Red Devil Mine
Retort Building Demolition and Limited Site Investigation

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G Well Development and Groundwater Sampling Forms
H XRF Field Screening Report and Results
I Fixation Treatability Study Results

Volume 2:

J Data Quality Assessments and Analytical Data Packages
K Alaska Abatement Corporation's Hazard Abatement Closeout Submittal
L Survey Report

DISTRIBUTION

ABBREVIATIONS

µg/L	Micrograms per liter
AAC	Alaska Administrative Code
ACM	Asbestos-containing material
ADCED	Alaska Department of Community and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ARL	Anchorage Regional Landfill
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
bgs	Below ground surface
BLM	Bureau of Land Management
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cPAH	Carcinogenic polynuclear aromatic hydrocarbons
CT&E	CT&E Environmental Services, Inc.
DOT	U.S. Department of Transportation
DQA	Data quality assessment
DRO	Diesel-range organics
EHS	EHS-Alaska, Inc.
EPA	U.S. Environmental Protection Agency
GRO	Gasoline-range organics
HLA/Wilder	Harding Lawson Associates/Wilder Construction Company Joint Venture
IATL	International Asbestos Testing Laboratories
IDW	Investigation-derived waste
LDR	Land Disposal Regulations
MCL	Maximum contaminant level
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
NESHAPS	National Emissions Standards for Hazardous Air Pollution
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated biphenyl
PID	Photoionization detector
PLM	Polarized light microscopy
PPE	Personal protective equipment
ppm	Parts per million
PVC	Polyvinyl chloride
QAPP	Quality Assurance Program Plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RFW	Roy F. Weston, Inc.
RRO	Residual-range organics
SOW	Scope of work
SHP	Safety and Health Plan
SRL	Sample reporting limit
TCLP	Toxicity characteristic leaching procedure
TSI	Thermal System Insulation
TWA	Time-weighted average
UA	University of Alaska
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile organic compound
WP	Work Plan
WRCC	Western Region Climate Center
XRF	X-ray fluorescence spectrometer

1.0 INTRODUCTION

This report documents environmental demolition and investigation performed at the Red Devil Mine Site in 2000 by Harding Lawson Associates/Wilder Construction Company Joint Venture (HLA/Wilder) under contract to the Bureau of Land Management (BLM).

This report is organized as follows:

- Section 1 presents the Scope of Work and background information.
- Section 2 describes the field activities conducted during the project.
- Section 3 identifies applicable regulatory climate and criteria.
- Section 4 describes the analytical program and presents the data quality assessment.
- Section 5 presents the results of the project.
- Section 6 presents recommendations and conclusions.

The report appendixes include the following:

- Appendix A – Task Order and Modification 001
- Appendix B – Photographic Log
- Appendix C – Public Meeting Summary
- Appendix D – Waste Stream Summary, Shipping Manifests, and Disposal Certificates
- Appendix E – Sample Record Log
- Appendix F – Soil Boring Logs
- Appendix G – Well Development and Groundwater Sampling Forms
- Appendix H – XRF Field Screening Summary
- Appendix I – Fixation Treatability Study Results
- Appendix J – Data Quality Assessments and Analytical Data Packages
- Appendix K – Alaska Abatement Corporation's Hazard Abatement Closeout Submittal
- Appendix L – Survey Report

Appendixes J, K, and L are in a separate volume.

Field activities were conducted in general accordance with requirements in the following documents:

- Program safety and health plan (SHP), *Safety and Health Plan, Hazardous Materials Removal Actions, Various Locations, Alaska* (HLA/Wilder, 1997a)
- Quality assurance program plan (QAPP), *Quality Assurance Program Plan, Hazardous Materials Removal Actions, Various Locations, Alaska* (HLA/Wilder, 1997b)
- Project-specific work plan (WP), *Work Plan, Remedial Action and Additional Site Investigation, Red Devil Mine, Red Devil, Alaska* (HLA/Wilder, 2000a)
- Work Plan Addendum Letter dated July 14, 2000 (HLA/Wilder, 2000c)

1.1 Scope of Work

The Scope of Work is presented in BLM's Delivery Order 0023 and Modification 0001, which are included in Appendix A.

The work items as presented in the BLM's Delivery Order scope of work are summarized below.

Delivery Order 0023

- Item 1 – Preliminary Field Visit: Complete the preliminary field visit to assess site logistics, available equipment, personnel needs, facilities, etc.
- Item 2 – Public Meeting: Attend a public meeting in the community of Red Devil during the preliminary field visit.
- Item 3 – Asbestos and Lead-based Paint Survey: Perform an asbestos and lead-based paint survey meeting the requirements of the National Emissions Standards for Hazardous Air Pollutants (NESHAPS) for building demolition.
- Item 4 – Remove Thermal System Insulation (asbestos) from retort building: Remove 2 feet of Thermal System Insulation (TSI) asbestos from the retort building.
- Item 5 – Retort building Decontamination and Demolition: Demolish the retort building and decontaminate impacted building components. Transport offsite and dispose of hazardous wastes generated during demolition.
- Item 6 – Fuel Pipe System and Aboveground Storage Tanks Inspection and Cleaning: Collect up to 20 surface soil samples at the fuel storage and distribution system for field-screening and laboratory analyses. Recover any fuel in the system and transport offsite for recycling. Recover any water in the system and treat and dispose of onsite. Coordinate sludge disposal options with BLM.
- Item 7 – Site Characterization: Establish grid at the retort building. Drill a soil boring at each node point of the grid and collect soil samples at 0.5, 1.5, 3, and 5 feet below ground surface (bgs) for field screening onsite with an X-ray fluorescence spectrometer (XRF). Use real-time XRF data to direct depth of drilling and sample collection. Coordinate number of borings with Project Inspector (estimate is 1000 borings). Select a representative number of samples for laboratory analyses to correlate fixed-lab results with XRF field-screening results.
- Item 8 – Installation of Six Monitoring Wells: Install six groundwater monitoring wells, three on each side of Red Devil Creek. Measure depth to groundwater. Develop and sample wells and collect samples for laboratory analyses.
- Item 9 – Install Gate: This item includes installing a locking gate across the access road to the site. The gate should be resistant to vandalism and theft.
- Item 10 – Acquire Permits: Acquire any necessary permits or approvals from state or federal agencies before work.
- Item 11 – Complete Site Survey: Complete a survey of the site to locate soil borings, monitoring wells, building corners, and site topography.

Modification 0001

Modification 0001 was issued by the BLM on September 13, 2000. No other modifications were issued. Modification 0001 included the following:

- Remove, transport, and dispose of additional mercury-contaminated asbestos and slag discovered during demolition of the retort building.
- Collect one additional surface soil sample from the area where the former retort (which burned down in the mid-1950s) was located and one sample from the Red Devil Lodge potable water system for laboratory analyses.
- Install one additional groundwater monitoring well.
- Drill four soil borings to collect geotechnical data to support onsite landfill planning and design.
- Collect up to six additional soil samples at the tank farm/fuel pipeline area.

- Backfill six mine openings and three subsidence pits.
- Demolish headworks (identified as wood ore hopper in BLM's modification).
- Inspect and clean additional fuel system components located on both sides of Red Devil Creek.

1.2 Deviations from the Work Plan

Differing site conditions and field requests from BLM's project manager resulted in deviations from the Work Plan (WP) as summarized below:

Groundwater Monitoring Wells

Only five groundwater monitoring wells were successfully completed. Groundwater was not encountered in two of the seven soil borings.

Onsite Treatment of IDW Water

Investigation-derived waste (IDW) water was collected and treated onsite with a Zeolite/carbon filtration unit. Filtration of the water did not reduce concentrations of dissolved antimony, arsenic and mercury in the water to less than federal maximum contaminant levels (MCLs). IDW water was discharged back into the retort building source area by placing the water into existing troughs in the retort building foundation. Water subsequently percolated through the foundation to subgrade soils.

Fuel Storage and Distribution System

Each aboveground storage tank (AST) was ventilated to the atmosphere by cutting a hole in the inspection plate on the tank sidewall (plate was removed from tank during cutting). A passive, rotary-type vent was installed at a penetration on the top of each tank.

The six additional soil samples to be collected at the fuel storage area (Modification 0001) were not collected.

Removal, Transportation, and Disposal of Additional Mercury-contaminated Asbestos and Slag

Approximately 8 cubic yards of slag from a furnace at the retort building was stockpiled onsite adjacent to the retort building foundation (south side). The slag is stockpiled on a bottom liner and covered (liner and cover are each two layers of 6-mil polyethylene sheeting).

General Mine Area Investigation

Five surface soil samples were collected from various locations in the general mine area and submitted for laboratory analyses for metals (antimony, arsenic, lead, and mercury).

1.3 Red Devil Mine Background Information and History

The following sections summarize mine location, property ownership, historical operations, and site investigation and cleanup history.

1.3.1 Mine Site Description

Red Devil Mine is situated on the south bank of the Kuskokwim River, at the mouth of Red Devil Creek. It lies 75 air miles northeast of Aniak and 250 miles west of Anchorage. It is at approximately 61°45'N latitude and 157°18'W longitude (Sec. 6, T19N, R44W, Seward Meridian) (Figure 1). The mine occupies approximately 100 acres of BLM-owned land (Roy F. Weston [RFW], 1989). The site is defined as the area bounded on the north by the Kuskokwim River, the south by the southernmost extent of the mine, the east by the milling facilities, and the west by the westernmost extent of the main camp area (RFW, 1989). A June 1996 aerial photograph of the site is shown in Figure 2 and an August 2000 oblique photograph of the site is shown in Figure 3.

The mine site includes the remains of the following:

- A housing area with seven individual units
- Equipment storage buildings
- Laboratory
- Engine shop
- Mine portals
- Chemical storage sheds
- Power plant
- Retort building
- Headworks and conveyor
- A settling pond
- Five ASTs

Currently, the buildings are dilapidated and structurally unsound. Mining material and debris are spread across much of the site. Many of the buildings have been used as a source of construction materials by residents of Red Devil (RFW, 1989).

Red Devil Creek, which flows northeast, bisects the site. The distance from the mine area to the confluence of Red Devil Creek and the Kuskokwim River is approximately 600 feet. The creek separates the headworks and main camp area from the milling operations area. Mine tailings were used for leveling beneath many of the site buildings. The margins of several tailings features are within the creek basin and are eroded by the creek. The mineralized zone strikes east-west and is intersected by the creek. There are no permanent residences within the Red Devil Creek drainage basin (RFW, 1989).

The milling operations area on the east side of Red Devil Creek included a conveyor, retort building, chemical storage sheds, a power plant, ASTs, a gravel storage pad, and a settling pond. The bolted steel ASTs are situated along the ridge northeast of the mill. The tanks have approximate capacities of 127,000 gallons (one AST) and 85,000 gallons (four ASTs). The tanks were filled through a pipeline from the Kuskokwim riverfront. The tanks and pipelines are currently empty.

On the west side of Red Devil Creek are the remains of a warehouse, a shop building, the foundation of a former laboratory (also known as the shop pad), a hoist building, headworks, and mine portals. A housing area and the remains of several other buildings are situated atop a small bluff northwest of the mine area, overlooking the site.

1.3.2 Mine History

Red Devil Mine was established in 1921 by Hans Halverson when numerous mercury deposits were discovered in the surrounding Kilbuck-Kuskokwim Mountains. By 1933, the mine was producing substantial quantities of mercury (Alaska Department of Community and Economic Development [ADCED], 2000). Eleven flasks (76 pounds per flask) of mercury were produced between 1933 and 1940, under the ownership of New Idria-Alaska Quicksilver Mining Company (Meyer, 1985). In 1942 the Red Devil Mine property was investigated by Bureau of Mines personnel. Soil samples collected from trenches contained 2.96 to 32.0 parts per million (ppm) of mercury and 0.98 to 26.5 ppm of antimony. In June 1944, 1,096 flasks of mercury were recovered (Meyer, 1985). Poor market conditions followed, resulting in reduced mining operations at the site, and in 1946 operations were shut down.

In 1952, the DeCoursey Mountain Mining Company acquired the lease on the property. DeCoursey Mountain Mining Company, also known as DeCoursey Brewis Company and Alaska Mines and Minerals, Inc., resumed mining operations in 1952, discontinuously producing mercury until 1971. A fire destroyed the mine and mill equipment in October 1954. During the same year, a controlling interest in the lease was sold to Brewis and White. They renamed the company the DeCoursey Brewis Company (Tryck, Nyman, Hayes [TNH], 1987). These companies produced 27,800 flasks of mercury between 1956 and 1963. Known ore reserves were exhausted by 1969. At this time, the price of mercury rose to $780 per flask. The Alaska Mines and Minerals Company defined additional economic ore reserves and began open pit mining. By 1970, the Red Devil Mine was the largest mercury producer in Alaska.

The mill operated at maximum capacity until 1971 when the mine was shut down once again because of a drop in the price of mercury (Meyer, 1985).

The mine has not operated since, and was allowed to flood in 1981 (RFW, 1989). At times, the mine was one of the largest producers of mercury in the United States and produced approximately 35,000 flasks of mercury (RFW, 1989).

1.3.3 Environmental Investigation and Cleanup History

This section presents summaries of previous investigations and cleanup activities for the mine site; and brief descriptions of related studies pertinent to the site and/or vicinity.

1971 and 1979 U.S. Environmental Protection Agency (EPA) Site Inspections – The EPA conducted an inspection at the site in late 1971. Water and sediment samples were collected for arsenic and mercury analyses. Laboratory analysis showed 9,000 micrograms per liter (µg/L) of mercury in the settling pond and 3 µg/L of mercury in McCally Creek (west of the site). Another EPA study, conducted in 1979, collected water samples from five locations at the mine site. All water samples contained less than 0.3 µg/L of mercury (RFW, 1989).

1985 and 1987 Alaska Department of Environmental Conservation (ADEC) Sampling – During the fall of 1985, the ADEC sampled water from two residential wells in the area. Mercury and arsenic were not detected (TNH, 1987). The ADEC conducted another site inspection in 1987. Their report recommended that access to the mine site be restricted and that various tailings features be stabilized (RFW, 1989).

1987 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Site Inspection – In September 1987, TNH, under contract to the ADEC, submitted the *Red Devil Mine CERCLA Site Inspection Report.* Their report concluded that because of the low population in the area and the residents' awareness of the presence of mercury at the mine, "potential public health effects due to exposure to mercury and arsenic are low" (RFW, 1989).

1988 BLM Sampling – In July 1988, a BLM representative collected 10 soil and 6 water samples from the mine area. Laboratory analysis showed mercury ranging from 41 milligrams per kilogram (mg/kg) to 967 mg/kg in soils and from 0.2 µg/l to 5.5 µg/L in surface waters. (RFW, 1989).

1988 Site Inspection – In September 1988, RFW conducted a site investigation at the mine. Results are presented in RFW's June 1989 report titled *Final Report, Site Inspection, Red Devil Mine, Red Devil, Alaska* (RFW, 1989).

The investigation included collecting samples of surface water, creek sediment, and mine tailings and analyzing them for mercury, arsenic, and antimony. Selected samples were analyzed for additional metals. One residential well in the community of Red Devil was sampled. Thirty-one transformers were inventoried and analyzed for polychlorinated biphenyls (PCBs). Chemicals stored at the site were characterized and their quantities estimated. Results from the investigation showed mercury, antimony, and arsenic in the sediment and tailings. The surface-water results were similar to background samples (RFW, 1989).

Two of the transformers showed PCB concentrations above 50 ppm and were removed from the site (RFW, 1989). Bulk chemicals stored at the site were identified as copper sulfate, sodium hydroxide, and potassium carbonate.

USGS Investigations – In 1994 the U.S. Geological Survey (USGS) performed tissue sampling of freshwater fish and collected water and sediment samples in the Kuskokwim River and tributaries in the Red Devil Mine region in southwestern Alaska. The study was performed to measure the concentration of mercury in fish, stream sediment, and stream water samples in the region and evaluate impacts from mercury mines and lodes. Freshwater fish collected downstream from mercury lodges generally contained the highest mercury concentrations. However, all mercury concentrations in fish collected in the study were below 1 ppm wet weight concentration for edible fish established by the Food and Drug Administration. In addition, all concentrations of mercury in stream water samples collected in the

study area were below the 2 parts per billion drinking water maximum contaminant level (Gray, 1995). Samples were not collected in Red Devil Creek or in the immediate vicinity of the town of Red Devil.

The USGS collected samples of soil, stream sediment, surface water, and vegetation in 1994, 1996, 1998, and 1999 from the Red Devil Mine and two other abandoned mine sites in southwest Alaska to evaluate environmental hazards the mines pose to this region.

The USGS did some "speciation" analyses of the mercury detected in environmental media. Speciation was performed to determine if the mercury was present in the environment in liquid, methyl mercury, or cinnabar forms. Mercury in the environment can be converted from inorganic forms such as cinnabar (HgS), liquid mercury (Hg), or mercuric ion (Hg2+) to an organic form such as methylmercury (meHg) through aerobic and anaerobic degradation.

The organic mercuric compounds, especially methylmercury, are the most toxic forms. Cinnabar, which is highly insoluble in water and resistant to physical and chemical weathering, presents little risk to human health and the environment. Cinnabar is not easily converted to methylmercury. Liquid mercury, which can be more easily converted to methylmercury, presents a higher level of risk to human health and the environment.

The USGS measured mercury concentrations in vegetation, soil, and stream-water samples collected at the Cinnabar Creek and Red Devil Mine Sites. Total mercury concentrations in all samples collected at the mines were elevated over concentrations observed in background samples. However, the ratio of methyl mercury to total mercury was consistently higher in the background sites (Bailey et al., 1999).

In 1994, 1996, 1998, and 1999 the USGS collected soil, sediment, and water samples at the mine for speciation analyses. Preliminary review of this unpublished data suggests that in disturbed mining areas the concentration of methylmercury (meHg) in soil typically comprises less than 0.01 percent of the total mercury detected. It is interesting to note that the highest percentage of methylmercury in relation to total mercury occurred at background locations that are considered to be undisturbed or minimally impacted by mining activities.

Cinnabar is the most commonly found form of mercury at Red Devil (Bailey and Gray, 1997). The study concluded that mercury concentrations in vegetation, soil, and stream-water samples collected from Cinnabar Creek and Red Devil Mines are probably not hazardous to humans and wildlife in the region (Bailey and Gray, 1997).

1999 Limited Removal Action – In June 1999, HLA/Wilder conducted a limited waste removal action and sampling project at the site (HLA/Wilder, 1999). Wastes shipped from the site for disposal included batteries; used oil; suspected PCB-contaminated transformer oil; Stoddard solvent; grease; mercury-contaminated ash; mercury-contaminated concrete; mercury-contaminated personal protective equipment (PPE) and debris; sodium dichromate dihydrate; potassium carbonate; chemical-contaminated soil and debris; sodium hydroxide; and copper sulfate.

Surface soil, sediment, and surface water samples were collected and analyzed to characterize potentially contaminated areas including battery storage areas, transformer areas, drum areas, the retort building, chemical storage area, tailings piles, settling ponds, Red Devil Creek, and the Kuskokwim River. A summary of the 1999 work is presented in HLA/Wilder's report *Limited Waste Removal Action, Red Devil Mine, Red Devil, Alaska* (HLA/Wilder, 1999).

2000 Engineering Evaluation/Cost Analysis – At the request of the BLM, HLA/Wilder completed an engineering evaluation/cost analysis for the Red Devil Mine retort building and two former battery storage areas. Rough order-of-magnitude costs were assessed for several onsite and offsite waste disposal options (HLA/Wilder, 2000b).

1.4 Regional Setting

1.4.1 Physiographic Setting

Red Devil Mine is in the mountain-enclosed Upper Kuskokwim River Basin. Near Red Devil the Kuskokwim River cuts through the 2,000- to 4,000-foot-high Kuskokwim Mountains. The region is characterized by heavily vegetated rolling hills and the meandering Kuskokwim River. The area is generally underlain by continuous permafrost with the areas around the river being permafrost free (University of Alaska [UA], 1974). The community of Red Devil sits at approximately 200 feet above mean sea level (USGS, 1954). The highest topographic feature in the area is Barometer Mountain at 2,484 feet (BLM, 1999). Barometer Mountain is approximately 3 miles south of Red Devil Mine.

1.4.2 Climate

The Red Devil area lies in a subarctic transition climatic zone between the continental zone of interior Alaska and the maritime zone of the coastal regions. Climate data are recorded at the Aniak Airport, 75 miles west of the mine. Average monthly temperatures range from -7 degrees Fahrenheit (°F) to 65°F. Extreme temperatures can range from -70°F in January to almost 90°F in July. Annual snowfall averages 56 inches, with total mean annual precipitation of 18.8 inches of water. Mean annual evapotranspiration in Aniak is approximately 17 inches, leaving a net precipitation of just over 1 inch (Western Region Climate Center [WRCC], 2000). High winds often cause flight delays in fall and winter.

The probable maximum 2-year, 24-hour rainfall for the vicinity of Red Devil is approximately 1.5 inches (Miller, 1963).

1.4.3 Geology

The Red Devil Mine lies on the southwest flank of the Sleetmute Anticline along the Red Devil Fault Zone. The majority of the displacements are right lateral strike slip. The mineralization is hosted in the Cretaceous Kuskokwim Formation, an interbedded graywacke-mudstone-shale sequence (Cady et al., 1955). The units trend N38W with a southerly dip of 63 degrees. The Kuskokwim Formation has been intruded by intermediate to mafic dikes and sills. In general the faults parallel bedding. The latest movement along the faults in the mine area is post intrusive and mineralization. However, most of the ore shoots are either along the faults themselves, or at fault-intrusive intersections (Meyer, 1985).

The mineralization consists primarily of mercuric and antimony sulfides, cinnabar and stibnite. Sparse orpiment and realgar (arsenic sulfides) are also present (MacKevett and Berg, 1963). Mineralized veins are mostly small, discontinuous, and less than 1/2 inch wide, but veins as much as 3 feet wide and 30 feet long were also observed (MacKevett and Berg, 1963). High-grade ore contained as much as 30 percent mercury, but most ore averaged about 2 to 5 percent mercury (Webber et al., 1947; MacKevett and Berg, 1963).

The Red Devil mineralized zone covered an area about 500 feet wide and 900 feet long, which extended about 620 feet vertically (MacKevett and Berg, 1963). Workings consisted of about 9,500 feet of shafts, adits, drifts, crosscuts, and stopes (MacKevett and Berg, 1963). Numerous sloughed trenches total several hundred feet in length; most are heavily overgrown with alder and a few spruce. Several ore and tailings piles on the site lie near the small Red Devil Creek that drains the mine area. The largest tailings pile is adjacent to the creek and is about 200 feet wide and 250 feet long. Abundant placer cinnabar and lesser stibnite are visible in Red Devil Creek (Bailey and Gray, 1997).

