmt	4.7P*	mg/kg-dr
Iron	Fe-Sedmt	1.4P*	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Blank ID: S930803A

Metals - Specified Blank #1		Sediment Result	Units
Mercury	Hg-Sedmt	0.02U	mg/kg-wt

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294420 Description: SS01 (MS/MSD) Source: Soil (General)

Begin Date: 93/07/13 11:50

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

Gen Inorg/Phys-Speci Matrix Spike #1		Sediment Result	Units
Cyanide	Sedmt	86	% Recov

Gen Inorg/Phys-Speci Matrix Spike #2		Sediment Result	Units
Cyanide	Sedmt	85	% Recov

Gen Inorg/Phys-Speci Duplicate #1		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

Metals - Specified		Sediment Result	Units
Selenium	Se-Sedmt	3.30N*	mg/kg-dr
Thallium	Tl-Sedmt	0.43PE*	mg/kg-dr
Mercury	Hg-Sedmt	0.65N*	mg/kg-wt

Metals - Specified Matrix Spike #1		Sediment Result	Units
Selenium	Se-Sedmt	75	% Recov
Thallium	Tl-Sedmt	76	% Recov
Mercury	Hg-Sedmt	129	% Recov

Metals - Specified Matrix Spike #2		Sediment Result	Units
Selenium	Se-Sedmt	74	% Recov
Thallium	Tl-Sedmt	77	% Recov
Mercury	Hg-Sedmt	164	% Recov

Metals - Specified Duplicate #1		Sediment Result	Units
Selenium	Se-Sedmt	3.28N*	mg/kg-dr
Thallium	Tl-Sedmt	0.33P*	mg/kg-dr
Mercury	Hg-Sedmt	0.77N*	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	6860 *	mg/kg-dr
Mgnsium	Mg-Sedmt	3050 *	mg/kg-dr
Sodium	Na-Sedmt	132 *	mg/kg-dr
Potssium	K -Sedmt	1190 *	mg/kg-dr
Arsenic	As-Sedmt	140 *	mg/kg-dr
Barium	Ba-Sedmt	151 *	mg/kg-dr
Berylium	Be-Sedmt	0.31P*	mg/kg-dr
Cadmium	Cd-Sedmt	26.8N*	mg/kg-dr
Chromium	Cr-Sedmt	36.2 *	mg/kg-dr
Cobalt	Co-Sedmt	54.6 *	mg/kg-dr
Copper	Cu-Sedmt	1600 *	mg/kg-dr
Lead	Pb-Sedmt	39000 *	mg/kg-dr
Mangnese	Mn-Sedmt	651 *	mg/kg-dr
Nickel	Ni-Sedmt	44.0 *	mg/kg-dr
Silver	Ag-Sedmt	93.9 *	mg/kg-dr
Vanadium	V -Sedmt	22.7 *	mg/kg-dr
Zinc	Zn-Sedmt	1770 *	mg/kg-dr
Antimony	Sb-Sedmt	48.4 *	mg/kg-dr
Aluminum	Al-Sedmt	7350 *	mg/kg-dr
Iron	Fe-Sedmt	33300 *	mg/kg-dr

Metals - ICP Scan Matrix Spike #1		Sediment Result	Units
Calcium	Ca-Sedmt	NAF	% Recov
Mgnsium	Mg-Sedmt	NAF	% Recov
Sodium	Na-Sedmt	NAF	% Recov
Potssium	K -Sedmt	NAF	% Recov
Arsenic	As-Sedmt	95	% Recov
Barium	Ba-Sedmt	95	% Recov
Berylium	Be-Sedmt	100	% Recov
Cadmium	Cd-Sedmt	73	% Recov
Chromium	Cr-Sedmt	75	% Recov
Cobalt	Co-Sedmt	84	% Recov
Copper	Cu-Sedmt	116	% Recov
Lead	Pb-Sedmt	NA	% Recov

(Continued on next page)

Metals - ICP Scan *** Continued *** Matrix Spike #1		Sediment Result	Units
Mangnese	Mn-Sedmt	NA	% Recov
Nickel	Ni-Sedmt	93	% Recov
Silver	Ag-Sedmt	NA	% Recov
Vanadium	V -Sedmt	99	% Recov
Zinc	Zn-Sedmt	NA	% Recov
Antimony	Sb-Sedmt	34	% Recov
Aluminum	Al-Sedmt	NA	% Recov
Iron	Fe-Sedmt	NA	% Recov

Metals - ICP Scan Matrix Spike #2		Sediment Result	Units
Calcium	Ca-Sedmt	NAF	% Recov
Mgnsium	Mg-Sedmt	NAF	% Recov
Sodium	Na-Sedmt	NAF	% Recov
Potssium	K -Sedmt	NAF	% Recov
Arsenic	As-Sedmt	94	% Recov
Barium	Ba-Sedmt	96	% Recov
Berylium	Be-Sedmt	101	% Recov
Cadmium	Cd-Sedmt	106	% Recov
Chromium	Cr-Sedmt	80	% Recov
Cobalt	Co-Sedmt	89	% Recov
Copper	Cu-Sedmt	NA	% Recov
Lead	Pb-Sedmt	NA	% Recov
Mangnese	Mn-Sedmt	NA	% Recov
Nickel	Ni-Sedmt	97	% Recov
Silver	Ag-Sedmt	NA	% Recov
Vanadium	V -Sedmt	100	% Recov
Zinc	Zn-Sedmt	NA	% Recov
Antimony	Sb-Sedmt	29	% Recov
Aluminum	Al-Sedmt	NA	% Recov
Iron	Fe-Sedmt	NA	% Recov

Metals - ICP Scan Duplicate #1		Sediment Result	Units
Calcium	Ca-Sedmt	6930 *	mg/kg-dr
Mgnsium	Mg-Sedmt	3090 *	mg/kg-dr
Sodium	Na-Sedmt	121 *	mg/kg-dr
Potssium	K -Sedmt	1170 *	mg/kg-dr
Arsenic	As-Sedmt	133 *	mg/kg-dr
Barium	Ba-Sedmt	151 *	mg/kg-dr

Final Report Sent to:
David Bennett
Bruce Woods
9/1/93
CRF

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294420 Description: SS01 (MS/MSD) Source: Soil (General)