Below the mine area, unconsolidated floodplain deposits overlie bedrock. These unconsolidated deposits of silt, sand, and gravel are typically up to 40 feet thick (RFW, 1989).

Lode and placer mining mercury deposits are fairly common within a belt 500 miles long and 200 miles wide in western Alaska. This belt extends from the Yukon River to Dillingham. Much of this belt is drained by the Kuskokwim River, which ultimately empties into Kuskokwim Bay (RFW, 1989).

Review of scientific publications suggests that permafrost is apparently absent in the mine area (MacKevett and Berg, 1963). However, while mine shafts and adits were being filled in during August 2000, a large piece of ice was observed protruding from a shaft wall at approximately 20 feet below ground surface. The shaft, which is now filled in, was identified as the Rice Shaft. It is possible this protrusion in the shaft wall was ice-rich permafrost.

1.4.4 Hydrology

Surface water bodies within 2 miles of the Red Devil Mine include the Kuskokwim River and its tributaries (Red Devil Creek, McCally Creek, Cribby Creek), oxbow lakes, and smaller unnamed creeks fed by runoff from Barometer Mountain, surrounding highlands, and ridges (BLM, 1999). The average annual flow for the Kuskokwim River below the Red Devil mine is 38,890 cubic feet per second (Wang, 1999). The Kuskokwim River is ice free from mid-June through October (ADCED, 2000).

The community of Red Devil was flooded in 1964, May 1971, May 1987, and May 1991. The highest event was the 1971 flood, caused by an ice jam. The elevation of the high water was estimated to be 212.84 feet (U.S. Army Corps of Engineers [USACE], undated). The lowest elevation of the mine site is approximately 279 feet (BLM, 1999), or approximately 66 feet above the highest recorded flood stage.

The Red Devil Creek drainage basin covers approximately 687 acres (BLM, 1999). Red Devil Creek flows northerly approximately 600 feet from the mine site to its confluence with the Kuskokwim River. No surface water uses of the creek are known (RFW, 1989). The majority of the surface water runoff in the mine and mill area and the surrounding slopes flows toward the creek. Intermittent drainage gullies have been cut into many of the tailings features in the mine and mill area. These gullies ultimately intersect the creek channel. Tailings piles, some exceeding 35 feet high, have been deposited into the creek. During periods of high water, the creek undercuts these piles and transports material downstream where it is ultimately deposited in the creek delta in the Kuskokwim River (RFW, 1989).

1.4.5 Hydrogeology

A bedrock aquifer underlies the Red Devil Mine Site. The aquifer characteristics have not been defined (RFW, 1989). The direction of groundwater flow is not known. In areas adjacent to major rivers such as the Kuskokwim groundwater parallels or subparallels the direction of surface flow (RFW, 1989). The Kuskokwim River flows to the west.

The mine has probably had little effect on groundwater (RFW, 1989). Groundwater can be considered to have been impacted by the heavy metal mineralization before any mining occurred in the area. Vadose-zone moisture and groundwater are still potentially being impacted by natural mineralization, and the tailings piles are not considered to have significantly increased this potential impact (RFW, 1989).

1.4.6 Drinking Water

There are no known wells within a 1-mile radius of the mine site. There are several wells between 1 mile and 4 miles of the site in the community of Red Devil. No well log information for these wells is known to exist (BLM, 1999).

According to the Alaska Community Database, household water is derived from individual wells or hauled from the school well. Some wells have a high iron content (ADCED, 2000).

Well information gathered from owners in the community of Red Devil indicated two water-bearing zones with unknown connectivity (Vanderpoole and Wilmarth, 1999). A surficial aquifer with water at 24 to 26 feet bgs is most commonly used and consists of silt to sand-size sediment. The flow rate from these shallow wells is reportedly low, but the wells can supply enough water for a single-family residence. The lower aquifer, in which wells are screened between 80 and 90 feet bgs, consists of clean gravels and produces enough water to supply the school and multiple families (BLM, 1999).

The information presented in Table 1-1 was obtained through BLM interviews with the local population.

Table 1-1. Wells Within 4 Miles of Site

Owner and Location[1]	Depth (feet bgs)	Population Served	Well Type
Gail Vanderpool	28	Single family	2" drive point
Richard Wilmarth	34	Single family	2" drive point
Red Devil School[2]	85	25 (estimate)	6" drilled
Paul Kinegak	~30	Single family	2" drive point

1. All listed wells are within the community of Red Devil, which is between 1- and 2.5-miles from the mine site. Well locations are at each of the private homes listed and at the school. No map coordinates are available.
2. Used by school children and local population without wells. Tested monthly by Kuspuk School District.

bgs – below ground surface

The Vanderpool well is reportedly closest to the mine site, approximately 1.25 miles northwest (TNH, 1987). There are several temporarily abandoned wells at private residences that are not used because of poor water quality or low water production. Another local well screened in the lower aquifer was temporarily abandoned because of excessively high iron content (Richard Wilmarth, 1999). Local residents who do not have a well haul water from the school well.

1.4.7 Culture and Demographics

The community of Red Devil was named after the mine. A post office was established in 1957 and a state school opened in 1958. The current population is 44 (1999 Alaska Department of Labor estimate), with Alaska natives representing 50.9 percent of the population. Unlike most villages in the area, Red Devil is a mixed population of Eskimos, Athabascans, and non-Natives. Subsistence activities are prevalent. There is one school in the community, attended by 16 students (ADCED, 2000).

During the April 1990 U.S. Census, there were 24 total housing units, and 6 of these were vacant. The official employment rate at that time was 14.3 percent with 12 jobs estimated to be in the community and 63.6 percent of all adults not in the work force. The median household income was $25,000, and 30.7 percent of residents were living below the poverty level (ADCED, 2000).

Since the closure of the mercury mine in 1971, employment opportunities have been limited. Income is supplemented by subsistence activities, BLM fire fighting, or work in the commercial fishing industry. Salmon, bear, moose, caribou, rabbit, waterfowl, and berries are harvested in season (ADCED, 2000).

The Kuskokwim River serves as a major transportation link and supply route for bulk supplies and fuel oil during the summer. In the winter, people use the frozen river for travel by snowmachine to neighboring villages. A gravel airstrip owned and operated by the State provides year-round access. Scheduled weekday service is available (ADCED, 2000).

1.4.8 Vegetation and Wildlife

Vegetation in the Kuskokwim Bay subregion is a mix of bottomland spruce-poplar forest and upland spruce-hardwood forest. White spruce, birch, and aspen typically dominate south-facing slopes. North-facing slopes and wet areas are typically dominated by black spruce (UA, 1974). There are no documented rare or sensitive plants in the area (BLM, 1999). There is the possibility of the following rare plants being found in the area: *Aphragmus eschscholtzianus*, *Thlaspi arcticum*, and *Arnica lessingii* ssp. *norbergii*, but they have never been documented in the area (BLM, 1999).

The Kuskokwim river is a major anadromous fish stream. Fish found in the Kuskokwim River near Red Devil include chinook, sockeye, coho, and chum salmon; whitefish; grayling; sheefish; Dolly Varden; and northern pike (BLM, 1999). In 2000, chinook salmon runs on the Kuskokwim River were so low that the Alaska Department of Fish and Game (ADF&G) and Federal Subsistence Board closed the chinook salmon fishery (ADF&G, 2000). Salmon are an important species for

subsistence, sport, and commercial fishing in the region.

Caribou, moose, and black and brown bear are common in the area. Moose typically spend the summer at higher elevations and winter in the lowlands. Many fur-bearing animals are found in the region, including beaver, mink, muskrat, and otter. Other representative mammals include fox, lynx, marten, and small rodent species (UA, 1974).

The upper Kuskokwim is a low density waterfowl area. Game birds include grouse and ptarmigan. Migratory birds that use the area include the olive-sided flycatcher, gray-cheeked thrush, Townsend's warbler, blackpoll warbler, and Hudsonian godwit. It is possible that the peregrine falcon uses the area. The peregrine falcon is listed by the State of Alaska as a species of special concern (BLM, 1999).

1.4.9 Wetlands

Based on U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory maps, less than 5 percent of the land within 4 miles of the site is classified as wetlands. There are no classified wetlands within the mine site; the nearest wetland is approximately 1 mile west in the McCally Creek drainage (USFWS, 1994).

2.0 DEMOLITION AND INVESTIGATION ACTIVITIES

Planning and field activities to complete this scope of work (SOW) were performed from January through October 2000 and are addressed in the following sections. Photographs taken throughout the duration of field activities are presented in the photographic log in Appendix B.

2.1 Contaminant Source Areas

The demolition and investigation activities completed under this SOW encompassed a large area at the Red Devil Mine. To more clearly describe work performed, address screening criteria, present results and conclusions, and make recommendations, the mine been divided into three separate contaminant source areas: the General Mine Area, Retort Building Area, and Fuel Storage Area. The extent of the source areas is largely defined by the mining activities performed and the types, concentrations, and extents of contaminants detected. The approximate extent of each of the source areas is shown in Figure 5. The source areas are described in detail below.

General Mine Area

The General Mine Area includes all portions of the mine except for the Retort Building Area and Fuel Storage Area. The General Mine Area includes facilities associated with daily mining operations such as the mess hall/bunkhouse, powder house, storage sheds, shop building, hoist shack, power plant, and a former retort furnace building that burned down in the 1950s. This building was reportedly located approximately 125 to 150 feet northeast of the Shop Building.

Concentrations of metals (antimony, arsenic, and mercury) observed in soil in this area are elevated above concentrations observed in background soil samples, but several orders –of magnitude less than the highest concentrations observed in soils at the Retort Building Area.

Retort Building Area

This area consists of a relatively flat bench of approximately 40,000 square feet excavated on a tailings pile. The area is bounded on the southeast and east by a steep hillside. The topography drops sharply in elevation approximately 50 feet northwest of the retort building.

Former buildings and structures in this area that were demolished during this SOW include the retort building, conveyor, ore hopper, bridge and east chemical storage building. The west chemical storage building remains standing.

Mercury and arsenic concentrations in soils in this area can be several orders of magnitude greater than concentrations observed in the General Mine Area.

Fuel Storage Area

This area encompasses the fuel storage tank farm on the ridge above the Kuskokwim River, a fuel supply line from the river to the tank farm, and lines distributing fuel from the tank farm. Soils in the Fuel Storage Area are impacted by petroleum hydrocarbons.

2.1 Project Planning

Project planning efforts consisted of preparation, review, and approval of project plans; application for and securing permits; a pre-construction site visit, and conducting a public meeting.

2.1.1 Planning Documents

The WP was submitted to the BLM on June 12, 2000. The Work Plan Addendum addressing comments from the ADEC, EPA, and additional items incorporated into the scope of work by BLM following the June 13, 2000, preliminary site visit, was submitted to BLM on July 14, 2000.

2.1.2 Notifications of Demolition and Renovation

In accordance with asbestos abatement regulations, notifications of demolition and renovation were submitted to EPA Region 10 and the Alaska

Department of Labor on June 30, 2000. On August 15, 2000, notifications were submitted to the EPA and Alaska Department of Labor, Division of Labor and Standard Safety, informing them that the asbestos abatement was complete.

A request for a temporary permit to cross Red Devil Creek at the existing ford was submitted to the ADF&G on July 10, 2000. The ADF&G issued a stream-crossing permit for the period from July 12 through August 31, 2000.

2.1.3 Pre-construction Site Visit

BLM and their contractors performed a pre-construction site visit on June 13, 2000. Managers evaluated local equipment and support services, site access routes, transportation, logistics, and staging areas.

2.1.4 Public Notice and Meeting

Representatives from the BLM provided public notice of proposed work and meetings via advertisements on local radio and in the *Tundra Drum*, a local newspaper. BLM conducted a public meeting in the town of Red Devil on June 14, 2000. Representatives from the following organizations were in attendance:

- Red Devil Traditional Council
- Calista Corporation
- The Kuskokwim Corporation
- Kuspuk School District
- HLA/Wilder

Members of the Red Devil community were also present. The BLM's meeting summary prepared for the Red Devil Mine Site Administrative Record is presented in Appendix C.

2.1.5 Asbestos and Lead Survey

An asbestos and lead survey of structures and debris areas at the mine site was performed from June 13 through 15, 2000. The surveys identified asbestos-containing material (ACM), characterized the structure waste streams for leachable lead, and provided data to identify and evaluate future disposal options. Survey procedures are described in the EHS-Alaska, Inc. (EHS) report, *Asbestos and Lead Survey Report, Various Buildings and Areas, Red Devil Mine, Red Devil, Alaska* (2000). Each of the structures and debris areas surveyed is shown in Figure 4.

2.2 Subcontractors

Subcontractors and key suppliers involved with the project are identified in Table 2-1.

Table 2-1. Subcontractor Summary

Subcontractor	Service Provided
Red Devil Lodge	Provided Meals and Lodging and transportation to the site
Lynden Air Transport	Air freight charter service for mobilization and demobilization
Lynden Transport	Truck transportation, for project mobilization and demobilization
Alaska Abatement Corporation	Asbestos abatement
EHS Alaska, Inc.	Asbestos and lead-based paint survey
Richard Wilmarth	Rental equipment for onsite transportation
Terra Surveys LLC	Land Surveying
Hageland Aviation	Local air commuter service
Inland Air	Local air commuter service
White Environmental Consultants Inc.	Air sample analysis
Philip Services Company	Waste characterization and disposal
Hughes Drilling	Soil borings and Monitoring Well Installation
Environmental Hazards Services	Laboratory analyses
CT&E Environmental Services, Inc.	Laboratory analysis
Frontier Air	Freight transportation
Alaska Energy Recovery Services	Fuel Recycling
International Asbestos Treatment Laboratories	Asbestos analyses
Metals Treatment Technology	Fixation study

2.3 Additional Mobilization and Demobilization

Project personnel mobilized to the site beginning July 19, 2000. Mobilization and demobilization of personnel and equipment occurred in multiple phases. Equipment and materials were transported to Red Devil by Hercules aircraft operated by Lynden Transport and small fixed-wing aircraft operated by Frontier Air. Personnel were transported on commercial aircraft operated by Alaska Airlines (Anchorage/Aniak route), and Hageland Aviation and Inland Air (Aniak/Red Devil route)

Before site work was begun, upgrades to the mine site access road were made to improve safety and accessibility. Brush near the edges of the road was trimmed to increase visibility, and clean fill material was placed in deep ruts and compacted. Equipment and materials were transferred between the Red Devil airstrip and the mine site with a locally rented International 500 dozer and trailer.

Mercury-impacted asbestos, soil, and slag wastes generated during the retort building demolition and fuels/liquids collected from the fuel storage and distribution system were containerized and transported from Red Devil to Anchorage on Hercules aircraft.

The field crew and equipment were demobilized by August 18, 2000.

2.4 Mercury Vapor Monitoring

Mercury vapor monitoring was performed during ACM abatement and retort building demolition activities. A Jerome 411 Mercury Vapor Analyzer was used to perform mercury vapor air monitoring during abatement activities. The Jerome 411 was calibrated and recharged daily.

Mercury vapor readings included baseline samples, breathing zone samples, and environmental samples. Results were recorded in HLA/Wilder field notebooks and in the Asbestos Daily Project Log. The Occupational Safety and Health Administration (OSHA) permissible exposure limit for mercury is 0.05 mg/m^3. Work was stopped when mercury vapor readings went above 0.5 mg/m^3, which is the protection factor for the North half-face respirator worn by craft labor workers. Work commenced after ambient air mercury vapor concentrations decreased to less than 0.5 mg/m^3.

2.5 Asbestos Abatement

ACM was abated from the retort building between July 20 and August 9, 2000. The location of the retort building is shown in Figure 4. Abated ACM was properly bagged, tagged, and placed into U.S. Department of Transportation (DOT)-approved shipping containers. The containers were transported from Red Devil to Anchorage on Hercules aircraft. The containers were then transported by truck to Anchorage Regional Landfill (ARL) for disposal.

ACM abated from the retort building included retort chamber TSI, rope packing insulation, pipe TSI, flange gaskets and valve packing and cement asbestos board.

Alaska Abatement Corporation's Hazard Abatement Closeout Submittal, which includes regulatory notifications, daily reports, air monitoring results, and waste disposal manifests, is presented in Appendix K. A summary of all wastes transported offsite, including waste description, container identification number, manifest number, shipping name and profile number is summarized in Appendix D. Shipping manifests and disposal certificates are also presented in Appendix D.

2.5.1 ACM Abatement Air Monitoring

Air monitoring was conducted in conjunction with the abatement process. Air samples were collected by Alaska Abatement Corporation and analyzed for asbestos content by White Environmental Consultants, Inc. Air samples were analyzed in accordance with the Code of Federal Regulations, Title 29, Part 1926.1101 (29 CFR 1926.1101) and National Institute of Occupational Safety and Health (NIOSH) Method 7400 "A" counting rules, Issue 2, August 15, 1994. Personal monitoring was performed on 25 percent of the work force to

determine an 8-hour time weighted average (TWA). Thirty-minute excursion sampling was conducted daily on personnel expected to receive the highest level of exposure. Personal monitoring samples were collected from the worker's breathing zone at flow rates between 1.5 and 3.5 liters per minute. Air monitoring was performed inside all regulated work areas. Air monitoring results were within approved exposure limits. ACM was wetted and removed with hand tools, properly contained and labeled, and staged for transport from the site.

2.6 Demolition of Facilities

The following sections address demolition of the retort building, the west chemical storage shed, and the headworks (Figure 4), and backfilling of mine shafts and adit.

2.6.1 Retort Building Demolition

The retort building and chemical storage sheds were demolished with a Kobelco trackhoe with thumb attachment. Elevated portions of the building were accessed by field crews via a telescopic handler equipped with a man basket.

Asbestos, mercury-impacted slag, and building debris were collected and containerized during building demolition. These materials were properly labeled, manifested, and transported for offsite disposal.

Retort building components and other miscellaneous debris generated during demolition were pressure washed in a low area of the retort building slab (trough area, on southwest end of slab) by pressure washing. Spent wash water was collected with sump pumps and discharged into a high-density polyethylene-lined holding pond. Following pressure washing, building components and debris were staged on the slab foundation. Demolition debris staged onsite consists of structural wood and steel, wood and tin sheeting, bricks, retort chamber, process piping, and miscellaneous equipment. The retort building debris pile is approximately 180 feet long by 20 feet wide, with a height of approximately 8 feet (1,067 cubic yards). Approximately 8 cubic yards of furnace slag is stockpiled on a bottom liner adjacent to the retort building foundation. The slag is securely covered.

2.6.2 Headworks

The headworks was demolished with the trackhoe. Resulting debris consists of a pile of wood and steel and is estimated at approximately 40 feet long, 20 feet wide, and 6 feet tall (175 cubic yards). Demolition material was not moved from the headworks location and debris was not sampled for waste characterization.

2.6.3 Backfilling of Mine Shafts and Adit

Under a field directive from BLM, work crews collapsed and backfilled the entrances to five mine shafts and one adit. Large rock debris was placed in the entrance of each opening. The trackhoe was used to collapse entrance walls and the material was compacted in place.

2.7 Fuel Storage and Distribution System Inspection

The ASTs and fuel distribution lines were inspected for the presence of residual fuels or fluids. The location of the fuel storage tanks and pipelines is shown in Figure 5. ASTs were inspected by removing man-way covers from the top of each tank. A small volume of water was present in each of the ASTs during inspection. The maximum volume of water measured in any AST was approximately 2 inches. The water did not exhibit a sheen or odor during inspection. Inspection plates bolted on the sides of the ASTs were removed and the water was discharged to the ground surface.

Field crews inspected former fuel piping runs from the Power Plant north to the Shop Building, Mess Hall, Warehouse, and other mine buildings on the north side of Red Devil Creek. Fuel lines that were discovered were empty and in poor condition. No significant signs of impacts attributable to fuels were observed during inspection of piping runs in this area.

Each AST was vented to the atmosphere by cutting a hole in the inspection plate located on the tank sidewall near the ground surface (inspection plates were removed from the ASTs before cutting). A passive, rotary-type vent was installed at a penetration on the top of each tank.

Approximately one 55-gallon drum of fuel was recovered from the fuel distribution lines connecting the ASTs and the fuel supply line from the Kuskokwim River to the tank farm. Fuel distribution lines from the tank farm to the retort building were observed to be broken or disconnected into several sections and in poor condition. Residual fuels were not observed in the pipe sections.

The recovered fuel was containerized in a 55-gallon bung-opening drum (total weight = 400 pounds) and transported to Alaska Energy Recovery Services in Anchorage for recycling.

2.8 Source Area Investigations

Source area investigations were performed at the retort building, fuels storage and distribution system, and in the general mine area. Field screening and confirmation samples were collected during these investigations.

Soil samples were collected at discrete surface and near-surface locations and from soil borings. Groundwater samples were collected from each of the monitoring wells installed. Sample locations are shown in Figure 5. The project sample record log presented in Appendix E summarizes all samples collected during the project including identification number, location, depth interval, associated quality control (QC) sample, date and time collected, and requested analyses.

Specific investigation activities are summarized in the following sections.

2.8.1 General Mine Area

Field crews completed the following in the general mine area:

- Drilled seven soil borings (B01 through B07)
- Completed borings B01, B03, B04, B06, and B07 as groundwater monitoring wells MW01, MW03, MW04, MW06, and MW07 (Groundwater was not encountered in borings B02 and B05.)
- Collected five surface soil samples from discrete locations near the retort building, Red Devil Creek, and the shop building
- Drilled four geotechnical soil borings, GT01 through GT04

Soil samples were field-screened and submitted for laboratory analyses.

Monitoring wells were installed following ADEC recommended practices (ADEC, 1992) with the protective monument installed in bentonite covered with gravel instead of a concrete surface seal (to minimize frost jacking). Monitoring well casings and screens were constructed of 2-inch-diameter, Schedule 40, flush joint, threaded, polyvinyl chloride (PVC). Well screens were 10 feet long with 0.010-inch screen slot size. Wells were constructed so the depth where water was first encountered was centered on the screened interval. A sand pack of clean Colorado silica sand (10/20 mesh) was placed adjacent to the entire screened interval and extended a minimum of 2 feet above the top of the screen. Bentonite chips were placed above the sand pack to the ground surface. The bentonite chips were hydrated following placement. The monitoring well installation was completed by embedding a 5-foot-long, 6-inch-diameter, steel pipe protective casing with a locking cap approximately 2 feet into the bentonite seal and over the well riser pipe. Specific well-completion details for each monitoring well installed were recorded by the field engineer. A notch was cut on the north side of the top of each PVC well casing. Casing elevation and depth to groundwater will be measured from the top of the casing at the notch. Water levels in all monitoring wells were measured with an electronic sounder.