Begin Date: 93/07/13 11:50

Metals - ICP Scan *** Continued ***		Sediment		
Duplicate #1		Result		Units
Berylium	Be-Sedmt	0.31P	*	mg/kg-dr
Cadmium	Cd-Sedmt	26.5N	*	mg/kg-dr
Chromium	Cr-Sedmt	31.0	*	mg/kg-dr
Cobalt	Co-Sedmt	48.2	*	mg/kg-dr
Copper	Cu-Sedmt	1640	*	mg/kg-dr
Lead	Pb-Sedmt	39200	*	mg/kg-dr
Mangnese	Mn-Sedmt	718	*	mg/kg-dr
Nickel	Ni-Sedmt	42.7	*	mg/kg-dr
Silver	Ag-Sedmt	94.6	*	mg/kg-dr
Vanadium	V -Sedmt	22.4	*	mg/kg-dr
Zinc	Zn-Sedmt	1730	*	mg/kg-dr
Antimony	Sb-Sedmt	52.6N	*	mg/kg-dr
Aluminum	Al-Sedmt	7280	*	mg/kg-dr
Iron	Fe-Sedmt	33400	*	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294421 Description: SS02 Source: Soil (General)

Begin Date: 93/07/13 12:06

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

Metals - Specified		Sediment Result	Units
Arsenic	As-Sedmt	18.1 *	mg/kg-dr
Selenium	Se-Sedmt	0.42PN*	mg/kg-dr
Thallium	Tl-Sedmt	0.25UE	mg/kg-dr
Mercury	Hg-Sedmt	0.38N*	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	172000 *	mg/kg-dr
Mgnsium	Mg-Sedmt	11200 *	mg/kg-dr
Sodium	Na-Sedmt	129 *	mg/kg-dr
Potssium	K -Sedmt	2400 *	mg/kg-dr
Barium	Ba-Sedmt	125 *	mg/kg-dr
Berylium	Be-Sedmt	0.29P*	mg/kg-dr
Cadmium	Cd-Sedmt	11.6N*	mg/kg-dr
Chromium	Cr-Sedmt	46.3 *	mg/kg-dr
Cobalt	Co-Sedmt	14.3 *	mg/kg-dr
Copper	Cu-Sedmt	165 *	mg/kg-dr
Lead	Pb-Sedmt	2180 *	mg/kg-dr
Mangnese	Mn-Sedmt	366 *	mg/kg-dr
Nickel	Ni-Sedmt	27.7 *	mg/kg-dr
Silver	Ag-Sedmt	4.87 *	mg/kg-dr
Vanadium	V -Sedmt	20.9 *	mg/kg-dr
Zinc	Zn-Sedmt	305 *	mg/kg-dr
Antimony	Sb-Sedmt	2.5UN	mg/kg-dr
Aluminum	Al-Sedmt	8490 *	mg/kg-dr
Iron	Fe-Sedmt	14800 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DM8 Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294422 Description: SS03 Source: Soil (General)

Begin Date: 93/07/13 10:33

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

Metals - Specified		Sediment Result	Units
Arsenic	As-Sedmt	5.64 *	mg/kg-dr
Selenium	Se-Sedmt	0.40UN	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr
Mercury	Hg-Sedmt	0.02N*	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	5320 *	mg/kg-dr
Mgnsium	Mg-Sedmt	6250 *	mg/kg-dr
Sodium	Na-Sedmt	195 *	mg/kg-dr
Potssium	K -Sedmt	1960 *	mg/kg-dr
Barium	Ba-Sedmt	109 *	mg/kg-dr
Berylium	Be-Sedmt	0.38P*	mg/kg-dr
Cadmium	Cd-Sedmt	1.59N*	mg/kg-dr
Chromium	Cr-Sedmt	51.3 *	mg/kg-dr
Cobalt	Co-Sedmt	25.3 *	mg/kg-dr
Copper	Cu-Sedmt	35.4 *	mg/kg-dr
Lead	Pb-Sedmt	112 *	mg/kg-dr
Mangnese	Mn-Sedmt	375 *	mg/kg-dr
Nickel	Ni-Sedmt	32.0 *	mg/kg-dr
Silver	Ag-Sedmt	0.30U	mg/kg-dr
Vanadium	V -Sedmt	41.5 *	mg/kg-dr
Zinc	Zn-Sedmt	127 *	mg/kg-dr
Antimony	Sb-Sedmt	2.5UN	mg/kg-dr
Aluminum	Al-Sedmt	10100 *	mg/kg-dr
Iron	Fe-Sedmt	18000 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294423 Description: SS04 Source: Soil (General)

Begin Date: 93/07/13 11:42

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

Metals - Specified		Sediment Result	Units
Selenium	Se-Sedmt	0.40UN	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr
Mercury	Hg-Sedmt	0.06N*	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	20500 *	mg/kg-dr
Mgnsium	Mg-Sedmt	3110 *	mg/kg-dr
Sodium	Na-Sedmt	453 *	mg/kg-dr
Potssium	K -Sedmt	770 *	mg/kg-dr
Arsenic	As-Sedmt	61.1 *	mg/kg-dr
Barium	Ba-Sedmt	312 *	mg/kg-dr
Berylium	Be-Sedmt	0.753 *	mg/kg-dr
Cadmium	Cd-Sedmt	0.72PN*	mg/kg-dr
Chromium	Cr-Sedmt	28.3 *	mg/kg-dr
Cobalt	Co-Sedmt	19.1 *	mg/kg-dr
Copper	Cu-Sedmt	355 *	mg/kg-dr
Lead	Pb-Sedmt	64.2 *	mg/kg-dr
Mangnese	Mn-Sedmt	350 *	mg/kg-dr
Nickel	Ni-Sedmt	25.1 *	mg/kg-dr
Silver	Ag-Sedmt	0.96P*	mg/kg-dr
Vanadium	V -Sedmt	43.4 *	mg/kg-dr
Zinc	Zn-Sedmt	83.0 *	mg/kg-dr
Antimony	Sb-Sedmt	4.8PN*	mg/kg-dr
Aluminum	Al-Sedmt	10900 *	mg/kg-dr
Iron	Fe-Sedmt	13600 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294424 Description: SS05 Source: Soil (General)