Surface soil grab samples were collected at discrete locations with a decontaminated stainless steel trowel.

The locations of soil borings, monitoring wells, and surface soil samples are shown in Figure 5. A lithologic log for each soil boring is presented in Appendix F. Subsurface soil samples collected from the borings are summarized in the sample record log (Appendix E) and on the boring logs. Monitoring well construction details are documented on the associated soil boring log (i.e., the construction details for MW01 are shown on the log of soil boring SB01). Well development and groundwater sampling forms are presented in Appendix G.

2.8.2 Fuel Storage and Distribution System Investigation

Soil samples were collected near the ASTs and distribution pipelines to assess if petroleum hydrocarbons are present in the near surface soils.

Shallow borings (maximum depth of approximately 3 feet bgs) were completed with a hand auger near a valve on each AST, at visible joints in the fuel distribution lines, and in areas of visible surface staining. Sampling equipment was decontaminated before the collection of each sample. Soil samples were collected and field-screened with a photoionization detector (PID). Those samples exhibiting the highest field-screening results were submitted for laboratory analyses.

2.8.3 Retort Building Soil Investigation

Soil samples were collected from the general area around the Retort Building Area to estimate the extent of elevated metals concentrations. Retort building soil sample locations are shown in Figure 6.

A sampling grid of 82 node points was established around the retort building slab foundation as shown in Figure 6. A surface soil sample (0 to 0.5 foot bgs) was collected from each of the 82 node points and field-screened for mercury content with a portable X-ray fluorescence (XRF) field-screening device that was operated by BLM personnel. Field screening samples were numbered FS001 through FS082 as shown in Figure 6.

Following XRF-screening of surface soil samples, field crews drilled shallow soil borings at the node point/field-screening locations. Drilling generally progressed from those node points with relatively low metals concentrations based on the XRF field screening to node points with higher metals concentrations. Subsurface soil samples were collected in each boring at typical intervals of 1.5 to 3.0, 3.0 to 4.5, and 5.0 to 6.5 feet bgs. Soil borings were completed at 75 of the grid nodes. These borings are numbered RT01 through RT75 as shown in Figure 6.

Soil samples collected for XRF-field screening and laboratory analyses are summarized in the sample record log (Appendix E). A lithologic log for each soil boring is presented in Appendix F.

2.8.4 Red Devil Lodge Potable Water Supply

A water sample was collected from the Red Devil Lodge water supply system for laboratory analyses. The sample was collected directly from the main spigot in the kitchen sink. The water supply was discharged for 5 minutes before sample collection.

2.9 Decontamination Procedures

Decontamination procedures consisted of high-pressure hot water rinse or Alconox wash and deionized or freshwater rinse, as described below:

2.9.1 Equipment and Materials

Drilling rig augers and drilling rods were pressure washed in the dedicated decontamination area before use and between borings. Visible soil was removed with a stiff bristle brush before washing.

Before collection of individual samples, the sampler was cleaned in an Alconox solution and double rinsed with deionized water. Sampling containers were cleaned and prepared by the analytical laboratories before shipment to the site. Sampling equipment used to collect samples for organic analyses remained free from contact with any type of plastic after being decontaminated.

2.9.2 Personnel Decontamination

Personnel decontamination was conducted in an established area with designated entry and egress paths. Field technicians underwent decontamination before eating, drinking, or smoking. Decontamination solutions and disposable personal protective equipment were stored in drums at the staging area and handled as investigation-derived waste (IDW). Fluids were placed in the lined holding pond for onsite treatment.

An exclusion zone was set up around the retort building. All field technicians leaving the exclusion zone underwent decontamination. Tyvek suits, rubber gloves, and booties were disposed of in designated containers as contaminated waste.

A decontamination station was set up near Red Devil Creek for all field technicians leaving the mine site. Disposable PPE, including Tyvek suits, booties, and gloves, was placed in designated drums. All field personnel washed their boots with Alconox and water and rinsed with clean water before leaving the site.

2.10 Investigation-derived Waste Classifying as Hazardous

The EPA requires generators of solid waste to evaluate whether their waste is hazardous as defined by the 40 CFR 261. If the waste is hazardous, the generator is responsible for meeting the storage, marking, labeling, transporting, and disposal requirements outlined in 40 CFR 262 through 268 and DOT regulations 49 CFR 171 through 178.

When possible, waste streams were characterized for disposal based on generator knowledge. When insufficient information was available to characterize waste streams, samples were collected for laboratory analyses and results were used to characterize the wastes.

2.10.1 Wastes Transported from the Site

Regulated hazardous wastes and materials generated during the project and transported offsite included asbestos, mercury-impacted asbestos, spent water filters, mercury-impacted soil/slag, and fuel recovered from distribution piping.

Other IDW removed from the site included used sorbents and used PPE, such as boot covers, Tyvek coveralls, respirator cartridges, and gloves.

Philip Services Corp. (Philip) prepared a Uniform Hazardous Material Manifest for each shipment, which was reviewed and signed by the BLM's Project Inspector. A summary of waste streams generated during the project and transported offsite is presented in Appendix D. Shipping manifests and disposal and recycling certificates are also presented in Appendix D.

2.10.2 Wastes Remaining Onsite

Demolition debris from the retort building, the west chemical storage shed, approximately 8 cubic yards of furnace slag, and the headworks remains onsite. Following demolition, debris was pressure washed and staged on the retort building foundation.

IDW water generated during the project includes equipment and personnel decontamination water, effluent from pressure washing of building debris, and groundwater monitoring well development water. The total volume of IDW water was estimated at 1,850 gallons. All IDW water was contained in a lined pit until treated onsite by carbon and Zeolite filtration. Filtered IDW water was contained in polyethylene tanks while a confirmation sample was analyzed for metals. Confirmation sample 00RDV09MI contained antimony at 14.5 milligrams per liter (mg/L), arsenic at 25.8 mg/L, and mercury at 0.0298 mg/L. Lead and BTEX were not detected. The IDW water treatment system did not reduce mercury, antimony, and arsenic concentrations to less than MCLs based on the results of sample 00RDV09MI. However, mercury was reduced to less than the toxicity characteristic leaching procedure (TCLP) regulatory level of 0.2 mg/L. The concentration of

arsenic in the IDW water exceeded the TCLP regulatory level of 5 mg/L. Oncoming autumn conditions and freezing temperatures precluded leaving the IDW water in polyethylene containers.

Field crews placed IDW water into troughs in the retort building foundation for temporary storage. The IDW water subsequently percolated through small cracks in the foundation and into subgrade soils.

Soil cuttings from borings not completed as groundwater monitoring wells were returned to the boring as backfill. Soil cuttings from borings completed as monitoring wells were placed on the ground surface next to the well.

2.11 Site Survey

Terra Surveys LLC performed surveying work as required by the task order. Site surveying activities were performed on October 11 and 12, 2000. Three permanent survey control monuments were installed at the mine site. Alaska State Plane coordinates were assigned to these monuments. The surveyor performed a topographic survey of the retort building area. The Terra Surveys report presenting project photographs, drawings and details, survey control data, locative survey ties, final survey data, copies of field books, raw data files, and GPS processing notes is included in Appendix L.

3.0 REGULATORY SUMMARY AND CHEMICAL-SPECIFIC SCREENING CRITERIA

3.1 Regulatory Summary

The following sections present a brief summary of the regulatory environment governing current and future operations at the Red Devil Mine. These sections address the BLM's CERCLA authority and present brief interpretations of federal and state regulations governing mining and Resource Conservation and Recovery Act (RCRA) wastes.

3.1.1 CERCLA Authority

Red Devil Mine is not on the National Priorities List; however, it is listed on the Federal Docket as a CERCLA site. The EPA identification is AKD980495618.

Section 115 of CERCLA authorizes the president to delegate any duties or powers vested in him by CERCLA. The president delegated specific functions to the heads of executive departments and agencies by Executive Orders 12580 and 13016. Pursuant to Secretarial Order 3201, the Secretary of the Interior has delegated certain of these CERCLA authorities to the BLM.

BLM policy is to exercise its delegated CERCLA authorities to undertake response actions and clean up hazardous substance releases affecting BLM lands. Cleanup of the abandoned Red Devil Mine is being addressed through the BLM's delegated CERCLA authorities.

3.1.2 Federal Regulation of Mine Wastes

Under the provisions of the Mining Waste Exclusion of RCRA, solid waste from the extraction, beneficiation, and processing of ores and minerals may be exempt from regulation as hazardous waste. This exemption, which is commonly referred to as the Bevill exemption, is valid for mineral extraction and beneficiation wastes and the 20 mineral processing wastes listed in 40 CFR 261.4(b)(7)(ii).

Extraction and Beneficiation Mining Wastes

Under the Bevill exemption, extraction and beneficiation mining wastes are not regulated under RCRA.

Mining Processing Wastes

Mining processing wastes generated through processes not listed in 40 CFR 261.4(b)(7)(ii) do not retain the Bevill exclusion. Retorted wastes are not listed among the 20 processing wastes in 40 CFR 261.4(b)(7)(ii), and thus are not exempt from RCRA under the Bevill exemption.

However, EPA's September 1, 1989, Final Rule (54 FR 36618) does not impose RCRA Subtitle C requirements on mining processing wastes disposed of in Alaska before March 1, 1990, unless those wastes are actively managed. Active management includes physical disturbance of the wastes (54 FR 36597).

If managed, process wastes are classified as hazardous based on the results of the TCLP analyses. A waste is classified as hazardous if, using the TCLP analysis, the extract from a sample contains any of the contaminants listed in 40 CFR 261.24 Table 1 at a concentration equal to or exceeding the respective regulatory level listed in that table. In addition, hazardous mercuric wastes must be further evaluated as described in Section 3.1.3.

3.1.3 Land Disposal Regulations

Hazardous mercuric wastes must be further subdivided on the basis of their total mercury content as defined in the Land Disposal Regulations (LDRs) under RCRA (40 CFR 268.45).

LDRs apply at the point of generation; therefore, a mercuric waste that classifies as hazardous must also be analyzed for total mercury concentrations to identify and implement appropriate treatment methods before disposal. Hazardous mercuric wastes containing up to 260 mg/kg of total mercury

are classified as "low level" wastes and must be stabilized before disposal by landfilling. Hazardous mercuric waste containing total mercury at concentrations in excess of 260 mg/kg are "high level" waste and must be retorted before disposal by landfilling.

Process mining wastes disposed of in Alaska before March 1, 1990, are subject to LDRs only if the wastes are actively managed. If process mining wastes disposed of in Alaska before March 1, 1990, are not actively managed, then LDRs are not applicable.

3.1.4 Contaminated Soil Regulations

The State of Alaska regulates chemical-impacted soils according to cleanup levels presented in the Alaska Administrative Code, Title 18, Chapter 75, Part 341 (18 AAC 75.341), Method Two, Table B1 (Soil Cleanup Levels) and Table B2 (Petroleum Hydrocarbon Soil Cleanup Levels).

3.1.5 Groundwater Regulations

Groundwater is regulated by drinking water maximum contaminant levels (MCLs). An MCL is a maximum permissible level of a contaminant in water delivered to any user of a public water system. Both the federal government and the State of Alaska promulgate MCLs. The EPA enforces drinking water standards (MCLs) under the Safe Drinking Water Act. The ADEC regulates hazardous substances in groundwater under 18 AAC 75.345, Table C, Groundwater Cleanup Levels. In most cases, the ADEC Groundwater Cleanup Levels are identical to federal MCLs.

3.2 Chemical-Specific Screening Criteria

To evaluate the significance of chemical concentrations detected in samples collected at the mine site, analytes detected in samples were screened against the chemical-specific screening criteria identified in the following sections.

3.2.1 Soil Screening Criteria

3.2.1.1 Background Soil Concentrations

The USGS performed an investigation to evaluate environmental hazards of abandoned mercury mines in southwestern Alaska (Bailey and Gray, 1997). Mercury concentrations were measured in vegetation, soil, and stream-water samples collected from sites around the Cinnabar Creek and Red Devil mines, as well as regional background sites. The estimate of mercury concentrations in background soil at the site is based on 4 samples collected along a transect established on a ridge adjacent to the Red Devil Mine area. The USGS's published values for the total mercury concentration in background soils at the Red Devil Mine Site range from 0.10 to 0.39 mg/kg. One soil sample analyzed for methyl mercury had a concentration of 0.88 parts per billion. No other speciation analyses were performed.

In 1999 HLA/Wilder performed a limited waste removal action under contract to the BLM. During the removal action, one soil sample was collected from an area west of the mine site that appeared unaffected by mine activities (HLA/Wilder, 1999). This sample contained detectable concentrations of antimony (27.6 mg/kg), arsenic (160 mg/kg), and total mercury (3.49 mg/kg) (note, this sample was not analyzed for lead). These concentrations are assumed to be indicative of areas at the Red Devil Mine with minimal to no disturbance based on review of available data. For the purposes of this screening assessment, these concentrations are considered representative of background conditions at the Red Devil Mine. Background concentrations for antimony, arsenic and mercury are presented in Table 3-1.

Table 3-1. Antimony, Arsenic, and Mercury Concentrations in Background Soil

Metal	Concentration (mg/kg)
Antimony	27.6
Arsenic	160
Mercury	3.49

mg/kg = Milligrams per kilogram

3.2.1.2 State of Alaska Soil Cleanup Levels

Soils impacted by petroleum hydrocarbons at the Red Devil mine site are screened against cleanup levels in 18 AAC 75, Soil Cleanup Levels, Tables B1 and B2, Under 40-Inch Zone, Migration to Groundwater. These screening criteria are summarized in Table 3-2.

Table 3-2. Screening Criteria for Petroleum Hydrocarbons in Soil

Analyte	Cleanup Level (mg/kg)
Residual-range organics	11,000
Diesel-range organics	250
Gasoline-range organics	300
Benzene	0.02
Ethylbenzene	5.5
Toluene	5.4
Xylenes (total)	78
Anthracene	4,300
Benzo[a]anthracene	6
Benzo[a]pyrene	3
Benzo[b]fluoranthene	20
Benzo[k]fluoranthene	200
Chrysene	620
Dibenzo[a,h]anthracene	6
Fluoranthene	2,100
Fluorene	270
Indeno[1,2,3-c,d)pyrene	54
Naphthalene	43
Pyrene	1,500

mg/kg = Milligrams per kilogram

The ADEC's 18 AAC 75 soil cleanup levels are not considered applicable screening criteria for soils impacted by antimony, arsenic, and mercury. State of Alaska cleanup levels are applicable for evaluation and cleanup of chemical spills and releases, such as the petroleum hydrocarbons detected in soils at the Tank Farm Area.

The Red Devil Mine is situated within a highly mineralized region. The proposed concentrations of antimony, arsenic, and mercury in background soil presented in Table 3-1 exceed the State of Alaska Method Two soil cleanup levels. Therefore, antimony, arsenic, and mercury data for soils in the General Mine Area and Retort Building Area are not screened against State of Alaska soil cleanup levels. Antimony, arsenic, and mercury data are presented and discussed in Sections 4 through 6 of this report.

Soils impacted by lead are screened against the lead cleanup levels in 18 AAC 75, Soil Cleanup Levels, Tables B1, Under 40-Inch Zone, Migration to Groundwater. The soil cleanup levels for lead are determined based on land use. For residential areas the cleanup level is 400 mg/kg, and for commercial or industrial areas the cleanup level is 1,000 mg/kg. For the purposes of this screening assessment, soils impacted by lead will be screened against the commercial/industrial cleanup level of 1,000 mg/kg.

The XRF was also used to screen soil samples for lead, manganese, iron, and zinc. Manganese, iron, and zinc were not requested for samples submitted for laboratory analyses. The XRF screening results for manganese, iron, and zinc in soil are summarized in Appendix H. XRF results for manganese, iron, and zinc are not further evaluated in this report.

3.2.1.3 Process Mining Wastes

The soils in the area of the retort building are assumed to include some process mining wastes. Mining wastes are evaluated according to the Mining Waste Exclusion of RCRA. If the BLM elects to manage these wastes, hazardous classification of process wastes as defined by 40 CFR 261.24 is required. Therefore, TCLP analytical results for soil samples collected at the retort building must be screened against the maximum concentration of contaminants for the toxicity characteristic as defined in 40 CFR 261.24, Table 1. The maximum concentrations for TCLP arsenic, lead, and mercury are presented in Table 3-3.

Table 3-3. Maximum Concentration for the Toxicity Characteristic

Metal in Sample Extract	Regulatory Level (mg/L)
Arsenic	5.0
Lead	5.0
Mercury	0.2

3.2.2 Groundwater Screening Criteria

For the purposes of this screening assessment, groundwater impacted by metals will be evaluated against MCLs. MCLs for metals detected in groundwater are summarized in Table 3-4.

Table 3-4. Maximum Contaminant Levels for Analytes Detected in Groundwater

Analyte	MCL (µg/L)
Antimony	6
Arsenic	50
Barium	2,000
Copper	1,300
Lead	15
Mercury	2

3.2.3 Demolition Debris and Solid Waste

The State of Alaska regulates solid waste disposal under the Solid Waste Management regulations in 18 AAC 60. If TCLP analysis of demolition debris exceeds regulatory criteria, the debris will be considered a RCRA hazardous waste. Hazardous classification of solid wastes is defined by 40 CFR 261.24.

TCLP analytical results for building debris samples are screened against the maximum concentration of contaminants for the toxicity characteristic as defined in 40 CFR 261.24, Table 1. The maximum concentrations for arsenic, lead, and mercury are presented in Table 3.3.

3.2.4 Potable Water

The ADEC regulates public drinking water under 18 AAC 80. The Red Devil Lodge owns a private well supplying potable water to the lodge. The analytical results of a sample collected from the lodge potable water system are screened against primary and secondary MCLs presented in 18 AAC 80.

3.3 Mercury Speciation

Mercury is regulated by the state and federal laws summarized in this section based on the concentration of total mercury detected in an environmental medium, or the concentration in the extract of a sample analyzed by TCLP method. However, the total mercury detected in an environmental medium can be comprised of various forms, or "species," of mercury.

Mercury can occur naturally in the environment in inorganic forms such as cinnabar (HgS), elemental or liquid mercury (Hg), and mercuric ion (Hg2+). These inorganic forms can be converted to an organic form such as methyl mercury (meHg) by aerobic and anaerobic degradation.

Methyl mercury is the most toxic and soluble form of mercury. Cinnabar, which is highly insoluble in water and resistant to physical and chemical weathering, is the least toxic form. In addition, cinnabar is fairly stable and not easily converted to methyl mercury. Liquid mercury is more easily converted to the more toxic methyl mercury.

Federal and state regulatory criteria are based on total mercury concentrations and not "speciation" of the various forms of mercury. However, speciation of mercury can be highly valuable data and essential to supporting risk-based cleanup levels.

4.0 ANALYTICAL PROGRAM

This section summarizes the analytical program and data quality assessment results. Data quality objectives, field sampling procedures, and QC procedures followed during this project are presented in the WP and QAPP. All samples collected for XRF field-screening and laboratory analyses are summarized in the sample record log presented in Appendix E. The sample record log includes the following data for each sample:

- Identification number
- Associated QC sample identification numbers
- BLM sample identification numbers
- Sample matrix
- Sample location
- Date and time sample was collected
- Sample type (project or QC)
- Initials of person who collected sample
- Depth interval at which sample was collected
- Requested screening and/or chemical analyses

The remainder of this section summarizes field-screening analyses, project laboratories and responsibilities, practical quantitation limits, and characterization and investigation samples collected during each phase of the project.

4.1 Field-Screening Analyses

Soil samples were field screened for volatile organic compounds (VOCs) and metals. Specific field-screening procedures are presented in the following sections.

4.1.1 Photoionization Detector Field Screening

A PID was used to field screen soil samples for VOCs and assist in the selection of samples for fixed-laboratory analyses. Soil samples were field screened by transferring soil directly into resealable plastic bags. Soil temperature was brought to between 55°F and 70°F by placing the bag of soil in a warm environment. The PID probe was inserted into the bag for approximately 30 seconds, and the maximum organic vapor headspace reading was recorded.

4.1.2 XRF Screening

An XRF was used to field screen soil samples for metals (lead, arsenic, mercury, zinc, iron, and manganese) in soil samples collected in the General Mine Area and Retort Building Area. The XRF was operated independently by qualified BLM personnel. A summary of the XRF field-screening program, results, data interpretation, and conclusions are presented in Appendix H.

4.2 Laboratory Analyses

The project laboratories and their responsibilities are summarized below:

CT&E Environmental Services, Inc. (CT&E), Anchorage, Alaska, analyzed project and QC soil and water samples under contract to HLA/Wilder. CT&E analyzed soil and water samples collected during retort building demolition and source area investigations.

International Asbestos Testing Laboratories (IATL), Mt. Laurel, New Jersey. EHS retained IATL to analyze building survey samples for asbestos content. Samples analyzed by IATL are addressed in EHS's *Asbestos and Lead Survey Report* (EHS, 2000).

Environmental Hazards Services, Richmond, Virginia. EHS retained Environmental Hazards Services to analyze building survey samples for leachable lead. Building survey analytical results are addressed in EHS's *Asbestos and Lead Survey Report* (EHS, 2000). HLA/Wilder collected eight building debris/ characterization samples during retort building demolition that were analyzed by Environmental Hazards Services. The results of these samples are addressed in the remainder of this report.

White Environmental Consultants Inc., Anchorage, Alaska. Alaska Abatement Corporation retained White Environmental Consultants to analyze air samples collected during the asbestos abatement of the retort building.

These samples are addressed in the Hazard Abatement Closeout Submittal in Appendix K.

Metals Treatment Technology. Metals Treatment Technologies performed a chemical-fixation treatability study for the fixation of soils and refractory brick classified as hazardous waste. The results of the study are presented in Section 5.

4.2.1 Practical Quantitation Limits

Depending on the sample matrix and analysis, required practical quantitation limits for laboratory analyses were as follows:

- One tenth of the lowest concentration in 18 AAC 75, January 22, 1999, Tables B and C;
- One tenth of the regulatory level in 40 CFR 261.24; or
- As specified in 18 AAC 80.