Begin Date: 93/07/13 13:38

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0UE	mg/kg-dr

Metals - Specified		Sediment Result	Units
Arsenic	As-Sedmt	17.8 *	mg/kg-dr
Selenium	Se-Sedmt	0.81PN*	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr
Mercury	Hg-Sedmt	0.33 *	mg/kg-wt

Metals - Specified Matrix Spike #1		Sediment Result	Units
Mercury	Hg-Sedmt	93	% Recov

Metals - Specified Matrix Spike #2		Sediment Result	Units
Mercury	Hg-Sedmt	110	% Recov

Metals - Specified Duplicate #1		Sediment Result	Units
Mercury	Hg-Sedmt	0.38 *	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	42200 *	mg/kg-dr
Magnesium	Mg-Sedmt	23000 *	mg/kg-dr
Sodium	Na-Sedmt	237 *	mg/kg-dr
Potassium	K -Sedmt	1230 *	mg/kg-dr
Barium	Ba-Sedmt	858 *	mg/kg-dr
Beryllium	Be-Sedmt	0.28P*	mg/kg-dr
Cadmium	Cd-Sedmt	8.16N*	mg/kg-dr
Chromium	Cr-Sedmt	51.8 *	mg/kg-dr
Cobalt	Co-Sedmt	10.6 *	mg/kg-dr
Copper	Cu-Sedmt	146 *	mg/kg-dr
Lead	Pb-Sedmt	699 *	mg/kg-dr
Manganese	Mn-Sedmt	532 *	mg/kg-dr

Metals - ICP Scan *** Continued ***		Sediment Result	Units
Nickel	Ni-Sedmt	33.8 *	mg/kg-dr
Silver	Ag-Sedmt	0.59P*	mg/kg-dr
Vanadium	V -Sedmt	26.0 *	mg/kg-dr
Zinc	Zn-Sedmt	3320 *	mg/kg-dr
Antimony	Sb-Sedmt	2.5UN	mg/kg-dr
Aluminum	Al-Sedmt	5870 *	mg/kg-dr
Iron	Fe-Sedmt	39000 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294425 Description: SS06 Source: Soil (General)

Begin Date: 93/07/13 13:00

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

Metals - Specified		Sediment Result	Units
Arsenic	As-Sedmt	7.53 *	mg/kg-dr
Selenium	Se-Sedmt	0.20UN	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr
Mercury	Hg-Sedmt	0.02N*	mg/kg-wt

Metals - ICP Scan		Sediment Result	Units
Calcium	Ca-Sedmt	5890 *	mg/kg-dr
Mgnsium	Mg-Sedmt	4500 *	mg/kg-dr
Sodium	Na-Sedmt	66.9 *	mg/kg-dr
Potssium	K -Sedmt	950 *	mg/kg-dr
Barium	Ba-Sedmt	120 *	mg/kg-dr
Berylium	Be-Sedmt	0.28P*	mg/kg-dr
Cadmium	Cd-Sedmt	2.18N*	mg/kg-dr
Chromium	Cr-Sedmt	36.9 *	mg/kg-dr
Cobalt	Co-Sedmt	44.9 *	mg/kg-dr
Copper	Cu-Sedmt	15.4 *	mg/kg-dr
Lead	Pb-Sedmt	202 *	mg/kg-dr
Mangnese	Mn-Sedmt	344 *	mg/kg-dr
Nickel	Ni-Sedmt	59.3 *	mg/kg-dr
Silver	Ag-Sedmt	0.31P*	mg/kg-dr
Vanadium	V -Sedmt	17.7 *	mg/kg-dr
Zinc	Zn-Sedmt	146 *	mg/kg-dr
Antimony	Sb-Sedmt	3.2PN*	mg/kg-dr
Aluminum	Al-Sedmt	5720 *	mg/kg-dr
Iron	Fe-Sedmt	10800 *	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294426 Description: SS07 Source: Soil (General)

Begin Date: 93/07/13 11:50

Gen Inorg/Phys-Speci		Sediment Result	Units
Cyanide	Sedmt	2.0U	mg/kg-dr

Metals - Specified		Sediment Result	Units
Selenium	Se-Sedmt	2.42N*	mg/kg-dr
Thallium	Tl-Sedmt	0.34P*	mg/kg-dr
Mercury	Hg-Sedmt	0.87N*	mg/kg-wt

Metals - ICP Scan		Sediment Result		Units
Calcium	Ca-Sedmt	6860	*	mg/kg-dr
Mgnsium	Mg-Sedmt	3830	*	mg/kg-dr
Sodium	Na-Sedmt	138	*	mg/kg-dr
Potssium	K -Sedmt	1240	*	mg/kg-dr
Arsenic	As-Sedmt	126	*	mg/kg-dr
Barium	Ba-Sedmt	146	*	mg/kg-dr
Berylium	Be-Sedmt	0.32P	*	mg/kg-dr
Cadmium	Cd-Sedmt	20.5N	*	mg/kg-dr
Chromium	Cr-Sedmt	25.8	*	mg/kg-dr
Cobalt	Co-Sedmt	20.4	*	mg/kg-dr
Copper	Cu-Sedmt	991	*	mg/kg-dr
Lead	Pb-Sedmt	37100	*	mg/kg-dr
Mangnese	Mn-Sedmt	820	*	mg/kg-dr
Nickel	Ni-Sedmt	21.6	*	mg/kg-dr
Silver	Ag-Sedmt	90.4	*	mg/kg-dr
Vanadium	V -Sedmt	23.8	*	mg/kg-dr
Zinc	Zn-Sedmt	1120	*	mg/kg-dr
Antimony	Sb-Sedmt	46.0N	*	mg/kg-dr
Aluminum	Al-Sedmt	8300	*	mg/kg-dr
Iron	Fe-Sedmt	31500	*	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Laboratory: EPA, Manchester

Sample No: 93 294427 Description: ER01 Source: Water (General)

Begin Date: 93/07/13 10:10

Gen Inorg/Phys-Speci		Water-Total Result	Units
Cyanide	Total	0.010U	mg/l

Metals - Specified		Water-Total Result	Units
Arsenic	As-Total	0.15U	ug/l
Thallium	Tl-Total	0.25U	ug/l
Selenium	Se-Total	0.20UN	ug/l
Mercury	Hg-Total	0.02UN	ug/l

Metals - ICP Scan		Water-Total Result	Units
Calcium	Ca-Sedmt	23.6B*	mg/kg-dr
Mgnsium	Mg-Sedmt	35.8B*	mg/kg-dr
Sodium	Na-Sedmt	8.82 *	mg/kg-dr
Potssium	K -Sedmt	40.U	mg/kg-dr
Barium	Ba-Sedmt	0.10U	mg/kg-dr
Berylium	Be-Sedmt	0.10U	mg/kg-dr
Cadmium	Cd-Sedmt	0.20UN	mg/kg-dr
Chromium	Cr-Sedmt	0.40U	mg/kg-dr
Cobalt	Co-Sedmt	0.60U	mg/kg-dr
Copper	Cu-Sedmt	0.24P*	mg/kg-dr
Lead	Pb-Sedmt	3.0U	mg/kg-dr
Mangnese	Mn-Sedmt	0.18P*	mg/kg-dr
Nickel	Ni-Sedmt	1.0U	mg/kg-dr
Silver	Ag-Sedmt	0.30U	mg/kg-dr
Vanadium	V -Sedmt	0.40U	mg/kg-dr
Zinc	Zn-Sedmt	14.7B*	mg/kg-dr
Antimony	Sb-Sedmt	2.5UN	mg/kg-dr
Aluminum	Al-Sedmt	14.3B*	mg/kg-dr
Iron	Fe-Sedmt	6.77B*	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Blank ID: BK3202A

Gen Inorg/Phys-Speci		Water-Total	
Blank #1		Result	Units
Cyanide	Total	0.010U	mg/l

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DME Account: FA10PUZZ

Blank ID: BK3203A

Gen Inorg/Phys-Speci		Water-Total	
Blank #2		Result	Units
Cyanide	Total	0.010U	mg/l

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Blank ID: S930720A

Metals - Blank #1	Specified	Sediment Result	Units
Arsenic	As-Sedmt	0.15U	mg/kg-dr
Selenium	Se-Sedmt	0.20U	mg/kg-dr
Thallium	Tl-Sedmt	0.25U	mg/kg-dr

Metals - Blank #1	ICP Scan	Sediment Result	Units
Calcium	Ca-Sedmt	5.88 *	mg/kg-dr
Mgnsium	Mg-Sedmt	13.0P*	mg/kg-dr
Sodium	Na-Sedmt	1.5U	mg/kg-dr
Potssium	K -Sedmt	40.U	mg/kg-dr
Barium	Ba-Sedmt	0.10U	mg/kg-dr
Berylium	Be-Sedmt	0.10U	mg/kg-dr
Cadmium	Cd-Sedmt	0.20U	mg/kg-dr
Chromium	Cr-Sedmt	0.40U	mg/kg-dr
Cobalt	Co-Sedmt	0.60U	mg/kg-dr
Copper	Cu-Sedmt	0.20U	mg/kg-dr
Lead	Pb-Sedmt	3.0U	mg/kg-dr
Mangnese	Mn-Sedmt	0.10U	mg/kg-dr
Nickel	Ni-Sedmt	1.0U	mg/kg-dr
Silver	Ag-Sedmt	0.30U	mg/kg-dr
Vanadium	V -Sedmt	0.40U	mg/kg-dr
Zinc	Zn-Sedmt	6.04 *	mg/kg-dr
Antimony	Sb-Sedmt	2.5U	mg/kg-dr
Aluminum	Al-Sedmt	4.7P*	mg/kg-dr
Iron	Fe-Sedmt	1.4P*	mg/kg-dr

(Sample Complete)

Project: TEC-597A LEROI COMPANY SMELTER Officer: DMB Account: FA10PUZZ

Blank ID: S930803A

Metals - Specified Blank #1		Sediment Result	Units
Mercury	Hg-Sedmt	0.02U	mg/kg-wt

(Sample Complete)

LeRoi Sf 2.1

WORKSHEET 1
SUMMARY SCORE SHEET

Site Name: LeRoi Smelter

Site Location: (City, County, or Section/Township/Range)

117 Park Road T39N R40E S4
Northport Washington 99157

Site Description: (Include management areas, compounds of concern, and quantities)

The 32 acre site is a former smelter site (copper, gold and lead) in northeastern Washington, that was active from the 1890's until 1909 and 1914 until 1921. Sometime between 1953 and 1969, a lumber mill started operation at the site, that continues today. One smoke stack still remains intact along with the smelter buildings foundations. Soil sampling conducted by URS in 1993 identified the following metals above Method A clean up levels for soil: Arsenic, Cadmium, and Lead. The site is not paved.

Special Considerations: (Include limitations in site file data, data which cannot be accommodated in the model, but which are important in evaluating the risk associated with the site)

The sampling identified cadmium and lead exceeding cleanup levels for the background samples. This may be a result of the historical emissions during operations or emissions from the smelter located in Trail, B.C., approximately 20 miles to the north.

The site inspection identified a 500 gallon UST and staining in the area where equipment had been serviced. There is no known discharge from the tank and this was not considered in the scoring, however further sampling may be warranted.

ROUTE SCORES:

Ground Water/Human:	26.3	Overall Rank:	1
Surface Water/Human:	25.4 ~~12.5~~		
Air/Human:	10.9		
Air/Environmental:	31.4		
Surface Water/Environmental:	63.6 ~~31.8~~		

WORKSHEET 2
ROUTE DOCUMENTATION

1. SURFACE WATER ROUTE

List those substances to be considered for scoring: Source: 1,2

Lead, Cadmium, and Arsenic

Explain basis for choice of substances to be used in scoring.

Surface soil samples contained above metals in concentrations exceeding MTCA clean up levels for both soil and industrial soil.

List management units to be considered in scoring: Source: 1,2,3

Contaminated surface soils

Explain basis for choice of unit used in scoring.

Contaminated soil is expected to cover the entire site based on the sample results presented in the Site Inspection Report prepared by URS Consultants. The constituents were found in the surface soils in concentrations exceeding the MTCA clean up levels for both soils and industrial soils. The area is not paved and has numerous non-vegetated areas.