4.3 Retort Building Debris Characterization Samples

Eight characterization samples (00RDV01MI through 00RDV08MI) were collected from the retort building and east chemical storage shed during demolition activities. Six of the characterization samples were submitted to Environmental Hazards Services and analyzed as follows:

- Three samples for TCLP RCRA eight metals (arsenic, selenium, chromium, cadmium, lead, silver, barium, and mercury) by Method SW846-6010B
- Three samples for TCLP arsenic by Method SW846-6010B and TCLP mercury by Method SW846-7470A

Two of the eight characterization samples were submitted to White Environmental Consultants and analyzed for asbestos according to Polarized Light Microscopy (PLM) – EPA Method 600/R-93/166. The sample numbers, debris material sampled, and requested analyses are summarized in the following table.

Table 4-1. Retort Building Debris Characterization Samples

Sample Number	Material	Analyses Requested
00RDV01MI	Composite Sample	TCLP RCRA 8 metals
00RDV02MI	Condenser Manifold	TCLP RCRA 8 metals
00RDV03MI	Lining - Upper Furnace	Asbestos by PLM
00RDV04MI	Refractory Brick, Upper Furnace	Asbestos by PLM
00RDV05MI	Refractory Brick, Upper Furnace	TCLP RCRA 8 metals
00RDV06MI	Wood from Structure	TCLP arsenic and mercury
00RDV07MI	Wood from Structure	TCLP arsenic and mercury
00RDV08MI	Fiberboard	TCLP arsenic and mercury

4.4 Source Area Investigations

The following sections summarize investigation samples collected and analyses requested for each of the source areas.

4.4.1 Retort Building Area Investigation

4.4.1.1 Total Metals Analyses

Approximately 300 soil samples collected in the Retort Building Area from surface and subsurface locations were field-screened for metals with the XRF.

Sixty-six soil samples collected at the Retort Building Area were submitted to CT&E and analyzed for metals (antimony, arsenic, lead, and mercury) according to the following methods:

- Antimony, arsenic, and lead by Method SW846-6020

- Mercury by Method SW846-7471A – Cold Vapor

Samples collected at the Retort Building Area for field-screening and laboratory analyses are summarized in the sample log (Appendix E). Field-screening and fixed-laboratory soil sample locations are shown in Figure 6.

4.4.1.2 TCLP Analyses

Twenty soil samples collected at the Retort Building Area were analyzed by CT&E for toxicity characteristic for metals (antimony, arsenic, lead, and mercury) according to the following methods:

- TCLP antimony and lead by Method SW846-6010B
- TCLP arsenic by Method SW846-7060A
- TCLP mercury by Method SW846-7470A

Samples collected at the Retort Building Area and submitted for TCLP analyses are summarized in the sample record log (Appendix E). Sample locations are shown in Figure 6.

4.4.2 Fuel Storage Area Investigation

Twenty-two soil samples were collected at the ASTs and fuel distribution lines area and analyzed for the following:

- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8021
- Diesel-range organics (DRO) by ADEC Method AK102
- Residual-range organics (RRO) by ADEC Method AK103
- Carcinogenic polynuclear aromatic hydrocarbons (cPAHs) by EPA Method 8270-selective ion monitoring (Note: Three of the 22 soil samples were selected for analysis by this method.)

The locations of samples collected in the vicinity of the AST and fuel distribution line are shown in Figure 5.

4.4.3 General Mine Area Investigation

Seven borings were drilled and five were completed as groundwater monitoring wells at various locations throughout the General Mine Area. Approximately 50 soil samples collected from the soil borings and at surface locations were field-screened for metals with the XRF.

Six soil samples from various borings and depth intervals were submitted to CT&E for toxicity characteristic analyses for metals (antimony, arsenic, lead, and mercury) according to the following methods:

- TCLP antimony and lead by Method SW846-6010B TCLP.
- TCLP arsenic by Method SW846-7060A TCLP
- TCLP mercury by Method SW846-7470A TCLP

Six groundwater samples (one from each of five wells and one QC sample) were collected and analyzed according to the following methods:

- Mercury by Method SW7470/E245.1
- Antimony, arsenic, and lead by Method SW846 6020

The locations of soil borings and monitoring wells are shown in Figure 5. Sample identification numbers are also identified on the soil boring logs (Appendix F).

4.4.4 Red Devil Lodge Potable Water Sample

One water sample was collected from the potable water supply well at the Red Devil Lodge and submitted for laboratory analyses. The analytical methods used for drinking water analyses were as follows:

- Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc by EPA 200.8
- Mercury by Method SW7470/E245.1
- Fecal coliform by Method SM18 9222D

4.5 Waste Characterization

Potentially hazardous wastes generated during this project were sampled and analyzed for characterization before disposal. Wastes sampled and requested laboratory analyses are presented in the following sections.

4.5.1 Demolition Debris

Wastes generated during building demolition and transported offsite for disposal were asbestos, mercury-impacted asbestos, mercury-impacted slag/soil, and miscellaneous PPE and possibly contaminated project materials.

Asbestos wastes were sampled before and during building demolition. Asbestos wastes were characterized, containerized, and transported from the site by Philip Services Corporation and disposed of in the ARL. Asbestos samples were analyzed by PLM by Environmental Hazards Services and White Environmental Consultants.

Mercury-impacted wastes were not characterized before shipment from Red Devil. The wastes were assumed hazardous based on generator knowledge, and were containerized and transported by Philip to their Burlington Environmental disposal facility in Seattle, Washington. Philip then characterized the waste for total mercury and TCLP. Those wastes failing TCLP for mercury and exceeding 260 mg/kg total mercury were transported to Superior Special Services, Phoenix, Arizona, for retorting and disposal. Those wastes not failing TCLP for mercury or containing less than 260 mg/kg total mercury were disposed of at the Burlington facility.

A summary of waste streams generated during the project, shipping manifests, and disposal certificates are presented in Appendix D.

4.5.2 Recovered Fuel

Recovered fuel was transported by Philip to Alaska Energy Recovery Services in Anchorage, Alaska. The fuel was analyzed for oil burning specifications by the following methods:

- PCBs by EPA Method 8082
- Ignitability (flashpoint) by EPA Method 1010/1020
- Heat capacity (in British thermal units) by American Society for Testing and Materials (ASTM) Method E711
- Total halogens by EPA Method 9060
- Arsenic, cadmium, chromium, and lead by EPA Method 6010/6020/7000

4.5.3 Water Generated During Pressure Washing and Decontamination

One sample was collected from the decontamination holding pond and submitted to CT&E for the following analyses:

- Mercury by Method SW7470/E245.1
- Antimony, arsenic, and lead by Method SW846 6020
- BTEX constituents by Method EPA 602

4.6 Air Monitoring for Asbestos

Monitoring for airborne asbestos was performed to assess worker exposure levels as required by 29 CFR 1926.1101. Monitoring was performed onsite by Alaska Abatement Corporation. Air samples were analyzed by White Environmental Consultants of Anchorage. Asbestos monitoring samples were analyzed in compliance with 29 CFR 1926.1101 Appendix A and NIOSH Method 7400

"A" counting rules. Air monitoring included the following:

- Area monitoring before asbestos abatement
- Personal monitoring on 25 percent of workers performing each task to determine the 8-hour TWA. Samples were collected from the worker's breathing zone by using personal sampling pumps set at flow rates from 0.5 to 2.5 liters per minute.
- Area monitoring within work areas during asbestos removal

Asbestos air monitoring results are included in Section 3 of the Hazard Abatement Closeout Submittal (Appendix K).

4.7 Data Quality Assessment

HLA/Wilder's project chemist performed a chemical data quality assessment (DQA) of all project and QC sample results. The DQA included examination and review of sample holding times, temperatures, custody records, and reported results for samples and extraction QC runs. Analytical data were reviewed according to the Chemical Quality Assurance for Hazardous, Toxic, and Radioactive Waste Projects, USACE EM-200-1-6, dated October 10, 1997. The analytical data were reviewed for the following:

- Completeness
- Identification of anomalous data
- Correction of analytical data
- Accuracy and precision of analytical data
- Compliance with data quality objectives
- Procedural compliance with method procedures

The DQA checklists are presented in Appendix J.

The DQA warranted the qualification of several sample results as estimated. Data qualifiers were added to the result tables for problems affecting the accuracy of the data, such as exceeding holding times to extraction, analytes detected in the method blanks, poor surrogate recoveries, poor matrix spike recoveries, and field duplicate results outside tolerances. Although several sample results were flagged as estimated values, the overall quality of the data was good. No sample results were rejected.

5.0 ANALYTICAL RESULTS

This section presents a summary of the analytical results for each of the following:

- Asbestos and Lead Survey
- Building Debris and IDW Characterization
- General Mine Area Investigation
- Fuel Storage Area Investigation
- Retort Building Area Investigation
- Red Devil Lodge Potable Water Supply
- Fixation Treatability Study

Laboratory data packages documenting analytical results are presented in Appendix J in Volume II of this report. This section does not address analytical results for IDW transported offsite for disposal.

5.1 Asbestos and Lead Survey

Asbestos survey results are summarized in Figure 7, which lists the building locations, ACM observed, percent asbestos content of the material, location where the asbestos was observed, and estimated quantity. Lead survey results are summarized in Figure 8, which lists the building locations, leachable lead results, and other hazards observed. Detailed survey information is presented in the EHS *Asbestos and Lead Survey Report* (EHS, 2000).

5.2 Retort Building Debris and IDW Characterization

5.2.1 TCLP Metals Results

Six demolition debris samples from the retort building and east chemical storage shed were analyzed for TCLP analyses for waste characterization. Three samples were analyzed for TCLP RCRA 8 metals, three samples for TCLP arsenic and mercury, and two samples for asbestos. Analytical results are presented in Table 5-1.

Sample 00RDV01MI was a composite of retort building construction materials including plywood, fiberboard, tin siding, and condenser manifold. The extraction from sample 00RDV01MI contained mercury at a concentration of 0.31 mg/L, which exceeds the TCLP regulatory level of 0.2 mg/L. Sample 00RDV05MI was a refractory brick from the upper retort furnace. The extraction from sample 00RDV05MI contained arsenic and mercury at concentrations of 6.4 mg/L and 0.22 mg/L, respectively. These concentrations exceed the TCLP regulatory levels for arsenic (5 mg/L) and mercury (0.2 mg/L). The building demolition debris from which these samples were obtained was decontaminated and staged on the retort building concrete slab foundation. Refractory bricks are encapsulated with a product typically used to encapsulate ACM.

5.2.2 Asbestos Results

Asbestos sample 00RDV03MI was identified as TSI friable asbestos containing 14 percent chrysotile and 9 percent amosite. The material from which this sample was obtained was abated and transported from the site for disposal.

Sample 00RDV04MI consisted of a refractory brick from the upper furnace. This sample did not contain asbestos. Refractory bricks from the retort building furnaces are staged on the retort building concrete slab foundation.

5.2.3 IDW Water Characterization

IDW water generated during the project was filtered through carbon and Zeolite filters. Filtered effluent was contained in a lined holding pond while a representative sample was analyzed by CT&E on quick-turnaround basis. Sample 00RDV09MI contained antimony at 14.5 mg/L, arsenic at 25.8 mg/L, and mercury at 0.0298 mg/L. Sample 00RDV09MI did not contain detectable concentrations of lead or BTEX.

Table 5-1. Retort Building Debris Waste Characterization Results Samples

(All units are in milligrams per liter (mg/L)

Regulated Metal Regulatory Level		Arsenic 5.0	Selenium 1.0	Chromium 5.0	Cadmium 1.0	Lead 5.0	Silver 5.0	Barium 100.0	Mercury 0.2
Sample Number	Material								
00RDV01MI	Composite[1]	3.3	ND(0.35)	ND(0.080)	0.28	0.83	ND(0.10)	ND(0.10)	**0.31**
00RDV02MI	Condenser Manifold	0.42	ND(0.35)	0.2	ND(0.10)	ND(0.40)	ND(0.10)	ND(0.10)	0.17
00RDV05MI	Refractory Brick	**6.4**	ND(0.35)	ND(0.080)	ND(0.10)	ND(0.40)	ND(0.10)	ND(0.10)	**0.22**
00RDV06MI	Wood	1.2	NA	NA	NA	NA	NA	NA	0.044
00RDV07MI	Wood	3.4	NA	NA	NA	NA	NA	NA	0.059
00RDV08MI	Fiberboard – Retort Bldg.	ND(0.20)	NA	NA	NA	NA	NA	NA	0.007

1. Sample includes plywood, fiberboard, tin siding, and condenser manifold.

Concentrations are in milligrams per liter.

NA Not analyzed

TCLP Toxicity characteristic leaching procedure

ND Not detected (at the concentration in parentheses)

Note: Bold red text denotes exceedance of regulatory criteria (40 CFR 261.24, Table 1, maximum concentration of contaminants for the toxicity characteristic).

5.3 General Mine Area Investigation

5.3.1 Surface Soil

Five surface soil samples collected in the General Mine Area contain antimony, arsenic, and mercury at concentrations exceeding background concentrations in soil presented in Table 3-1. Lead was not detected in surface soil samples at concentrations exceeding the sample reporting limits. Surface soil samples 00RDV24SL through 28SL were discrete surface grab samples collected from zero to 0.5 foot bgs. Sample locations and analytical results are presented in Figure 9. Sample analytes and results shown in bold green text in Figure 9 denote exceedance of background concentrations.

Surface soil sample 00RDV24SL, which is located northwest of the retort building and immediately south of well MW01, contained the lowest concentrations of antimony (37.5 mg/kg), arsenic (380 mg/kg), and mercury (396 mg/kg) observed in surface soil samples collected in this area. The highest concentrations in surface soil were detected in samples 00RDV25SL and 26SL, as follows:

00RDV25SL (on road west of Red Devil Creek)

Antimony – 2,560 mg/kg
Arsenic – 2,540 mg/kg
Mercury – 1,110 mg/kg

00RDV26SL (near shop building pad)

Antimony – 3,490 mg/kg
Arsenic – 2,010 mg/kg
Mercury – 212 mg/kg.

5.3.2 Subsurface Soil

Nine subsurface soil samples collected from various depth intervals in Soil Borings B03, B04, B05, and B06 were analyzed for antimony, arsenic, lead, and mercury. Sample locations, depth intervals, and respective analytical results are shown in Figure 9. Sample analytes and results shown in bold red text in Figure 9 denote exceedance of background concentrations presented in Table 3-1.

Lead concentrations were relatively consistent in all samples, ranging from 5.27 to 29.9 mg/kg. Samples collected from borings B03, B04, and B05 at depth intervals of 0.5 to 2.0 feet and 5.0 to 6.5 feet contained arsenic concentrations in excess of 2,000 mg/kg. The highest concentrations were observed in samples collected from boring B05, which is located adjacent to the Shop Building (see Figure 9). A sample collected from 0.5 to 2.0 feet in boring B06 contained arsenic at 1,870 mg/kg.

Only two samples collected from greater than 14 feet bgs were submitted for laboratory analyses. These samples exhibited a reduction in concentrations of antimony, arsenic, and mercury of several orders of magnitude below metals concentrations observed in surface soil. Results for deep samples are shown below:

Sample B06/14-15.5

Antimony – 3.79 mg/kg
Arsenic – 61.1 mg/kg
Mercury – 30.9 mg/kg

Sample B05/30-31.5

Antimony – Not Detected (<0.955 mg/kg)
Arsenic – 113 mg/kg
Mercury – 4.41 mg/kg

5.3.3 TCLP Results

Six soil samples collected from Soil Borings B01 through B06 were submitted to CT&E for antimony, arsenic, lead, and mercury toxicity characterization as defined in 40 CFR 261.24. Table 5-2 summarizes the samples by boring location, sample depth interval, sample number, analyte, and concentration detected. The extract from all samples did not contain arsenic, mercury, or lead at concentrations exceeding regulatory levels (antimony is not regulated under 40 CFR 261.24).

Table 5-2. Soil Boring Sample TCLP Results

	Boring Number	B01	B02	B03	B04	B05	B06
	Sample Depth Interval	4.0-6.0	14.0-15.5	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
	Sample Number	00RDV41SL	00RDV42SL	00RDV43SL	00RDV44SL	00RDV45SL	00RDV46SL
Metal	Regulatory Criteria (mg/L)						
Antimony	NA	ND(2)	ND(2)	7.83	6.87	9.67	4.96
Arsenic	5.0	ND(0.05)	0.017	1.75	0.761	3.05	4.97
Lead	5.0	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)
Mercury	0.2	ND(0.002)	ND(0.002)	0.0071	ND(0.002)	ND(0.002)	ND(0.002)

Concentrations are in milligrams per liter
Sample depth interval given in feet below ground surface
NA Not applicable. Antimony is not regulated under 40 CFR 261.24
ND Not detected above concentration in parentheses

5.3.4 Groundwater

Groundwater samples were collected from each of the five groundwater monitoring wells installed during the project (MW01, MW03, MW04, MW05, and MW07) and submitted for laboratory analyses. All wells are located within the General Mine Area as shown in Figure 10.

A groundwater well was not successfully completed in the Retort Building Area. Soil Boring B02 was drilled to a depth of 40 feet before being terminated because of auger refusal by bedrock. Groundwater was not encountered within this depth in Boring B02. Monitoring well installation was not planned for the Fuel Storage Area during year 2000 fieldwork.

The depth to groundwater in each well was measured to the nearest 0.01 foot during sampling and converted to a groundwater elevation following completion of the site survey. Monitoring well locations, groundwater sample numbers, laboratory analytical results and groundwater elevation contours are presented in Figure 10.

The nearest wells to the Retort Building Area are MW01 and MW03. Well MW03 is in a general downgradient direction from the former retort building. Well MW01 appears to be located in a cross to downgradient direction from the retort building. Well MW01 may be downgradient from the Retort Building Area at certain times of the year based on seasonal fluctuations in groundwater elevation and flow direction. Well MW07 appears to be up-gradient or crossgradient from the Retort Building Area. Wells MW04 and MW06 are on the opposite side of Red Devil Creek from the Retort Building Area.

Water samples from all four wells contain antimony at concentrations exceeding MCLs. Antimony was not detected in well MW07 at a sample reporting limit (SRL) of 22.2 mg/L; however, this SRL was elevated and exceeds the MCL of 6 µg/L.

Samples collected from wells MW01, MW03, MW04, and MW07 contained arsenic at concentrations exceeding the MCL of 50 µg/L. A sample collected from well MW05 contained arsenic at a concentration of 25.4 µg/L.

Water samples collected from all five wells contain arsenic at concentrations exceeding 10 µg/L.

Lead was detected in well MW07 at a concentration of 205 µg/L, which exceeds the MCL of 15 µg/L. Lead was not detected in samples collected from wells MW01, MW03, MW04, and MW05.

Mercury was detected in water samples collected from wells MW01, MW03, and MW07 at concentrations exceeding the MCL of 2 µg/L. Mercury was present in well MW04 at a concentration of 0.829 µg/L. Mercury was not detected in well MW06.

The general direction of groundwater flow during the sampling event is toward the Kuskokwim River, as expected. Some localized gradient toward Red Devil Creek likely occurs. Slight variations in the direction of groundwater flow may occur as a result of seasonal fluctuations in the groundwater elevation and the hydraulic relationship between groundwater and Red Devil Creek.

5.4 Fuel Storage and Distribution System Investigation

Twenty-two surface and near surface soil samples (00RDV02SL through 00RDV23SL) were collected in the general vicinity of the fuel storage and distribution system and analyzed for DRO, gasoline-range organics (GRO), RRO, and BTEX. Three samples, 00RDV05SL, 09SL, and 11SL, were also analyzed for cPAHs. Sample locations, depth intervals, and analytical results are presented in Figure 9. Sample analytes and results shown in bold red text in Figure 9 denote exceedance of ADEC soil cleanup levels from Method Two, Table B1.

GRO, RRO, toluene, ethylbenzene, total xylenes, and cPAHs were not detected at concentrations exceeding ADEC soil cleanup levels.

Benzene was detected in 2 of 22 samples at concentrations exceeding the ADEC soil cleanup level of 0.02 mg/kg. Sample 00RDV11SL contained benzene at 0.095 mg/kg, and sample 00RDV14SL contained benzene at 0.0658 mg/kg.

DRO was detected in 20 of 22 samples at concentrations exceeding the ADEC cleanup level of 250 mg/kg, as presented in Table 5-3. DRO was not detected in samples 00RDV17SL and 00RDV23SL.

5.5 Retort Building Area Investigation

The following sections summarize XRF field screening and fixed-laboratory analytical results for investigative soil samples collected during the investigation at the Retort Building Area.

5.5.1 XRF Field Screening

Approximately 400 surface and subsurface soil samples collected at the Retort Building Area were field-screened for metals with the XRF field-screening device. The XRF results provided real-time data that were used to direct drilling and sampling activities. A memorandum prepared by the BLM summarizing XRF analytical results is presented in Appendix H.

Field-screening and the associated fixed laboratory data for a given sample location were statistically evaluated using linear regression. For the XRF results to meet the EPA definition of screening-level data, the correlation coefficient r^2 should be 0.7 or greater.

XRF mercury data less than 25 ppm, which is the detection level of the XRF field screening instrument, satisfy EPA requirements and can be used quantitatively.

Mercury data in the quantitation range of 25 to 10,000 ppm must be corrected by the following equation to be used quantitatively:

Lab Concentration = XRF Concentration x 5

Mercury data greater than 10,000 ppm did not correlate with fixed laboratory data and are not presented in this report.

XRF arsenic data must be corrected by the following equation to be used quantitatively:

Lab = (XRF x 0.67) + 4.6

XRF results for lead, manganese, iron, and zinc are not addressed further in this report.

Corrected XRF mercury results in soil for each depth interval sampled are presented in Figures 11 through 14. Corrected XRF arsenic results in soil for each depth interval sampled are presented in Figures 15 through 18.

Soil samples containing mercury and arsenic at concentrations greater than 500 mg/kg are identified in Figures 11 through 18. The concentration of 500 mg/kg has no regulatory significance, but was selected rather arbitrarily to evaluate trends in the lateral extent of impacted soils for each of the depth intervals sampled.

The highest detected concentrations of mercury in surface soil generally correlate with the highest detected concentrations of arsenic. Nine surface soil samples contained arsenic at a concentration greater than 5,000 mg/kg, while 9 surface soil samples contained mercury at concentrations greater than 5,000 mg/kg. Seven of these nine sample are collocated as shown in Figure 19. The concentration of 5,000 mg/kg has no regulatory significance, but was selected based on review of the data set.

Soil samples collected from depth intervals of 1.5 to 3 feet, 3 to 4.5 feet, and 5 to 6.5 feet indicate the highest concentrations of arsenic and mercury are present in the areas adjacent to the concrete slab as demonstrated in Figures 12 through 14 and 16 through 18.