2. AIR ROUTE

List those substances to be considered for scoring: Source: 1,2

Lead, Cadmium, and Arsenic

Explain basis for choice of substances to be used in scoring.

All three constituents were found in the surface soils in concentrations exceeding the MTCA clean up levels for both soils and industrial soils. The area is not paved and has numerous non-vegetated areas.

List management units to be considered in scoring: Source: 1,2,3

Contaminated Soils

Explain basis for choice of unit used in scoring.

Site soils are unpaved, with metal concentrations exceeding Method A values.

3. GROUND WATER ROUTE

List those substances to be considered for scoring: Source: 1,2

Lead, Cadmium, and Arsenic

Explain basis for choice of substances to be used in scoring.

Surface soil samples contained above metals in concentrations exceeding MTCA clean up levels for both soil and industrial soil.

List management units to be considered in scoring: Source: 1,2,3

Contaminated Soils

Explain basis for choice of unit used in scoring.

Contaminated soil is expected to cover the entire site based on the sample results presented in the Site Inspection Report prepared by URS Consultants.

WORKSHEET 4
SURFACE WATER ROUTE

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human Toxicity

Substance	Drinking Water Std.		Chronic Toxicity		Acute Toxicity		Carcinogenicity Potency		
	(μg/l)	Value	mg/kg/day	Value	mg/kg-bw	Value	WOE	Factor	Value
1. Arsenic		6		5		5			7
2. Cadmium		8		5		5			ND
3. Lead		8		ND		ND			ND

Source: 1, 2, 4
Highest Value: 8
+2 Bonus Points?: 2
Value: 10

1.2 Environmental Toxicity Based on Fresh Water Source: 1, 2, 4 Value: 8

Substance	Acute Criteria (μg/l)	Value	Non-human mammalian acute toxicity (mg/kg)	Value
Arsenic		4		4
Cadmium		8		8
Lead		6		6

1.3 Substance Quantity 32 Acres Source: 1, 2, 11 Value: 10

Explain basis: Sampling indicates surface soils over entire site are contaminated.

2.0 MIGRATION POTENTIAL

2.1 Containment Contaminated soils Source: 13 Value: ~~4~~ 10 mjd

Explain basis: with ~~ineffective~~ no run-off controls

2.2 Surface Soil Permeability: clayey gravels Source: 6 Value: 5

2.3 Total Annual Precipitation: 19.2 inches Source: 7 Value: 2

2.4 Maximum 2-Year 24-Hr Precipitation: 1.2 inches Source: 5 Value: 2

2.5 Flood Plain: No Source: 8 Value: 0

2.6 Terrain Slope: 30 % Source: 8 Value: 5

3.0 TARGETS

3.1 Distance to Surface Water: 100 feet — Source: 8 Value: 10

3.2 Population Served within 2 miles: 0 — Source: 10 Value: 0

3.3 Area Irrigated by Sources within 2 miles: $0.75\sqrt{3} = 1$ — Source: 10 Value: 1

3.4 Distance to Fishery Resource: 100 feet -Columbia River — Source: 8 Value: 12

3.5 Distance to Sensitive Environment 100 feet — Source: 8 Value: 12

List: Columbia River

4.0 RELEASE

Source: - Value: 0

Explain basis: None documented

WORKSHEET 5
AIR ROUTE

1.0 SUBSTANCE CHARACTERISTICS

1.1 Introduction - please review before scoring

1.2 Human Toxicity

Substance	Air Std.		Chronic Toxicity		Acute Toxicity		Carcinogenicity Potency		
	($\mu g/m^3$)	Value	mg/kg/day	Value	mg/m^3	Value	WOE	Factor	Value
Arsenic	0.00023	10	-	ND	-	ND	A	50	9
Lead	0.5	10	-	ND	-	ND	B2	-	ND
Cadmium	0.00056	10	-	ND	25	10	B1	6.1	6

Source: 1,2,4
Highest Value: 10
+2 Bonus Points?: +2
Value: 12

1.3 Mobility

1.3.1 Gaseous Mobility Not selected because non-volatile substances Source:
Vapor Pressure:_
Value:_

1.3.2 Particulate Mobility Source: 6,5
Soil Type: sandy loam
Erodibility: 86 tons/acre/yr
Climatic Factor: 1-10
Particulate Mobility Potential Value: 1

1.4 Final Human Health Toxicity/Mobility Matrix: Value: 6

1.5 Environmental Toxicity Source: Value:

Substance	Non-human mammalian acute toxicity (mg/kg)	Value	Mobility (Particulate)	Value
Arsenic	-	ND	1	ND
Lead	-	ND	1	ND
Cadmium	25	10	1	5

Environmental Toxicity Mobility Matrix Source: 1,2,4 Value: 5

1.6 Substance Quantity Source: 1,2,3 Value: 8

Explain basis: Based on a 32 acre site = 1,394,000 square feet

2.0 MIGRATION POTENTIAL

2.1 Containment — Source: 1,2,3 Value: 10

Explain basis: There is no cover with metal contamination in surface soils (particulates - no cover).

3.0 TARGETS

3.1 Nearest Population: 200 feet — Source: 1,2,3,11 Value: 10

3.2 Nearest Sensitive Environment: adjacent — Source: 1,2,3,11 Value: 7
List: City park adjacent

3.3 Population within 1/2 mile: 281 — Source: 1,2 Value: 17

4.0 RELEASE

Explain basis: No known ongoing releases; however during dry periods fugitive dust could be released from vehicular traffic. Source: 3 Value: 0

WORKSHEET 6
GROUND WATER ROUTE

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human Toxicity

Substance	Drinking Water Std.		Chronic Toxicity		Acute Toxicity		Carcinogenicity Potency		
	(μg/l)	Value	mg/kg/day	Value	mg/kg-bw	Value	WOE	Factor	Value
Arsenic	50	6	0.001	5	763	5	A	1.75	7
Lead	5	8	-	ND	-	ND	B2	-	ND
Cadmium	5	8	0.0005	5	225	5	B1	-	ND

Source: 4,1,2
Highest Value: 8
+2 Bonus Points?: +2
Value: 10

1.2 Mobility (Use numbers to refer to above listed substances)
Cations/Anions: #1=3; #2=2; #3=3 Source: 5 Value: 3
OR
Solubility (mg/l): _____

1.3 Substance Quantity Source: 1,2,11 Value: 7

Explain basis: 32 acres at 3' depth = 154,880 cubic yards

2.0 MIGRATION POTENTIAL

2.1 Containment Source: 5 Value: 10
Explain basis: Contaminated soils

2.2 Net Precipitation: 8.5 Source: 7,11 Value: 1

2.3 Subsurface Hydraulic Conductivity: 10^{-3} to 10^{-5} Source: 12,1,2,11 Value: 3

2.4 Vertical Depth to Ground Water: 75 feet Source: 1,2 Value: 4

3.0 TARGETS

3.1 Ground Water Usage: public supply - no alternative source Source: 1,2 Value: 9

3.2 Distance to Nearest Drinking Water Well: on-site Source: 1,2,11 Value: 5

3.3 Population Served within 2 miles: 415 Source: 1,2,11 Value: 20

3.4 Area Irrigated by Wells within 2 miles: 0 Source: 1,2 Value: 0

4.0 RELEASE

Source: 1,2 Value: 0

Explain basis: No release documented

REFERENCES

1. URS Consultants, Inc. October 1993. Site Inspection Report for LeRoi Company Smelter.

2. URS Consultants, Inc. April 1993. Preliminary Assessment Report for LeRoi Company Smelter.

3. Tousley, Gerald. Science Applications International Corp. (SAIC). Site inspection on April 19, 1995.

4. Washington Department of Ecology. January 1992. Toxicology Database for Use in Washington Ranking Method Scoring. Publication No. 92-37.

5. Washington Department of Ecology. 1990. Washington Ranking Method Scoring Manual. April 1992. Publication No. 90-14.

6. Stevens County Soil Survey.

7. Washington State Cooperative Extension Service. 1968. Washington Climate for Stevens County.

8. U.S. Geological Survey. Photorevised 1982. Northport Quadrangle Washington - Stevens Co. 7.5 Minute Series (Topographic).

9. U.S. Geological Survey. Photorevised 1982. Boundary Quadrangle Washington - Stevens Co. 7.5 Minute Series (Topographic).

10. Water Rights Information System (WRIS) Database. 1995. Washington Department of Ecology.

11. Site Hazard Assessment Data Collection Summary Sheets for Washington Ranking Method for LeRoi Smelter.

12. Freeze, R.A. and J.A. Cherry. 1979. Groundwater. Prentice-Hall, Inc. New Jersey.

13. Carter, Patti, Department of Ecology. 1995. Personal communication with Nancy Winters (SAIC) via telephone June 29, 1995.

Table 1. **Age: 1990**—Con.

[For definitions of terms and meanings of symbols, see text]