Cross sections through this area of the foundation showing soil boring profiles, sample results, extent of visible processed mercury, and approximate depth to highly fractured bedrock are presented in Figure 20.

Table 5-3. Diesel-Range Organics Concentrations in Fuel Storage and Distribution System Soil Samples

Sample Number	Field Location	Sample Depth Interval (Feet bgs)	Concentration (mg/kg)
00RDV02SL	Pipeline Station 1-6	0 - 0.5	3760
00RDV03SL	Pipeline Station 1-18	0 - 0.5	8670
00RDV04SL	Storage tank #1 valve #2	0 - 0.5	4010
00RDV05SL	Storage tank #1 valve #2	0 - 0.5	6620
00RDV06SL	Storage tank #1 valve #2	0 - 0.5	6900
00RDV07SL	Pipeline Station 2-4	0 - 0.5	6640
00RDV08SL	Pipeline Station 2-4	0 - 0.5	3270
00RDV09SL	Storage tank #2 valve #2	0 - 0.5	4660
00RDV10SL	Storage tank #2 valve #2	0 - 0.5	2660
00RDV11SL	Pipeline Station 3-3	0 - 0.5	1910
00RDV12SL	Pipeline Station 3-3	1.0 - 1.5	1250
00RDV13SL	Storage tank #3 valve #1	0 – 0.5	3060
00RDV14SL	Pipeline Station 4-6	1.0 - 1.5	530
00RDV15SL	Pipeline Station 4-6	2.0 - 2.5	559
00RDV16SL	Storage tank #4 valve #1	1.5 – 2.0	515
00RDV17SL	Pipeline Station 5-2	0.75 – 1.0	ND(9.99)
00RDV18SL	Storage tank #5 valve #2	2.0-2.5	2350
00RDV19SL	Supply line Station SP-5	2.5 - 3.0	13600
00RDV20SL	Supply line Station SP-7	1.0 – 1.5	22900
00RDV21SL	Supply line Station SP-7	2.5 - 3.0	1400
00RDV22SL	Supply line Station SP-7	2.5 - 3.0	636
00RDV23SL	Pipeline Station 0-4	2.5 - 3.0	ND(10.9)

bgs Below ground surface
mg/kg Milligrams per kilogram
ND Not detected (sample reporting limit in parentheses)

5.5.2 Correlation of Arsenic and Mercury XRF and Fixed Laboratory Results

The BLM submitted 75 soil samples to CT&E for arsenic and mercury analyses to correlate field-screening results with fixed-laboratory data. The BLM report summarizing the correlation of field-screening and fixed-laboratory results is presented in Appendix H.

The locations of the 75 soil samples the BLM submitted to CT&E, including depth intervals and analytical results are presented in Figure 21. Sample analytes and results shown in bold red text denote exceedance of background concentrations presented in Table 3-1.

5.5.3 Soil TCLP Results

Twenty-one samples were submitted to CT&E for antimony, arsenic, lead, and mercury toxicity characterization as defined in 40 CFR 261.24. The following sections present the results for each of the metals analyzed.

Mercury

The locations of samples submitted for TCLP mercury analysis and those samples exceeding regulatory criteria are shown in Figure 22. The extract from 2 of 21 samples contained mercury at concentrations exceeding the regulatory level of 0.2 mg/L. The extract from sample 00RDV34SL, collected in boring RT09 from zero to 0.5 foot bgs, contained 0.352 mg/L of mercury. The extract from sample 00RDV51SL, collected in boring RT73 from zero to 0.5 foot bgs, contained 0.429 mg/L of mercury.

Arsenic

The locations of samples submitted for TCLP arsenic analyses and those exceeding regulatory criteria are shown in Figure 23. The extract from 14 of 21 samples contained arsenic at concentrations exceeding the regulatory level of 5 mg/L. Concentrations ranged from 5.31 mg/L in sample 00RDV35SL (collected in boring RT10 from zero to 0.5 foot bgs) to 373 mg/L in sample 00RDV52SL (collected in boring RT68 from zero to 0.5 foot bgs).

Lead and Antimony

Twenty-one samples were submitted for TCLP antimony and lead analyses. The extract from samples contained antimony at concentrations ranging from not detected to 46.1 mg/L. Antimony is not regulated under 40 CFR 261.24.

Lead was not detected in the extract from any of the 21 samples submitted for TCLP lead analyses.

5.5.4 Land Disposal Regulations

As previously described in Section 3, the LDRs under RCRA (40 CFR 268.45) require hazardous mercuric wastes to be further subdivided on the basis of their total mercury content. Hazardous wastes containing up to 260 mg/kg of total mercury are classified as "low level" wastes and must be stabilized before disposal by landfilling. Hazardous waste having total mercury concentrations in excess of 260 mg/kg are "high level" waste and must be retorted before disposal by landfilling.

The extract from sample 00RDV51SL, collected in boring RT73 from zero to 0.5 foot bgs, contained 0.429 mg/L of mercury. Sample FS032, which is collocated with sample 00RDV51SL, contained total mercury at a concentration of 24,500 mg/kg, exceeding the LDR threshold.

The extract from sample 00RDV34SL, collected in boring RT09 from zero to 0.5 foot bgs, contained 0.352 mg/L of mercury, exceeding TCLP criteria. However, sample FS028, which is collocated with sample 00RDV34SL, was not submitted for fixed-laboratory analyses for total mercury.

5.6 Red Devil Lodge Potable Water Supply

Table 5-4 presents the analytical results for sample 00RDV07WA, collected from the Red Devil Lodge potable water supply.

Table 5-4. Red Devil Lodge Potable Water Supply Results

Analyte	Analytical Method	Result	Units
Aluminum	EPA 200.8	ND(75)	µg/L
Antimony	EPA 200.8	ND(4)	µg/L
Arsenic	EPA 200.8	ND(10)	µg/L
Barium	EPA 200.8	124	µg/L
Beryllium	EPA 200.8	ND(0.5)	µg/L
Cadmium	EPA 200.8	ND(1)	µg/L
Calcium	EPA 200.8	18600	µg/L
Chromium	EPA 200.8	ND(12.5)	µg/L
Cobalt	EPA 200.8	ND(25)	µg/L
Copper	EPA 200.8	84.5	µg/L
Iron	EPA 200.8	ND(250)	µg/L
Lead	EPA 200.8	ND(2)	µg/L
Magnesium	EPA 200.8	7200	µg/L
Manganese	EPA 200.8	13.1	µg/L
Nickel	EPA 200.8	ND(50)	µg/L
Potassium	EPA 200.8	ND(2500)	µg/L
Selenium	EPA 200.8	ND(3)	µg/L
Silver	EPA 200.8	ND(2)	µg/L
Sodium	EPA 200.8	2990	µg/L
Thallium	EPA 200.8	ND(0.15)	µg/L
Vanadium	EPA 200.8	ND(12.5)	µg/L
Zinc	EPA 200.8	ND(100)	µg/L
Fecal Coliform	SM18 9222D	0	col/100mL
Mercury	SW7470/E245.1	ND(0.0002)	mg/L

ND = Not Detected (sample reporting limit in parentheses)
µg/L = microgram per liter
col/100mL = colonies per 100 milliliters

Inorganic chemicals for which MCLs or secondary MCLs are established were not present at concentrations exceeding regulatory criteria. Fecal coliform were not detected in the sample.

5.7 Chemical-fixation Treatability Study

Metals Treatment Technologies (MT^2) of Boulder, Colorado, performed a chemical-fixation bench-scale treatability study on retort building soils and refractory brick impacted with metals. The study was designed to develop a formulation that stabilizes TCLP leachable mercury and arsenic in Red Devil Mine soil samples.

Three soil samples and one refractory brick were provided to MT^2 for the bench-scale study. Baseline TCLP mercury and arsenic analyses were performed on each sample. All samples failed the TCLP for arsenic; however, only one soil sample failed the TCLP for mercury. The samples were treated with varying concentrations of proprietary chemicals developed by MT^2. Bench-scale tests were performed to determine the concentration of Ecobond necessary to chemically fixate the arsenic and mercury in the soil to levels that will pass the TCLP analyses. MT^2 concluded that the Red Devil Mine soil samples were successfully stabilized. Some additional optimization testing of mercury-impacted soils is recommended. A report prepared by MT^2 summarizing baseline results and study procedures and presenting conclusions is presented in Appendix I.

6.0 RECOMMENDATIONS AND CONCLUSIONS

The following sections briefly summarize results, identify data gaps, and present recommendations and conclusions.

6.1 Asbestos and Lead in Buildings

6.1.1 Asbestos

EHS identified ACM in all buildings/areas except the Powder House, Warehouse Annex, and Dry Room (see Figure 7 for summary of results). The only friable ACM identified during the survey was in the retort building. ACM in the retort building was abated in July 2000. Other ACM identified at the mine site is considered Category I and II non-friable. These types of ACM may remain in a building during demolition if the following conditions apply:

- Category I ACM is not in poor condition and is non friable;
- Category II ACM will probably not crumble, become pulverized or be reduced to powder during demolition; and
- No visible emissions can be generated from the buildings during demolition

If future demolition of mine site buildings is planned and the constraints identified above can be satisfied, demolition can commence without abating Category I and II asbestos. Workers must be Asbestos Hazard Emergency Response Act (AHERA) certified, and asbestos must be properly transported and disposed of. If the above constraints cannot be satisfied, asbestos must be abated separately from building demolition.

6.1.2 Leachable Lead

EHS identified leachable lead at concentrations above regulatory levels in the Mess Hall/ Bunkhouse; Houses #1, #3, and #4; and the warehouse (see Figure 8 for a summary of results). Bulk lead was identified in lead-wrapped heat tracing on water pipe and bell and spigot connections of drain piping, and in batteries associated with internal combustion engines. Bulk lead can be collected and shipped offsite for recycling.

There are no regulations requiring the removal of lead-based paint from buildings before demolition. However, demolition debris that is characterized as hazardous waste must be properly disposed of at a hazardous waste disposal site in accordance with EPA regulations. In addition, Occupational Safety and Health Administration (OSHA) worker protection regulations must be satisfied during future demolition of buildings containing leachable lead exceeding regulatory criteria.

A primary data gap includes identification of the sources of leachable lead in the Mess Hall/Bunkhouse; Houses #1, #3, and #4; and the warehouse. Samples collected from each building were composite samples of various materials. A laboratory result failing TCLP for lead indicates that the debris generated from a particular building will require special handling as a hazardous waste with respect to lead. Additional sampling and analysis of discrete building materials will be required to identify and separate out those building components containing leachable lead.

6.2 Building Demolition Debris

6.2.1 Building Materials

The retort building demolition debris currently staged onsite is estimated at 1,067 cubic yards of loosely compressed material. This demolition debris includes the former retort building as well as the east chemical storage building, which was located adjacent to the retort building.

Characterization samples were collected from the retort building before demolition and pressure washing of building components. Six samples of demolition debris were analyzed for TCLP metals. The extract in a composite sample of building debris (00RDV01MI) contained 0.31 mg/L of mercury, exceeding regulatory criteria. This

sample consisted of plywood, fiberboard, tin siding, and condenser manifold. A discrete sample of condenser manifold (00RDV02MI) analyzed for TCLP arsenic and mercury did not exceed regulatory criteria. The extract from samples of structural wood did not contain arsenic and mercury at concentrations exceeding regulatory criteria. Until additional discrete samples of demolition debris waste stream components are collected and analyzed for TCLP arsenic, mercury, and lead, the building debris should be assumed to be hazardous waste.

Primary data gaps for management of the retort building waste are lack of TCLP and total mercury results for discrete samples of each of the various components making up the demolition debris waste stream. BLM managers should consider RCRA time constraints for temporary storage of potentially hazardous wastes and take appropriate measures to extend the storage period. Additional characterization sampling of building demolition debris is recommended. Demolition materials suspected of being impacted by metals, such as process materials and piping associated with the retorting process, should be sampled discretely (that is, not composited). Samples should be analyzed for TCLP arsenic, TCLP mercury, and total mercury. Results can then be used to separate demolition debris into hazardous and non-hazardous wastes and identify wastes that fall under Land Disposal Regulations.

The retort building concrete foundation should be sampled and characterized for TCLP arsenic, TCLP mercury, and total mercury. Holes should be cut through the slab near cracks and joints to inspect subgrade soils for the presence of processed mercury. Following characterization, BLM may consider removing the concrete slab foundation for proper disposal. If processed mercury is present beneath the slab, it should be collected for proper disposal.

6.2.2 Refractory Brick and Furnace Slag

The extract from a refractory brick sample (00RDV03MI) contained 6.4 mg/L of arsenic and 0.22 mg/L of mercury, both of which exceed RCRA regulatory criteria. A refractory brick analyzed by Metals Treatment Technology for TCLP arsenic and mercury contained 6 mg/L of arsenic, while mercury was not detected. Asbestos was not detected in a brick submitted for PLM analysis. Refractory bricks were not analyzed for total mercury. During demolition activities each refractory brick was coated with Erpiloc, a pre-mixed lockdown penetrating ACM encapsulant, as a temporary and precautionary measure. Erpiloc is manufactured by the W.R. Grace Company specifically for encapsulating ACM. W.R. Grace Company's engineering support personnel report Erpiloc has not been tested on materials other than ACM and is not designed to prevent leaching of metals. All refractory bricks should be managed as hazardous waste.

A primary data gap for management of refractory bricks is lack of total mercury data. To fill this data gap, representative refractory brick samples should be collected and analyzed for total mercury. Assuming the representative samples contain less than 260 mg/kg of total mercury (LDRs under RCRA 40 CFR 268.45), the bricks should be managed according to one of the following options:

- Treat bricks onsite by processing to 3/8-inch in diameter or smaller (that is, 3/8-minus as required by TCLP sample preparation procedure), chemically fixate, and dispose of in the proposed onsite landfill.
- Treat as prescribed in the previous option and transport to Anchorage for disposal in the ARL.
- Transport offsite and dispose of at a permitted TSD facility.

If the representative samples contains more than 260 mg/kg of total mercury, the bricks will require retorting before disposal.

Approximately 8 cubic yards of retort furnace slag, which is a process mining waste, is adjacent to the building foundation. No characterization samples of this material have been collected to date.

Primary data gaps for management of retort furnace slag are total mercury, TCLP arsenic, and TCLP mercury analytical data. To fill this data gap, a representative slag sample must be collected and analyzed for TCLP arsenic, TCLP mercury, and total mercury. The following management options are recommended based on various analytical result scenarios:

- Assuming the slag sample extract does not contain metals at concentrations exceeding TCLP regulatory criteria, the slag can remain onsite for management as non-hazardous process mining waste.

- Assuming the slag sample extract contains mercury, arsenic, or lead at concentrations exceeding TCLP regulatory criteria, and the total mercury concentration is less than 260 mg/kg, the slag should be managed according to one of the following options:

  - Treat onsite by chemically fixating and dispose of in the proposed onsite landfill.

  - Treat as prescribed in the previous option, fixate onsite, and transport to Anchorage for disposal in the ARL.

  - Transport offsite and dispose of at a permitted TSD facility.

- Assuming the slag sample extract contains mercury at concentrations exceeding TCLP regulatory criteria, and the total mercury concentration is greater than 260 mg/kg, the slag must be retorted before disposal.

6.3 General Mine Area Investigation

Background soil data for the Red Devil Mine site are based on the USGS's estimate of mercury concentrations in samples collected along a transect perpendicular to a large surface-mined area (Bailey and Gray, 1997). Other background data are limited to one surface-soil sample collected by HLA/Wilder during the 1999 debris removal action. This sample was collected from an area that appeared to have been undisturbed by mining activity (HLA/Wilder, 1999).

In 1994, 1996, 1998, and 1999 the USGS collected soil, sediment, and water samples at the mine for speciation analyses. Preliminary review of this unpublished data suggests that in disturbed mining areas the concentration of methylmercury (meHg) in soil typically comprises less than 0.01 percent of the total mercury detected. It is interesting to note that the highest percentage of methylmercury in relation to total mercury occurred at background locations that are considered to be undisturbed or minimally impacted by mining activities.

The high concentrations of mercury observed in soil samples may be attributable to the mercury ore, or cinnabar, which is found throughout the region. Cinnabar has low solubility and is very stable, thus it is not easily converted to the more toxic, organic forms of mercury such as methylmercury.

Surface and near-surface soils collected in Soil Borings B01 through B07 contain antimony, arsenic, and mercury at concentrations exceeding background soil concentrations. Lead was not detected in surface soil, and concentrations in subsurface soils were relatively low. Samples collected from greater than 14 feet bgs exhibited a several-orders-of-magnitude reduction in antimony, arsenic, and mercury concentrations in comparison with surface and near-surface concentrations. Soils analyzed for TCLP did not exceed regulatory criteria.

The soil samples collected in borings B01 through B07 typically contained lower concentrations of metals than soil samples collected near the southwest end of the retort building foundation that are assumed to be indicative of process wastes. Elevated concentrations of metals in Soil Borings B01 through B07 may be attributable to naturally occurring conditions or mining activities.

If surface and near-surface soils in borings B01 through B07 are extraction and beneficiation wastes, they are exempt from regulation under RCRA and no further action is required. No further action is recommended for surface and near-surface soils in the general mine area unless they are determined to be process mining wastes. The BLM may elect to perform additional investigation to estimate the presence and extent of potential process wastes at the mine or to not manage those wastes determined to result from mining processes.

6.4 Groundwater

Antimony, arsenic, and mercury were detected in all samples collected. Mercury was not detected in monitoring well MW06, which is on the north side of Red Devil Creek. Monitoring well MW04, which is also on the north side of Red Devil Creek, contained mercury at 0.829 µg/L, which is one to two orders of magnitude lower than concentrations observed in wells on the south side of Red Devil Creek.

Monitoring well MW01 contained the highest concentration of mercury at 28.6 µg/L. This well appears to be downgradient from the Retort Building Area.

All wells in the General Mine Area are constructed in highly mineralized zones. Sufficient chemical data are not available to determine if metals observed in groundwater wells are indicative of naturally occurring conditions or result from leaching of mining wastes disposed of on the ground surface.

A potential data gap is the lack of groundwater data for background locations, the General Mine Area, the Retort Building Area, and the Fuel Storage Area. BLM managers may consider collecting additional groundwater data for various areas within the mine and at background locations.

6.5 Fuel Storage and Distribution System Soil Investigation

Diesel-range organics were observed in 20 of 22 soil samples collected near the fuel storage and distribution system at concentrations exceeding the ADEC soil cleanup level. Benzene was observed in 2 of 22 soil samples collected near the fuel storage and distribution system at concentrations exceeding the ADEC soil cleanup level.

A potential data gap is that the lateral and vertical extent of hydrocarbons at the mine are not known. BLM managers should notify the ADEC that a fuel release has occurred at this site. Future investigation should be performed to estimate the extent of hydrocarbons and impacts to groundwater.

6.6 Retort Building Area Investigation

Soils in the vicinity of the retort building containing arsenic and mercury are possibly process mining wastes. Soils in the vicinity of the southern edge of the building foundation exhibit the highest concentrations of mercury and arsenic. Process equipment such as furnaces and condenser piping were situated in this area of the building, and collection troughs constructed in the concrete slab drain toward a sump in the southwest end of the pad.

Available data at the Retort Building Area are insufficient to determine if the soils impacted with mercury and arsenic are extraction and beneficiation wastes or process wastes. Mining wastes disposed of in Alaska before March 1, 1990, and not actively managed are not regulated under RCRA. BLM managers may want to consider implementing a policy of not managing (i.e., disturbing) potential process mining wastes at the retort building. If soils in the vicinity of the retort building are removed from the ground, which constitutes active management, extensive investigation will be required for adequate characterization.

LDRs under RCRA (40 CFR 268.45) require hazardous mercuric wastes to be further subdivided on the basis of their total mercury content. Hazardous wastes containing up to 260 mg/kg of total mercury are classified as "low level" wastes and must be stabilized before disposal by landfilling. Hazardous waste with total mercury concentrations in excess of 260 mg/kg are "high level" waste and must be retorted before disposal by landfilling.

The extract from sample 00RDV51SL, collected in boring RT73 from zero to 0.5 foot bgs, contained 0.429 mg/L of mercury. Sample FS032, which is collocated with sample 00RDV51SL, contained total mercury at a concentration of 24,500 mg/kg.

The extract from sample 00RDV34SL, collected in boring RT09 from zero to 0.5 foot bgs, contained 0.352 mg/L of mercury. However, sample FS028, which is collocated with sample 00RDV34SL, was not submitted for fixed laboratory analysis for total mercury.

If mining wastes are determined to be process wastes and BLM actively manages these wastes, LDRs must be evaluated.

6.7 Institutional Controls

The BLM may want to consider installation of additional short-term institutional controls at the project site. A locking gate and signs warning of environmental hazards are currently installed on the access road to the mine site. However, recreational tourist groups and fishing/hunting expeditions floating the Kuskokwim River have been known to stop and inspect the mine ruins. BLM managers should consider installation of additional warning signs visible to those people trying to access the mine ruins from the Kuskokwim River and possible land routes.

6.8 Red Devil Mine Management Plan

BLM managers should prepare a comprehensive management plan for the Red Devil Mine. The general purposes of the management plan are the following:

- Identify overall long-term objectives and establish procedures for obtaining those objectives.
- Ensure environmental impacts associated with past activities are properly investigated and appropriate removal actions are taken as necessary to protect the public health, welfare, and the environment.
- Establish a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions at the site that comply with federal and state laws.
- Facilitate cooperation, exchange of information, and participation of the parties involved.

The plan, at a minimum, should do the following:

- Identify BLM's short-term and long-term management objectives for the Red Devil Mine
- Compile all available mine site data
- Construct a comprehensive database
- Prepare conceptual site models
- Identify short-term and long-term risks
- Identify data gaps
- Develop data quality objectives
- Prioritize risks and identify corrective actions

Several areas of environmental concern other than those described in this report are present at the mine site such as the areas identified by HLA/Wilder during 1999 site work. A management plan will provide a means for ensuring that all areas are dealt with in systematic order.

6.9 Risk Assessment

BLM may choose to assess the potential effects of the mine site on human health and the environment by performing comprehensive risk assessments. Human health and ecological risk assessments may be the most scientifically valid and economical methods for addressing risks at the mine site.

A risk assessment approach will be particularly beneficial should BLM managers elect not to manage process-mining wastes at the site. In addition, a human health risk assessment may justify a higher cleanup level for soils impacted by petroleum hydrocarbons and potentially impacted groundwater at the site.

6.10 Addendum

The BLM plans to perform additional fieldwork in spring or summer 2001 to fill data gaps identified in this report. Work will be summarized in an addendum to this report, which will include the following:

- An introduction and description of work performed
- Revised figures showing sample locations
- Summary of analytical results
- Revised conclusions and recommendations.