State County County Subdivision Place	All persons	Age												
		Under 5 years	16 years and over	18 years and over	18 to 20 years	21 to 24 years	25 to 44 years	45 to 54 years	55 to 59 years	60 to 64 years	65 years and over	75 years and over	85 years and over	Median age
Spokane County—Con.														
Rockford division	3 112	182	2 351	2 177	131	87	839	320	131	147	522	234	72	35.0
Fairfield town	446	32	336	330	8	12	119	70	23	19	79	41	9	39.4
Latah town	175	13	119	112	2	2	49	10	9	9	31	9	3	35.5
Rockford town	481	30	337	318	20	14	145	41	8	20	70	27	8	31.5
Spangle city	229	13	181	172	11	4	71	26	11	13	36	20	5	34.9
Waverly town	37	4	28	27	1	1	9	1	6	3	6	3	1	37.5
Spokane division	286 784	21 190	220 762	213 339	13 161	16 316	91 859	27 120	11 423	11 777	41 683	18 812	4 744	33.5
Country Homes CDP	5 126	307	4 160	4 041	729	470	1 241	497	244	241	619	273	72	29.7
Dishman CDP	9 671	684	7 629	7 401	388	545	3 083	933	417	449	1 586	675	143	34.5
Fairwood CDP	5 807	306	4 270	4 006	230	163	1 706	876	276	238	517	180	36	36.6
Green Acres CDP	4 626	357	3 350	3 218	153	203	1 520	449	177	200	516	195	32	32.2
Millwood town	1 559	87	1 245	1 211	45	90	501	158	72	67	278	117	30	36.8
Opportunity CDP	22 326	1 557	17 023	16 364	948	1 090	6 895	2 438	1 018	970	3 005	1 256	321	34.1
Spokane city (pt.)	175 588	13 300	136 654	132 537	8 269	11 047	56 518	14 817	6 506	7 103	28 277	13 428	3 516	33.3
Town and Country CDP	4 921	308	3 861	3 705	198	199	1 335	681	302	306	684	224	47	37.9
Trentwood CDP	4 060	390	2 852	2 713	158	206	1 505	367	139	92	246	78	10	29.2
Veradale CDP	7 836	658	5 535	5 268	294	297	2 707	832	282	252	604	195	25	31.5
Turnbull division	1 871	96	1 429	1 365	69	68	639	247	80	85	177	52	15	35.5
Cheney city (pt.)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Valleyford division	2 092	130	1 519	1 441	69	59	655	317	82	87	172	49	9	35.4
Stevens County	30 948	2 271	22 262	21 191	936	955	9 292	3 545	1 335	1 273	3 855	1 657	382	34.5
Chewelah division	4 473	309	3 256	3 108	121	146	1 233	481	191	163	773	406	99	35.5
Chewelah city	1 945	132	1 458	1 402	47	66	482	186	87	65	469	286	76	37.5
Columbia division	1 128	73	828	799	25	31	338	153	52	59	141	62	14	36.7
Colville division	9 345	684	6 807	6 494	257	323	2 831	1 045	378	382	1 278	618	170	34.6
Colville city	4 360	337	3 259	3 128	133	171	1 271	445	148	169	791	433	118	34.8
Kettle Falls division	5 631	430	4 040	3 847	188	159	1 663	640	262	243	692	260	37	34.7
Kettle Falls city	1 272	128	888	842	56	56	370	103	42	50	165	76	15	30.3
Marcus town	135	11	98	98	4	6	37	12	7	9	23	10	1	35.8
Northport town	308	13	225	210	14	5	80	37	12	16	46	28	3	34.2
Loon Lake division	5 556	360	3 940	3 716	169	134	1 820	689	223	211	470	152	27	34.6
Spokane Reservation division	1 502	184	979	923	74	75	435	135	58	44	102	41	15	26.0
Springdale division	3 313	231	2 412	2 304	102	87	972	402	171	171	399	118	20	35.3
Springdale town	260	20	178	170	4	6	82	29	17	6	26	13	1	31.7
Thurston County	161 238	11 439	122 399	117 794	6 886	8 087	54 125	17 445	6 292	6 125	18 834	7 835	1 816	33.7
Olympia division	106 569	7 324	82 332	79 533	4 913	5 939	35 550	11 377	4 136	3 978	13 640	6 078	1 513	34.1
Lacey city	19 279	1 421	14 871	14 335	911	1 154	6 025	1 857	648	689	3 051	1 682	484	33.5
Olympia city	33 840	2 162	26 980	26 187	1 353	2 170	11 675	3 497	1 300	1 269	4 923	2 263	587	35.0
Tanglewilde-Thompson Place CDP	6 061	535	4 295	4 127	281	345	1 977	658	254	193	419	131	21	29.6
Tumwater city (pt.)	9 976	692	7 795	7 533	409	572	3 281	984	365	373	1 549	828	223	34.9
Olympia East division	18 662	1 580	13 299	12 684	641	762	6 633	1 896	599	597	1 556	525	81	31.2
Nisqually Indian Community CDP	558	51	352	323	24	19	188	48	15	18	11	2	–	25.1
North Yelm CDP	2 075	169	1 545	1 487	50	119	596	223	78	108	313	110	15	33.6
Yelm town	1 337	124	900	847	66	52	435	96	36	41	121	52	15	28.3
Olympia West division	15 003	1 041	11 232	10 836	484	536	5 272	1 713	633	640	1 558	506	67	34.9
Tumwater city (pt.)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Thurston South division	21 004	1 494	15 536	14 741	848	850	6 670	2 459	924	910	2 080	726	155	33.2
Bucoda town	536	43	374	363	23	21	173	41	19	25	61	29	9	31.0
Grand Mound CDP	1 394	111	1 023	980	59	82	453	154	57	42	133	33	6	31.2
Rainier town	991	88	677	640	51	44	327	75	29	43	71	22	7	27.9
Rochester CDP	1 250	97	893	853	44	56	402	144	53	54	100	25	1	31.9
Tenino town	1 292	111	949	912	49	67	380	127	64	54	171	87	25	31.7
Wahkiakum County	3 327	200	2 592	2 503	109	99	897	397	162	191	648	272	67	40.2
Cathlamet-Elochoman division	1 181	68	963	930	41	46	292	141	65	73	272	131	44	42.8
Cathlamet town	508	31	415	401	26	25	118	55	26	18	133	75	26	41.9
Grays River division	997	65	752	723	33	24	284	119	48	48	167	58	5	37.4
Puget Island division	734	51	560	547	23	19	199	82	34	47	143	54	13	39.6
Skamokawa division	415	16	317	303	12	10	122	55	15	23	66	29	5	40.5
Walla Walla County	48 439	3 298	37 637	36 419	3 096	3 056	14 080	4 535	1 956	2 082	7 614	3 554	968	33.5
Burbank division	3 115	250	2 209	2 099	117	96	1 017	355	131	132	251	82	13	32.0
Burbank CDP	1 745	124	1 239	1 180	63	64	572	184	87	74	136	47	6	31.9
Eureka Flat division	697	59	510	485	28	42	201	70	29	39	76	28	6	31.7
Prescott town	267	20	203	194	8	15	72	23	11	19	46	17	3	33.7
Touchet division	1 467	117	1 107	1 057	53	49	455	159	67	89	185	67	11	35.2
Waitsburg division	2 469	154	1 849	1 782	58	78	719	288	126	148	365	142	24	37.2
Waitsburg city	990	67	736	713	20	28	255	110	51	67	182	76	7	38.8
Walla Walla-College Place division	40 691	2 718	31 962	30 996	2 840	2 791	11 688	3 663	1 603	1 674	6 737	3 235	914	33.4
College Place city	6 308	392	5 144	5 025	768	758	1 575	455	218	242	1 009	509	137	28.4
Garrett CDP	1 004	65	779	758	29	36	279	134	44	49	187	89	15	38.9
Walla Walla city	26 478	1 786	20 824	20 207	1 765	1 748	7 970	2 222	980	1 013	4 509	2 226	666	33.3
Walla Walla East CDP	2 959	207	2 249	2 180	86	71	811	357	162	170	523	216	62	38.9