7.0 REFERENCES

ADCED (Alaska Department of Community and Economic Development). 2000. Alaska Community Database Online. December. (http://www.dced.state.ak.us/mra/CF_CIS.cfm).

ADEC. 1992. *Recommended practices and monitoring well design, installation, and decommissioning.* April.

ADEC. 1999. *Title 18 Alaska Administrative Code, Chapter 75, oil and hazardous substances pollution control regulations,* January 22.

ADEC. 2001. *How to dispose of wastes from building demolition, renovation and construction projects,* at www.state.ak.us/local/akpages/ ENV.CONSERV/deh/solidwaste/ demolitionflyer.pdf

ADF&G. 2000. News Release. Cooperative Appeal for Kuskokwim River Drainage King Salmon Conservation. July 12.

Bailey, E.A., and J.E. Gray. 1997. Mercury in the terrestrial environment, Kuskokwim Mountains Region, Southwestern Alaska. In *Geologic Studies in Alaska by the U.S. Geological Survey, 1995*, Julie A. Dumoulin and John E. Gray, Editors. U.S. Geological Survey Professional Paper 1574.

Bailey, E.A., M.E. Hines, and J.E. Gray. 1999. Biogeochemistry of mercury in soils near abandoned mercury mines in southwest Alaska, USA [abs.], 5th International Conference on Mercury as a Global Pollutant, Rio de Janeiro, Brazil, May 23-27, 1999, Conference Proceedings (submitted and accepted).

BLM. 1999. *Preliminary assessment, data requirements for federal facility docket sites, site investigation for Red Devil Mine Site.* BLM Anchorage Field Office. December 6.

Cady, W.M., R.E. Wallace, J.M. Hoare, and E.J. Webber. 1955. *The Central Kuskokwim region, Alaska.* U.S. Geological Survey Professional Paper 268, 132 p., 5 pls.

Code of Federal Regulations, Title 40, Part 261, Section 24, *Maximum concentrations of contaminants for the toxicity characteristic.*

EHS (EHS-Alaska, Inc). 2000. *Asbestos and lead survey report, various buildings and areas, Red Devil Mine, Red Devil, Alaska.* September 29.

EPA, Region 3. 1999. *Risk-based concentration table.* Online at www.epa.gov/reg3hwmd/ risk/riskmenu. September 15.

EPA, Region 9. 1999. *Preliminary remedial goals for planning purposes.* Online at www.epa.gov/region09/waste/ sfund/prg/index. September 15.

EPA. 1986. *Test methods for evaluation of solid waste.* Updated through January 1998.

Fernald, 1960, USGS Bulletin 1071-G, *Geomorphology of the Upper Kuskokwim Region, Alaska.*

HLA/Wilder. 1997a. *Safety and Health Plan, Hazardous Materials Removal Actions, Various Locations, Alaska.*

HLA/Wilder. 1997b. *Quality Assurance Program Plan, Hazardous Materials Removal Actions, Various Locations, Alaska.*

HLA/Wilder. 1999. *Limited Waste Removal Action, Red Devil Mine, Red Devil, Alaska.* November.

HLA/Wilder. 2000a. *Work Plan, Remedial Action and Additional Site Investigation, Red Devil Mine, Red Devil, Alaska.*

HLA/Wilder. 2000b. *Engineering evaluation/cost analysis, Red Devil Mine, Red Devil, Alaska.* April 10.

HLA/Wilder. 2000c. Work Plan Addendum Letter. July 14.

MacKevett, E.M., and H.C. Berg. 1963. *Geology of the Red Devil quicksilver mine, Alaska.* U.S. Geological Survey Bulletin 1142-G, 16 pp.

Meyer, Mark. 1985. *Mineral investigation of the Iditarod-George Planning Block, Central Kukokiva River Area, Alaska.* Open file report.

Miller, J.F. 1963. *Probable maximum precipitation and rainfall-frequency data for Alaska.* Technical Paper No. 47. U.S. Weather Bureau, Washington, D.C.

RFW (Roy F. Weston). 1989. *Final Report, Site Inspection, Red Devil Mine.* June.

TNH (Tryck Nyman Hayes, Inc.). 1987. *Red Devil Mine CERCLA Site Inspection Report.* September.

UA. 1974. Alaska Regional Profiles. University of Alaska, Arctic Environmental Information and Data Center. July.

USACE (U.S. Army Corps of Engineers). Undated. *Alaska District Corps of Engineers Flood Plain Management Services, High Water Elevation Identification for Community of Red Devil.*

USGS. 1954. Topographic Map. Sleetmute, Alaska.

USFWS (U.S. Fish and Wildlife Service). 1994. National Wetlands Inventory, 1:40,000 maps Sleetmute C-4 and D-4.

USDOI (U.S. Department of the Interior, Geological Survey), 1958. Geologic Map of the Red Devil Mine Area, Alaska, Plate 2 in MacKevett, E.M., and Berg, H.C., 1963, Geology of the Red Devil quicksilver mine, Alaska: U.S. Geological Survey Bulletin 1142-G.

USGS. 1996. Unpublished data, sampling at Red Devil. July.

USGS. 1998. Unpublished data, sampling at Red Devil. May.

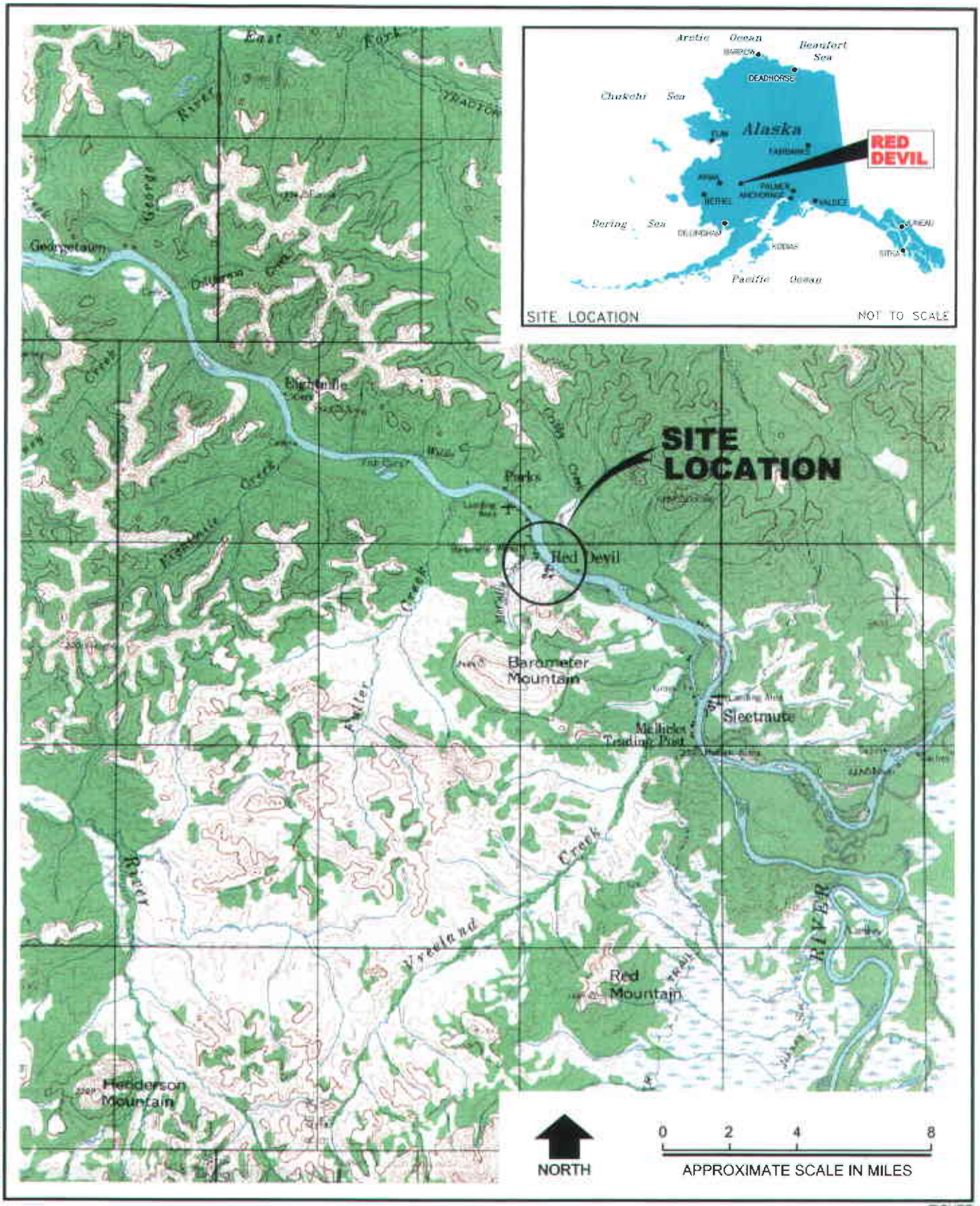
USGS. 1999. Unpublished data, sampling at Red Devil. July.

Vanderpoole, Gail, and Richard Wilmarth. 1999. Oral communication with BLM personnel.

Wang, Bronwen. 1999. *Spatial distribution of chemical constituents in the Kuskokwim River, Alaska.* U.S. Geological Survey, Water-Resources Investigations Report 99-4177, 33 pp.

Webber et al. 1947.
WRCC (Western Region Climate Center). 2000. Aniak Airport climate summary at www.wrcc.dri.edu/cgi-bin/cliRECtM.pl/akania.

FIGURES



Harding Lawson Associates/
Wilder Construction Company
Joint Venture

Site Location and Vicinity Maps

Red Devil, Alaska

FIGURE
1

DRAWN	PROJECT NUMBER	APPROVED	DATE
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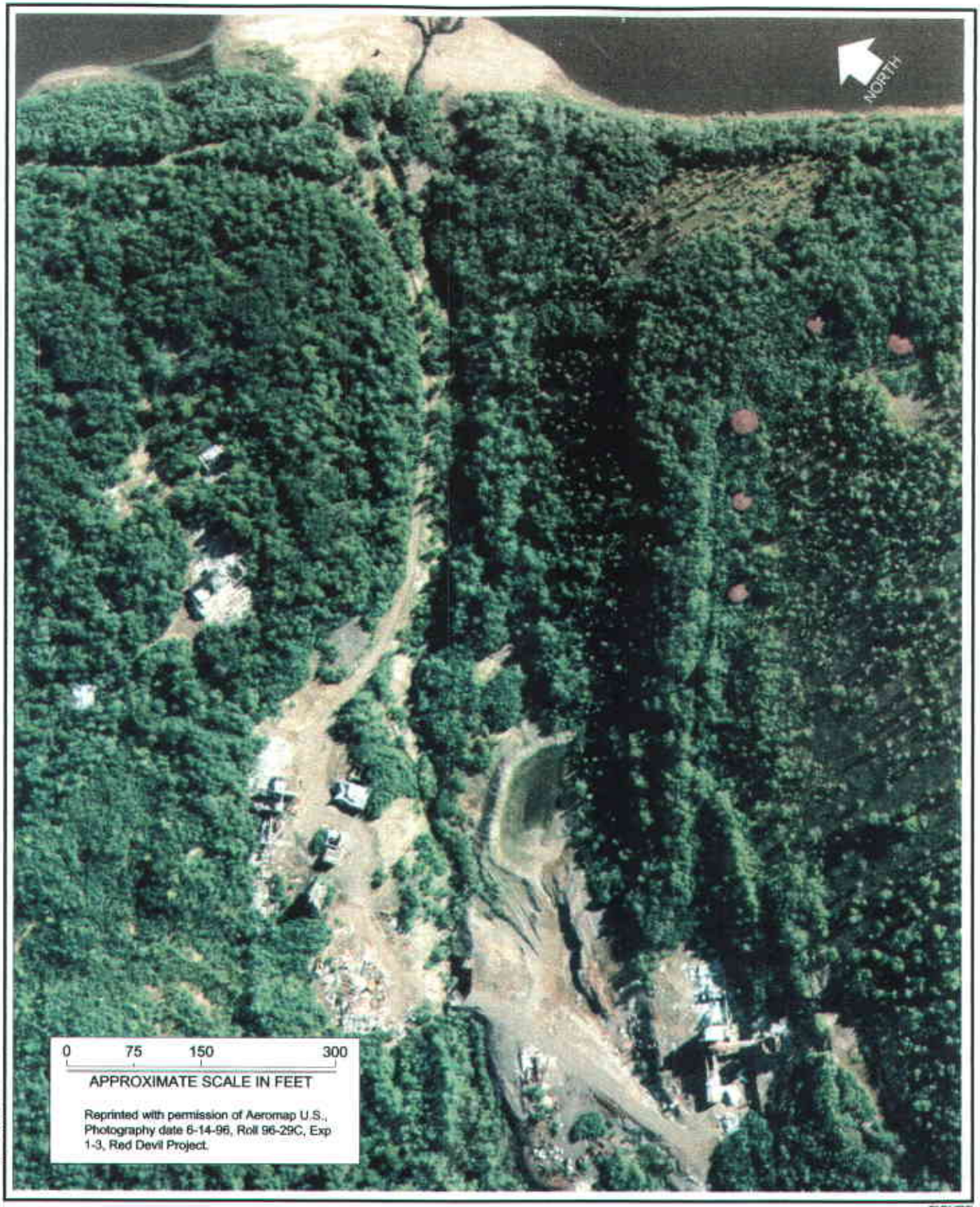

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HLA WILDER

Harding Lawson Associates/
Wilder Construction Company
Joint Venture

Aerial Photograph of Red Devil Mine
June 14, 1996

Red Devil, Alaska

FIGURE
2

DRAWN	PROJECT NUMBER	APPROVED	DATE
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Harding Lawson Associates/
Wilder Construction Company
Joint Venture

HLA WILDER

August 2000 Oblique Photograph

Red Devil, Alaska

FIGURE
3

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mlp	03/2001

NORTH

HOUSE 5

POWDER HOUSE

HOUSE 6

HOUSE 7

MESS HALL / BUNKHOUSE

SHOP BUILDING

DRY ROOM

HOIST SHACK 2

SHOP PAD

WAREHOUSE

POWER PLANT

HOIST SHACK

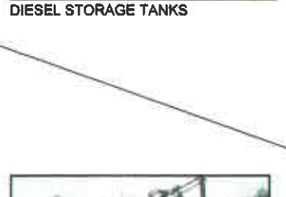
STORAGE SHED

HOUSE 3

HOUSE 4

HOUSE 2

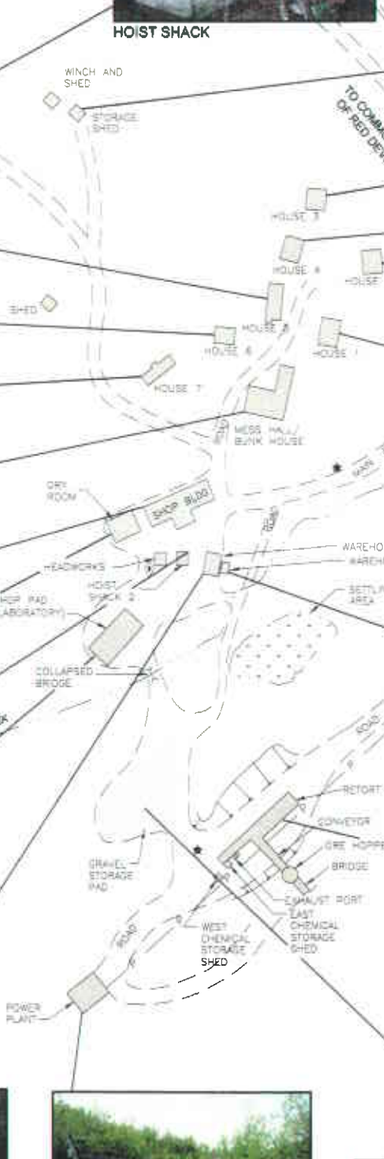
HOUSE 1


DIESEL STORAGE TANKS

WAREHOUSE ANNEX

GRAVEL STORAGE PAD

RETORT BUILDING



LEGEND

- BUILDING
- (AST) ABOVEGROUND STORAGE TANK
- ADITS
- INCLINE SHAFT

NOT TO SCALE

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HLA WILDER

Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Site Plan

Red Devil, Alaska

FIGURE **4**

DRAWN	PROJECT NUMBER	APPROVED	DATE
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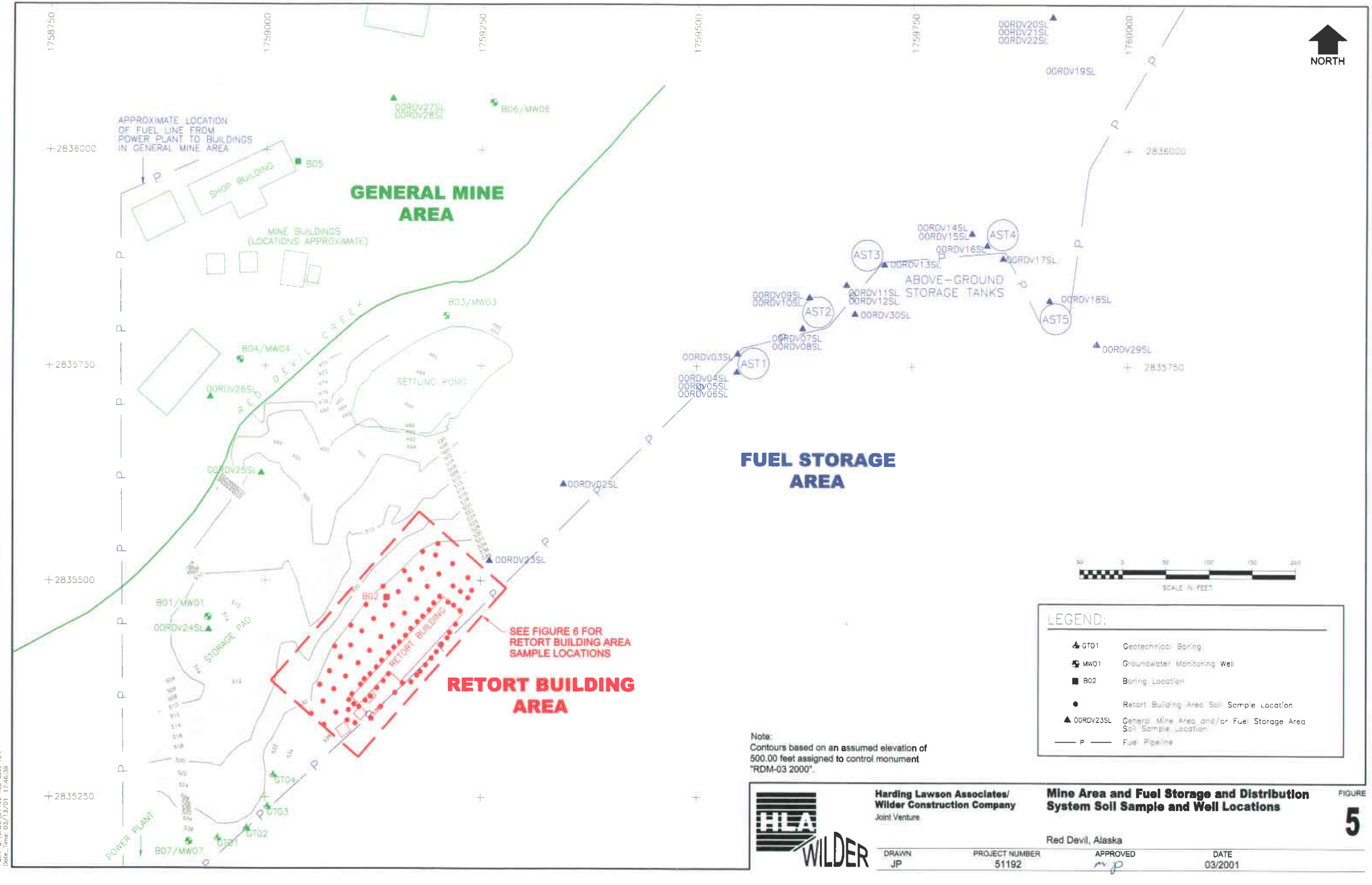

50 0 50 100 150 200

SCALE IN FEET

LEGEND:

GT01	Geotechnical Boring
MW01	Groundwater Monitoring Well
B02	Boring Location
●	Retort Building Area Soil Sample Location
▲ 00RDV23SL	General Mine Area and/or Fuel Storage Area Soil Sample Location
—— P ——	Fuel Pipeline

Note:
Contours based on an assumed elevation of 500.00 feet assigned to control monument "RDM-03 2000".