Ferry, Pend Oreille, Stevens

LeRoi Smelter

LeRoi St 2.1

STATION LOCATIONS

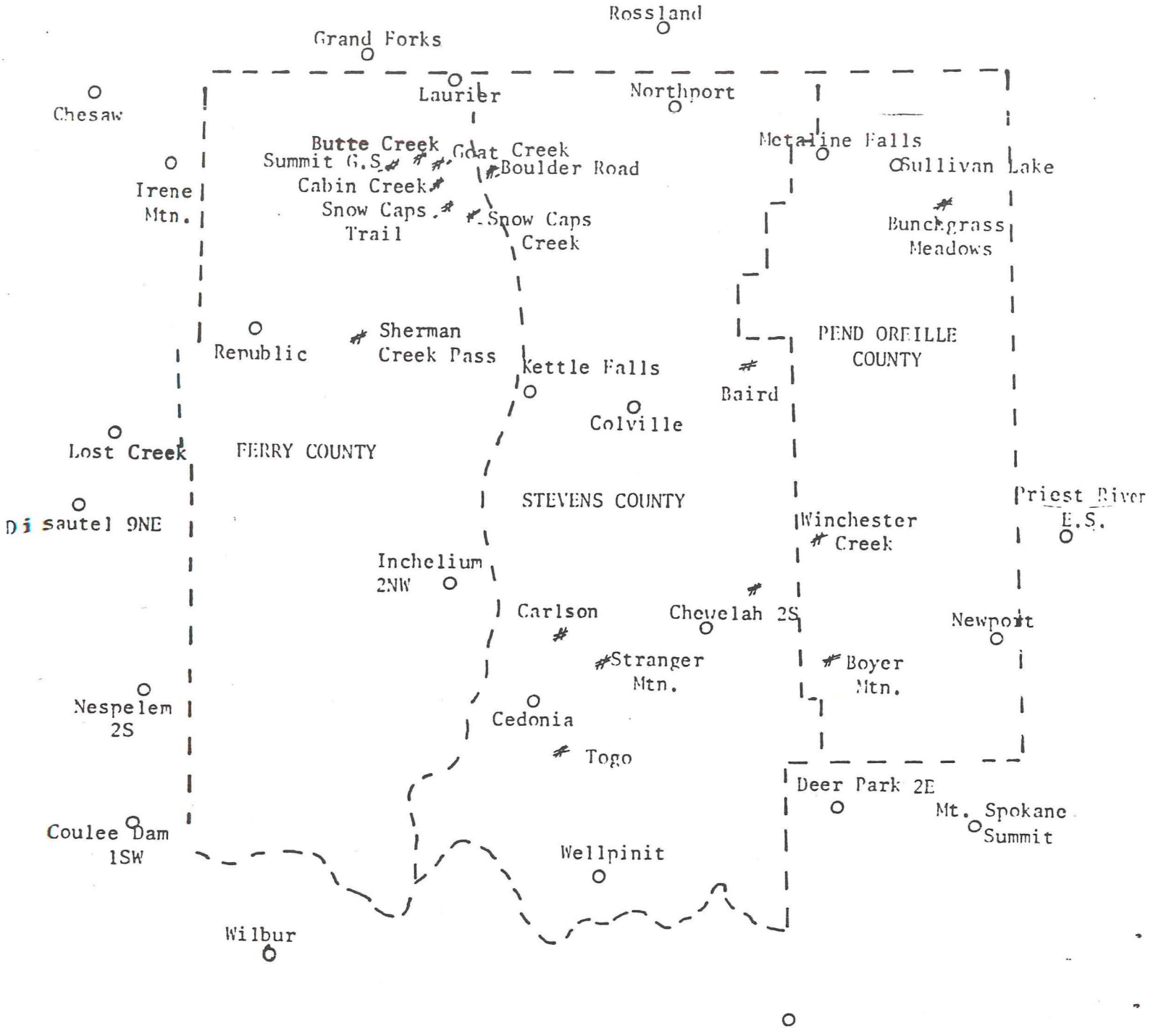


TABLE 29 - ESTIMATED EVAPOTRANSPIRATION
(Inches of Water)

	J	F	M	A	M	J	J	A	S	O	N	D	ANNUAL
FERRY COUNTY						Laurier							
Precip	2.0	1.4	1.3	1.4	1.5	2.3	1.0	.9	1.1	1.8	2.0	2.4	19.1
PET			.4	1.8	3.4	4.3	5.6	4.8	3.0	1.5	.2		25.0
Ea(6)			.4	1.8	3.1	3.5	2.5	1.5	1.3	1.5	.2		15.8
						Nespelem 2S							
Precip	1.5	1.0	1.0	1.1	1.1	1.6	.5	.5	.7	1.2	1.5	1.6	13.3
PET			.6	1.7	3.2	4.2	5.5	4.8	3.1	1.6	.2		24.9
Ea(6)			.6	1.7	2.7	2.9	1.9	1.1	.9	1.2	.2		13.2
						Republic							
Precip	1.8	1.1	1.1	1.1	1.5	1.7	.8	.8	.8	1.3	1.4	1.7	15.1
PET			.3	1.6	3.0	3.9	4.9	4.3	2.8	1.4			22.2
Ea(6)			.3	1.6	2.8	3.0	2.3	1.4	1.0	1.3			13.7
STEVENS COUNTY						Chewelah 2S							
Precip	2.4	1.8	1.7	1.2	1.4	1.7	.6	.5	1.1	1.9	2.3	2.9	19.5
PET			.7	1.8	3.2	4.0	5.2	4.3	2.9	1.4	.2		23.7
Ea(6)			.7	1.8	2.8	3.0	2.1	1.1	1.3	1.4	.2		14.4
						Colville AP							
Precip	2.1	1.6	1.3	1.1	1.4	1.7	.7	.8	.9	1.7	2.0	2.2	17.5
PET			.6	1.9	3.3	4.2	5.3	4.6	2.9	1.5	.1		24.4
Ea(6)			.6	1.9	2.8	3.0	2.1	1.3	1.1	1.5	.1		14.4
						Deer Park 2E							
Precip	2.8	2.1	1.9	1.5	1.4	1.6	.5	.5	1.2	2.3	2.6	3.5	21.9
PET			.4	1.7	3.1	4.0	5.0	4.4	2.8	1.4	.2		23.0
Ea(6)			.4	1.7	2.9	3.1	2.0	1.1	1.4	1.4	.2		14.2
						Northport							
Precip	2.1	1.5	1.4	1.3	1.5	2.2	.9	.8	1.1	2.1	1.9	2.4	19.2
PET			.6	1.9	3.5	4.5	5.6	4.8	3.0	1.5	.2		25.6
Ea(6)			.6	1.9	3.1	3.4	2.3	1.4	1.3	1.5	.2		15.7
PEND OREILLE COUNTY						Metaline Falls							
Precip	2.7	2.5	2.0	1.5	2.1	2.8	1.4	1.2	1.6	3.5	3.0	3.3	27.6
PET			.4	1.7	3.1	4.0	5.1	4.5	2.9	1.4	.1		23.2
EA(6)			.4	1.7	3.0	3.7	3.3	2.1	1.8	1.4	.1		17.5
						Newport							
Precip	3.4	2.5	2.5	1.7	1.8	1.9	.7	.7	1.5	2.8	3.3	3.9	26.7
PET			.4	1.7	3.0	4.0	5.0	4.2	2.7	1.4	.2		22.6
Ea(6)			.4	1.7	2.9	3.4	2.5	1.4	1.7	1.4	.2		15.6

Precipitation (Precip), Potential Evapotranspiration (PET), Actual Evapotranspiration for the 6-inch waterholding capacity soil (Ea(6))