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Harding Lawson Associates/ Wilder Construction Company
Joint Venture

HLA WILDER

Mine Area and Fuel Storage and Distribution System Soil Sample and Well Locations

Red Devil, Alaska

FIGURE **5**

DRAWN	PROJECT NUMBER	APPROVED	DATE
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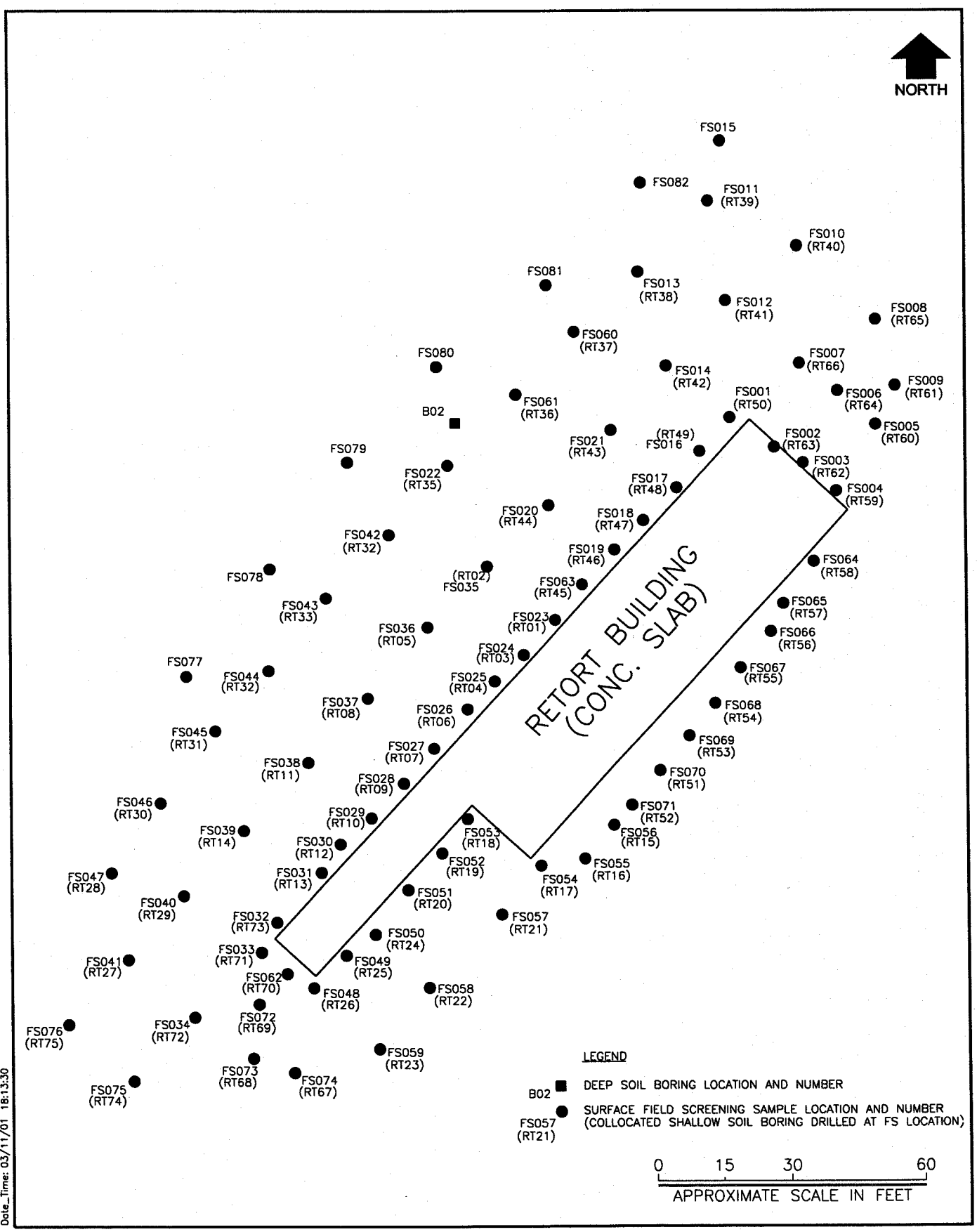

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Harding Lawson Associates/
Wilder Construction Company
Joint Venture

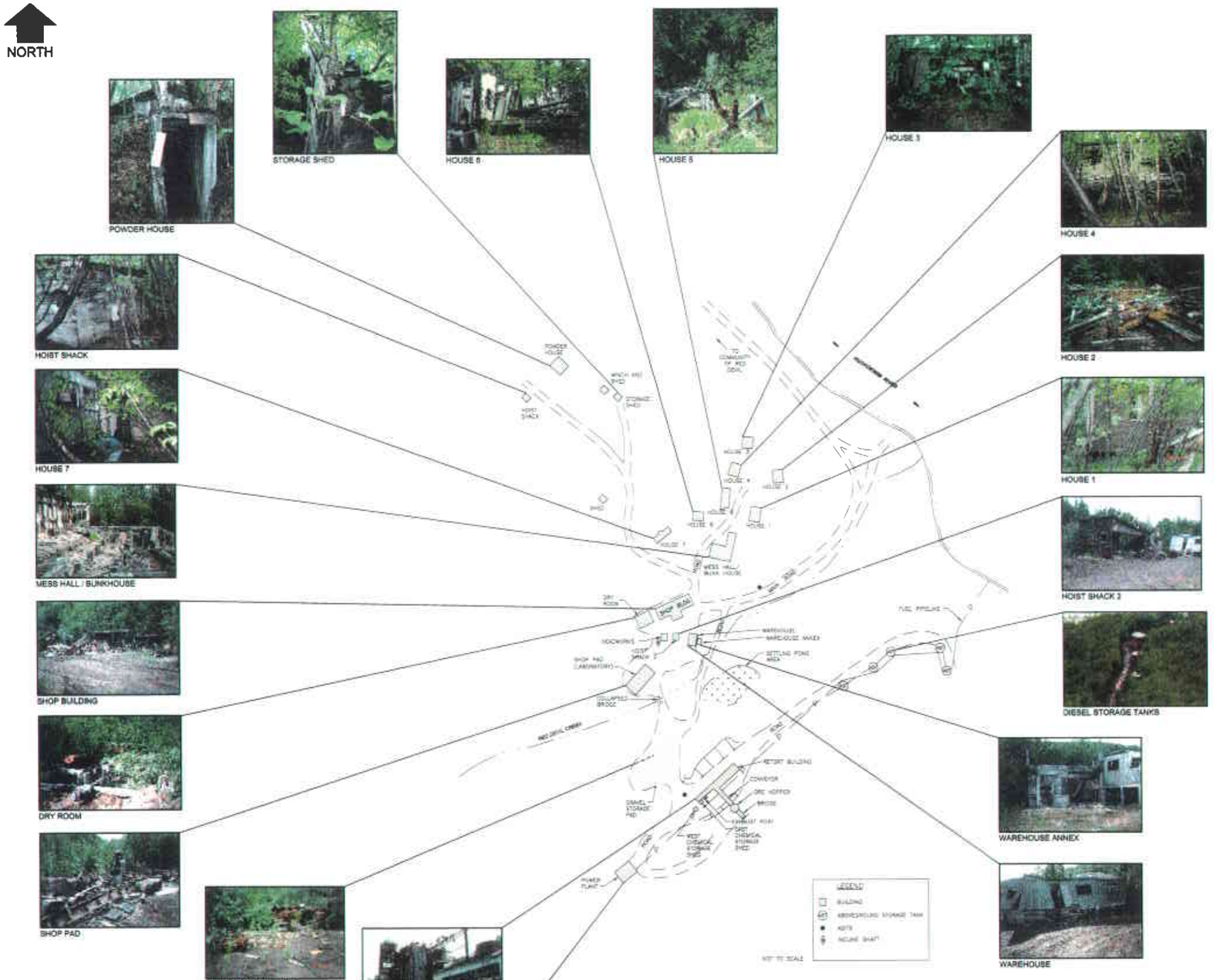
HLA WILDER

Retort Building Sample Locations

FIGURE **6**

Red Devil, Alaska

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mp	03/2001



BUILDING OR LOCATION	ASBESTOS CONTAINING MATERIAL	CONTENT (%)	LOCATION	ESTIMATED QUANTITY [1]
Retort Building	Rope packing insulation	90	U-bends in process piping	250 LF
	Pipe insulation	35	Horizontal pipe run above process piping and on all materials below	Originally 70 LF but extent of contamination unknown
	Flange gaskets and valve packing	30 – 50	Miscellaneous piping systems and equipment	1 Lot
	Cement asbestos board	25 – 30	Flue at storage shed and scattered around site	35 SF (may be more beneath debris)
Power Plant	Cement asbestos board	20 – 30	Electrical Control Panel	40 SF
	Wire insulation	15	Electrical Control Panel	500 LF
	Flange gaskets and valve packing	75	Misc piping systems and equipment	1 Lot
Gravel Storage Pad	Brake shoes and clutches	Assumed	Misc equipment	1 Lot
	Flange gaskets and valve packing	Assumed	Misc piping systems and equipment	1 Lot
Diesel Storage Tanks	Valve packing	Assumed	Misc valves in storage tank piping system	1 Lot
Mess Hall/ Bunkhouse	Cement asbestos board shingles	15	Stacked near north of building	50 SF
	Floor tile and mastic	2.5 – 8.5	Scattered throughout debris	3,500 SF
	GWB/joint compound system	1.8 – 2.3	East-west hallway and misc surfaces	1,200 SF
	Gray roofing sealant	2.5	Above west entrance	50 SF
House # 1	Cement asbestos board shingles	20	Exterior wall siding	1,050 SF
House # 2	Floor tile and mastic	8 – 10	Scattered throughout debris	650 SF
	Cement asbestos board flue	30	On ground, south of house	35 SF (may be more beneath debris)
House # 3	Cement asbestos board shingles	25	Exterior wall siding	1,050 SF
	GWB/Joint compound system	1.5 – 1.8	Interior walls	1,800 SF
House # 4 (duplex)	Cement asbestos board shingles	15	Exterior wall siding	1,050 SF
	GWB/Joint compound system	3	Bathroom walls	550 SF
	Floor tile and mastic	2.5 – 5.5	Throughout duplex	800 SF
House # 5	Cement asbestos board shingles	20	In debris	200 SF
	Cement asbestos board flue	25	On ground at north end of building	35 SF
House # 6	Cement asbestos board shingles	25	Misc exterior surfaces	250 SF
	GWB/Joint compound system	3.5	Misc walls	500 SF
	Floor tile and mastic	3.4 – 15	Throughout building	800 SF
House # 7	Cement asbestos board shingles	20 – 30	Exterior wall siding	900 SF
Powder House	No ACM was identified	N/A	N/A	N/A
Hoist Shack	Brake pads	Assumed	Winch mechanism	1 set
Storage Shed	Brake pads	Assumed	Hoist up the hill from the shed	1 set
Shop Pad	Brake shoes, flange gaskets, and valve packing	Assumed	Misc piping systems and equipment	1 Lot
Hoist Shack 2	Brake pads	35	Winch mechanism	1 Lot
	Roofing sealant	15	Rolled roofing	20 SF
Warehouse	Flange gaskets and valve packing	Assumed	Misc materials on floor	1 Lot
Warehouse Annex	No ACM was detected	N/A	N/A	N/A
Shop Building	Floor tile and mastic	2 – 6.8	Throughout debris	500 SF
	Flange gaskets and valve packing	Assumed	Misc piping systems and equipment	1 Lot
Dry Room	No ACM was detected	N/A	N/A	N/A

1. EHS – Alaska, Inc., estimated quantities based on visual observations and professional judgement. Due to dilapidated condition of the buildings not all materials were visible.

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Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Asbestos Survey Results

Red Devil, Alaska

FIGURE 7

DRAWN	PROJECT NUMBER	APPROVED	DATE
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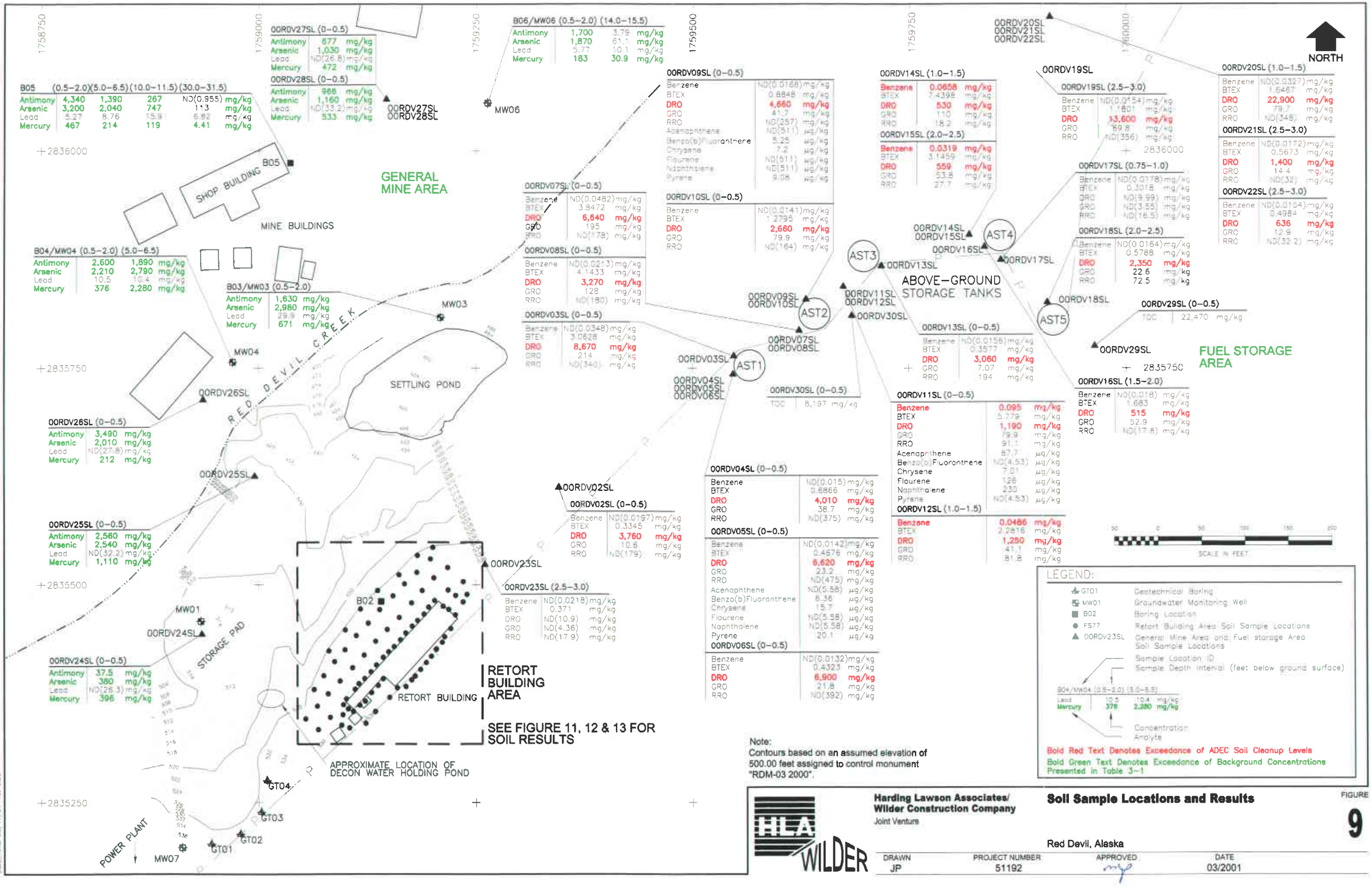

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Harding Lawson Associates/ Wilder Construction Company
Joint Venture

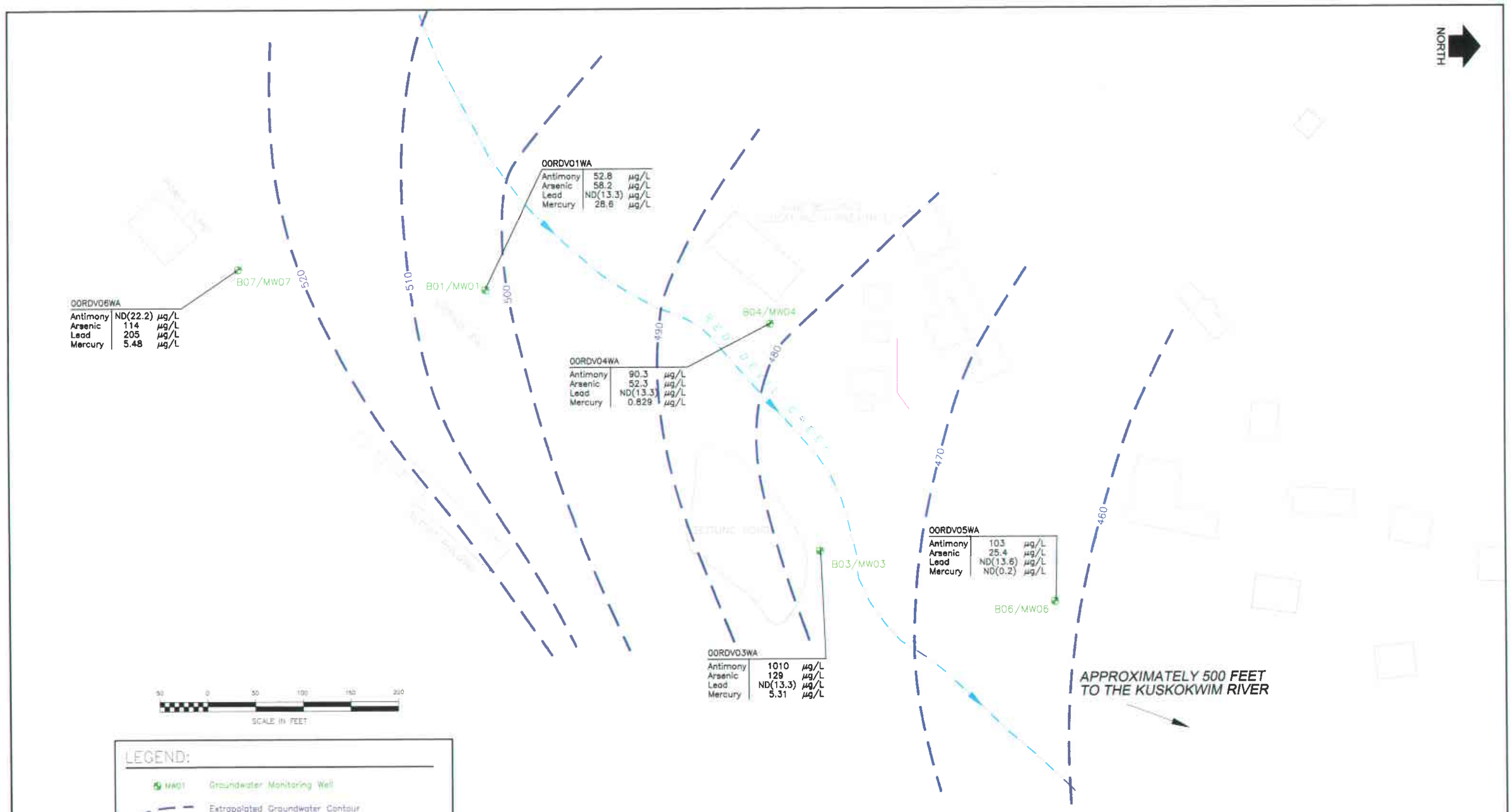
HLA WILDER

Soil Sample Locations and Results

Red Devil, Alaska

FIGURE 9

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mjp	03/2001



Note:
Groundwater contours are based on water elevations from monitoring wells (measured during well sampling on August 14, 2000), Red Devil Creek, and local topography. Groundwater levels will fluctuate seasonally and groundwater generally flows towards the Kuskokwim River.

Contours are based on an assumed elevation of 500.00 feet assigned to a control monument "RDM-03 2000".

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HLA WILDER

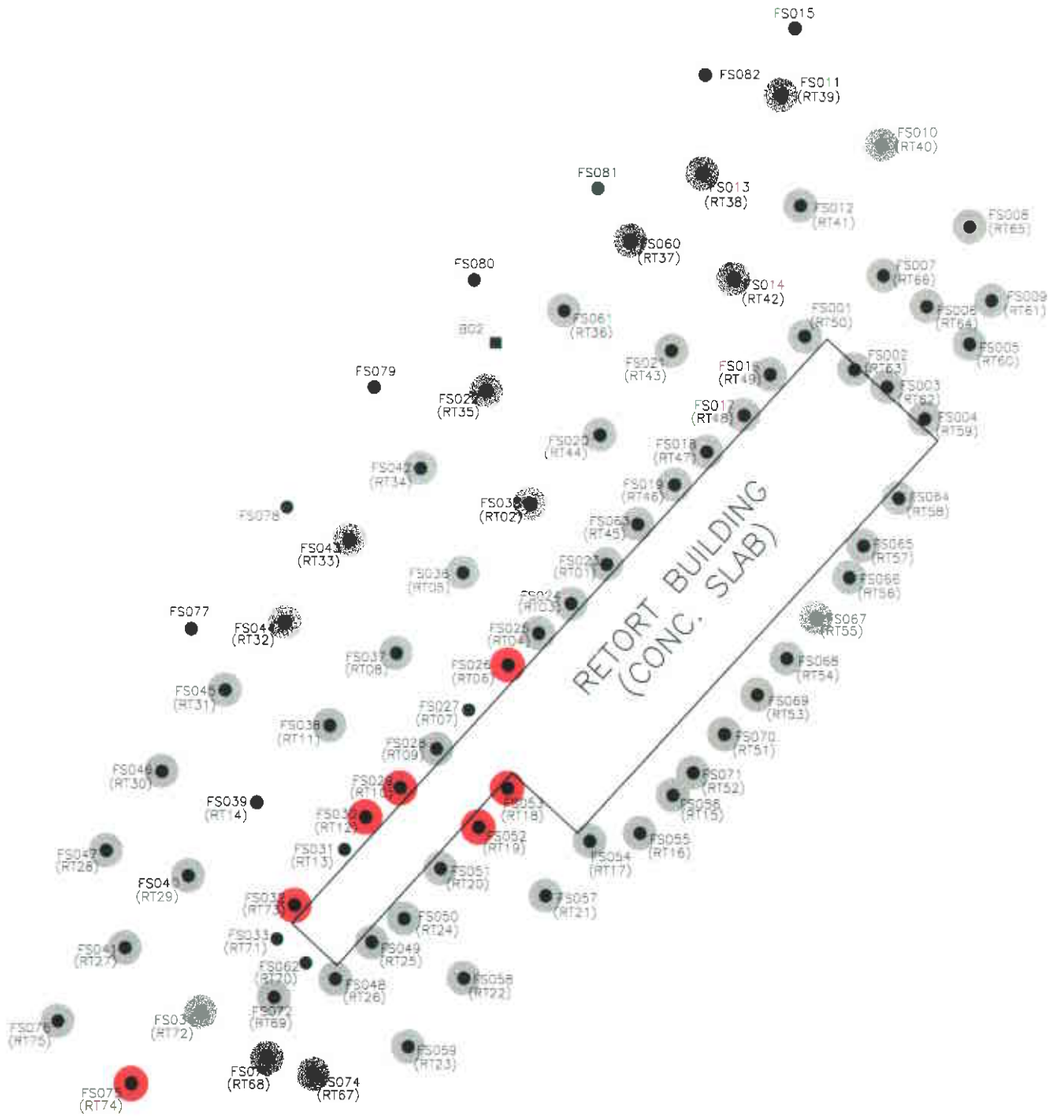
Harding Lawson Associates/
Wilder Construction Company
Joint Venture

Groundwater Elevation Map and Sampling Analytical Results

Red Devil, Alaska

FIGURE **10**

DRAWN	PROJECT NUMBER	APPROVED	DATE
EL	51192	MF	03/2001



Soil Boring or Field Screening Location	Corrected Mercury Concentration (ppm)	Soil Boring or Field Screening Location	Corrected Mercury Concentration (ppm)
RT01	<25	RT39	<25
RT02	<25	RT40	<25
RT03	387	RT41	9
RT04	<25	RT42	<25
RT05	<25	RT43	<25
RT06	3554	RT44	<25
RT08	10	RT45	<25
RT09	175	RT46	<25
RT10	522	RT47	20
RT11	<25	RT48	<25
RT12	1162	RT49	<25
RT15	17	RT50	<25
RT16	<25	RT51	<25
RT17	7	RT52	<25
RT18	893	RT53	<25
RT19	1802	RT54	<25
RT20	457	RT55	<25
RT21	<25	RT56	<25
RT22	<25	RT57	189
RT23	<25	RT58	<25
RT24	25	RT59	130
RT25	154	RT60	<25
RT26	311	RT61	<25
RT27	<25	RT62	<25
RT28	<25	RT63	154
RT29	<25	RT64	<25
RT30	<25	RT65	<25
RT31	<25	RT66	<25
RT32	<25	RT67	<25
RT33	217	RT68	252
RT34	<25	RT69	<25
RT35	<25	RT72	258
RT36	6	RT73	1150
RT37	<25	RT74	1410
RT38	460	RT75	<25

Red Text Denotes Sample Containing Mercury at a Concentration >500 ppm

LEGEND

B02 ■ DEEP SOIL BORING LOCATION AND NUMBER

FS057 (RT21) ● SURFACE SAMPLE AND SOIL BORING LOCATION

LOCATIONS OF SAMPLES FIELD-SCREENED FOR MERCURY USING XRF

LOCATIONS OF SAMPLES CONTAINING MERCURY AT A CONCENTRATION >500 ppm

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HLA WILDER

Harding Lawson Associates/
Wilder Construction Company
Joint Venture

XRF Mercury in Retort Building Area Soil (Sample Interval of 1.5-3.0 feet bgs)

Red Devil, Alaska

FIGURE 12

DRAWN	PROJECT NUMBER	APPROVED	DATE
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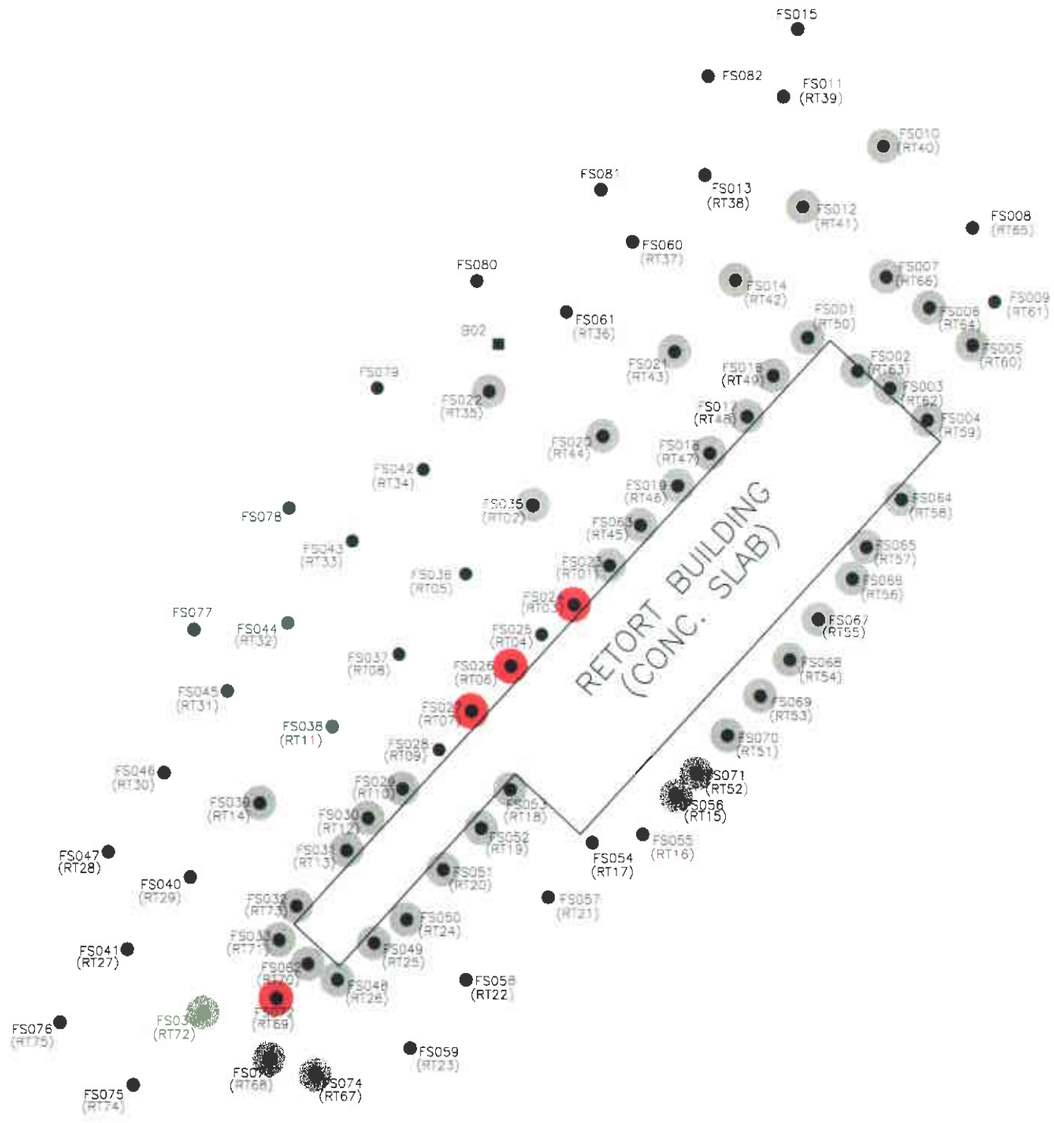

Soil Boring or Field Screening Location	Corrected Mercury Concentration (ppm)	Soil Boring or Field Screening Location	Corrected Mercury Concentration (ppm)
RT01	<25	RT47	<25
RT02	<25	RT48	<25
RT03	2368	RT49	<25
RT06	788	RT50	<25
RT07	1960	RT51	<25
RT10	<25	RT52	8
RT12	191	RT53	<25
RT13	188	RT54	<25
RT14	16	RT55	<25
RT14	16	RT56	<25
RT15	<25	RT57	<25
RT18	18	RT58	<25
RT19	<25	RT59	<25
RT20	214	RT60	<25
RT24	<25	RT62	14
RT25	170	RT63	<25
RT26	20	RT64	<25
RT35	<25	RT66	<25
RT40	<25	RT67	9
RT41	<25	RT68	12
RT42	7	RT69	2046
RT43	<25	RT70	<25
RT44	<25	RT71	<25
RT45	<25	RT72	<25
RT46	<25	RT73	14

Red Text Denotes Sample Containing Mercury at a Concentration >500 ppm

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Harding Lawson Associates/
Wilder Construction Company
Joint Venture

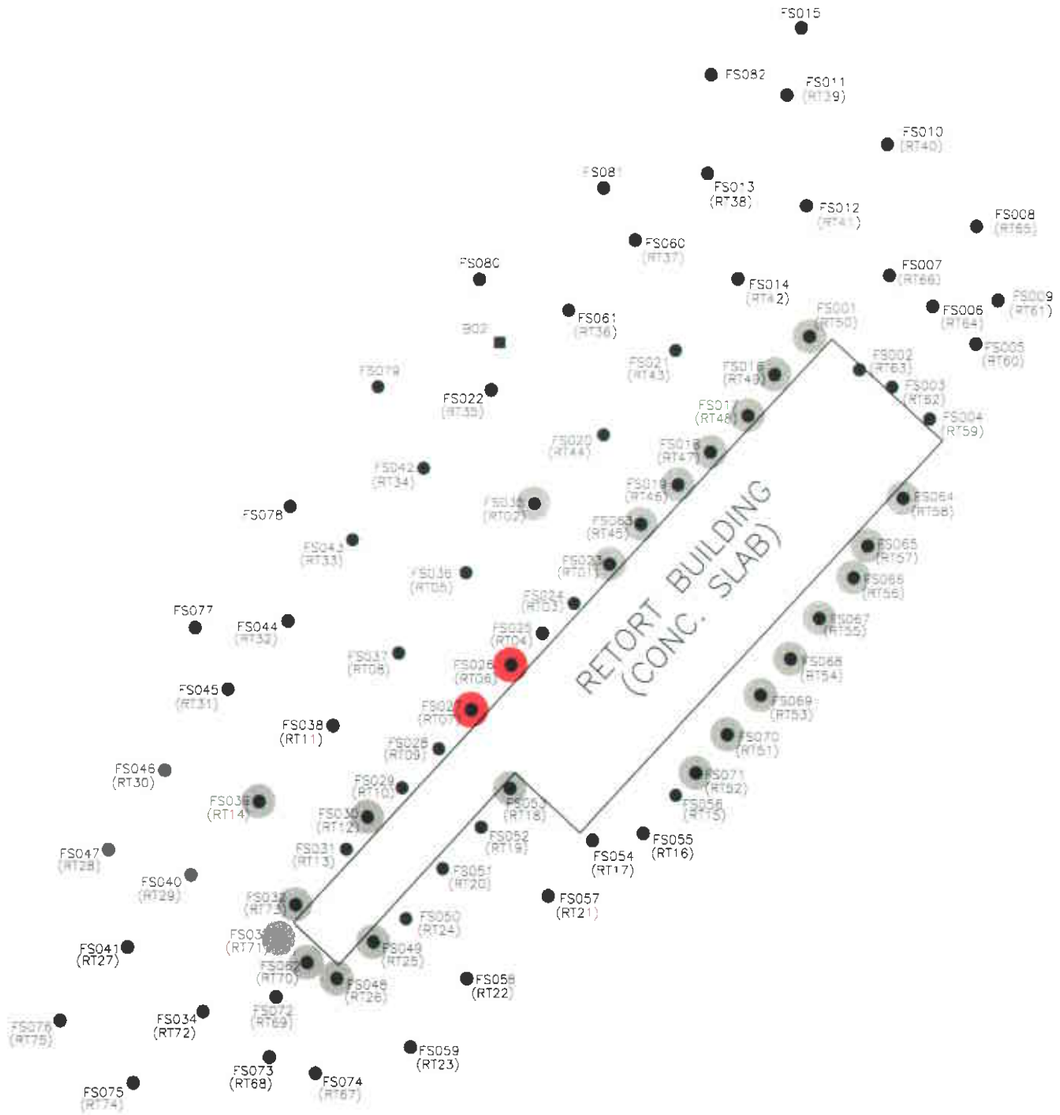
HLA WILDER

XRF Mercury In Retort Building Area Soil (Sample Interval of 3.0-4.5 feet bgs)

Red Devil, Alaska

FIGURE 13

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mjp	03/2001



Soil Boring or Field Screening Location	Corrected Mercury Concentration (ppm)
RT50	6.1
RT70	13
RT71	14
RT73	14.2
RT14	150.5
RT26	230
RT12	322.5
RT07	1100
RT06	2428
RT01	<25
RT02	<25
RT18	<25
RT25	<25
RT45	<25
RT46	<25
RT47	<25
RT48	<25
RT49	<25
RT51	<25
RT52	<25
RT53	<25
RT54	<25
RT55	<25
RT56	<25
RT57	<25
RT58	<25

Red Text Denotes Sample Containing Mercury at a Concentration >500 ppm

NORTH

0 15 30 60
SCALE IN FEET

LEGEND

B02 ■ DEEP SOIL BORING LOCATION AND NUMBER

FS057 (RT21) ● SURFACE SAMPLE AND SOIL BORING LOCATION

LOCATIONS OF SAMPLES FIELD-SCREENED FOR MERCURY USING XRF

LOCATIONS OF SAMPLES CONTAINING MERCURY AT A CONCENTRATION >500 ppm

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HLA WILDER

Harding Lawson Associates/
Wilder Construction Company
Joint Venture

XRF Mercury in Retort Building Area Soil (Sample Interval of >5.0 feet bgs)

Red Devil, Alaska

FIGURE 14

DRAWN	PROJECT NUMBER	APPROVED	DATE
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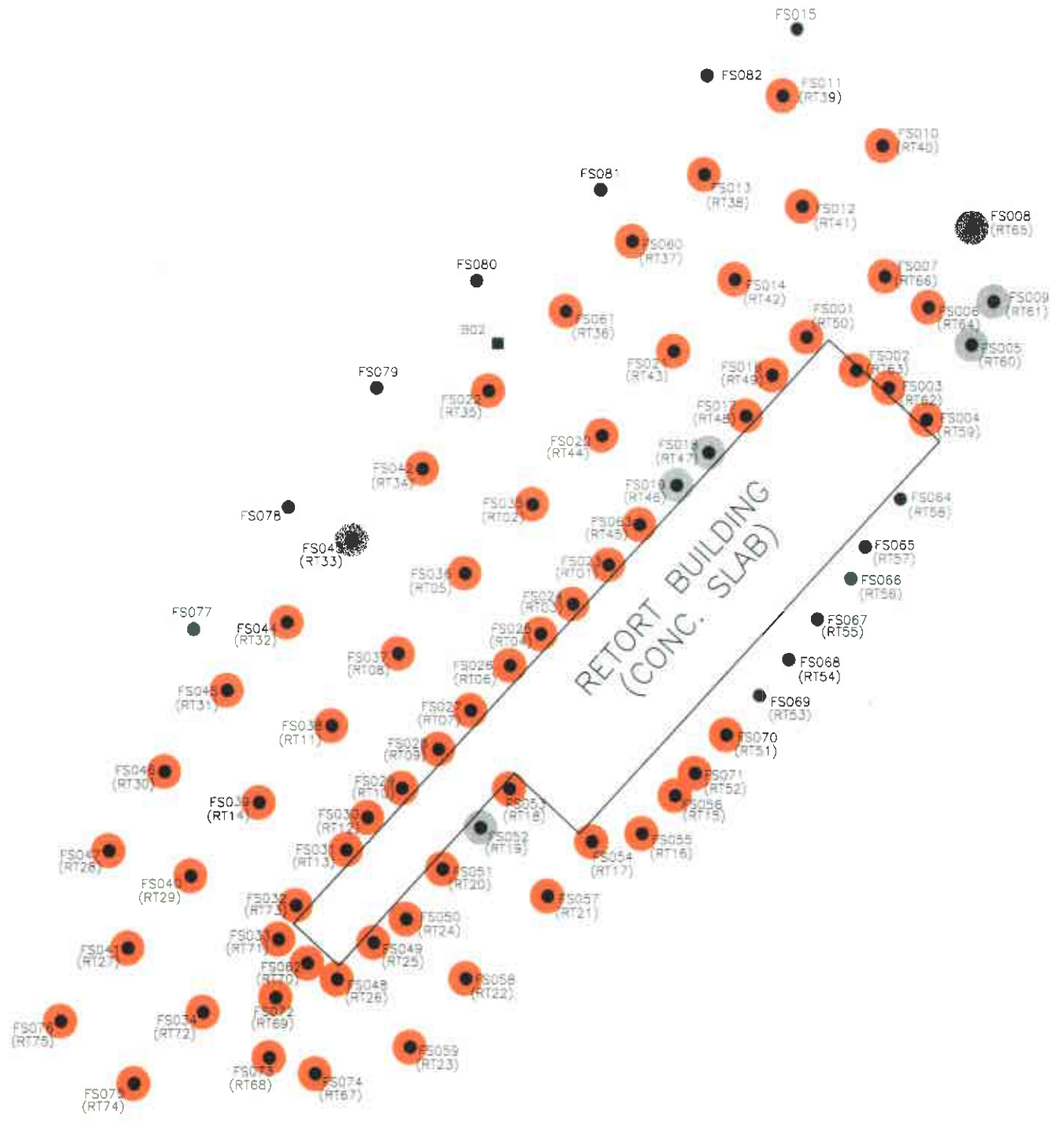

Soil Boring or Field Screening Location	Corrected Arsenic Concentration (ppm)	Soil Boring or Field Screening Location	Corrected Arsenic Concentration (ppm)
RT01	1759	RT36	1827
RT02	2168	RT37	1893
RT03	4085	RT38	2301
RT04	3789	RT39	1518
RT05	2515	RT40	664
RT06	3587	RT41	1176
RT07	4687	RT42	1351
RT08	1747	RT43	6703
RT09	5618	RT44	605
RT10	3587	RT45	1545
RT11	1164	RT46	418
RT12	2884	RT47	297
RT13	30947	RT48	728
RT14	2663	RT49	617
RT15	3769	RT50	3675
RT16	929	RT51	2388
RT17	1887	RT52	1063
RT18	622	RT59	1203
RT19	72	RT60	271
RT20	2670	RT61	220
RT21	1070	RT62	882
RT22	2515	RT63	598
RT23	517	RT64	1284
RT24	4451	RT65	315
RT25	17217	RT66	688
RT26	598	RT67	3609
RT27	2263	RT68	5047
RT28	782	RT69	5227
RT29	3401	RT70	10991
RT30	2041	RT71	3085
RT31	1217	RT72	3789
RT32	2556	RT73	10519
RT33	244	RT74	3649
RT34	2054	RT75	7841
RT35	3675		

Orange Text Denotes Sample Containing Arsenic at a Concentration >500 ppm

LEGEND

B02 DEEP SOIL BORING LOCATION AND NUMBER

FS057 (RT21) SURFACE SAMPLE AND SOIL BORING LOCATION

LOCATIONS OF SAMPLES FIELD-SCREENED FOR ARSENIC USING XRF

LOCATIONS OF SAMPLES CONTAINING ARSENIC AT A CONCENTRATION >500 ppm

NORTH

0 15 30 60

SCALE IN FEET

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Harding Lawson Associates/ Wilder Construction Company
Joint Venture

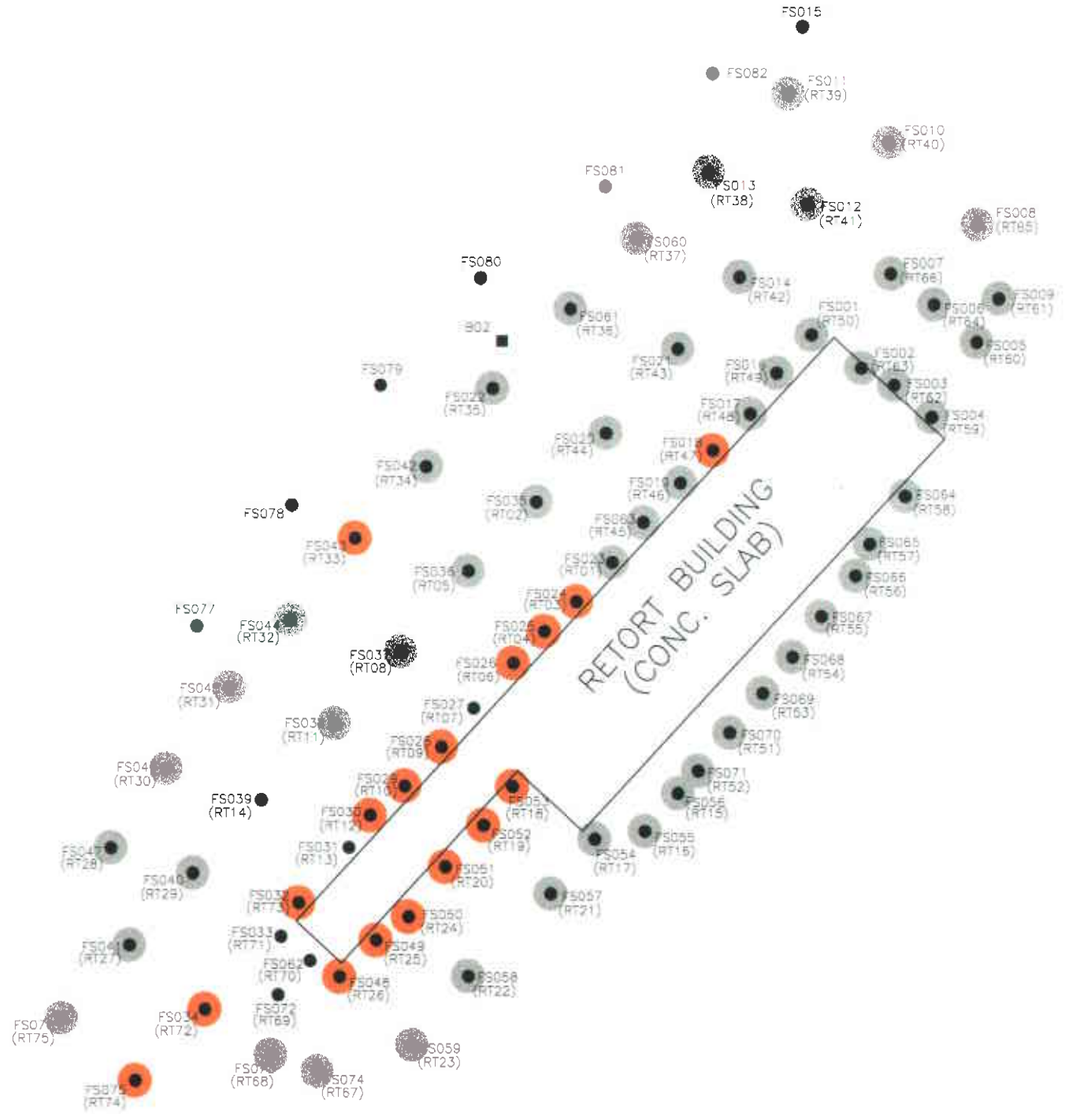
HLA WILDER

XRF Arsenic in Retort Building Area Surface Soil (Sample Interval of 0-0.5 feet bgs)

FIGURE **15**

Red Devil, Alaska

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		03/2001



Soil Boring or Field Screening Location	Corrected Arsenic Concentration (ppm)	Soil Boring or Field Screening Location	Corrected Arsenic Concentration (ppm)
RT01	160	RT38	223
RT02	243	RT39	39
RT03	949	RT40	38
RT04	802	RT41	132
RT05	492	RT42	184
RT06	7976	RT43	43
RT08	122	RT44	64
RT09	585	RT45	362
RT09	695	RT46	363
RT10	2817	RT47	555
RT11	133	RT48	39
RT12	3013	RT49	46
RT15	113	RT50	56
RT16	<LOD	RT51	178
RT17	90	RT52	58
RT18	1578	RT53	96
RT19	5532	RT54	88
RT20	3710	RT55	95
RT21	91	RT56	80
RT22	51	RT57	293
RT23	196	RT58	<LOD
RT24	1291	RT59	439
RT25	1813	RT60	197
RT26	1459	RT61	64
RT27	376	RT62	33
RT28	334	RT63	384
RT29	253	RT64	43
RT30	310	RT65	<LOD
RT31	108	RT66	188
RT32	105	RT67	119
RT33	2088	RT68	245
RT34	133	RT69	397
RT35	52	RT72	2061
RT36	70	RT73	2114
RT37	50	RT74	76365
		RT75	480

Orange Text Denotes Sample Containing Arsenic at a Concentration >500 ppm

Harding Lawson Associates/
Wilder Construction Company
Joint Venture

HLA WILDER

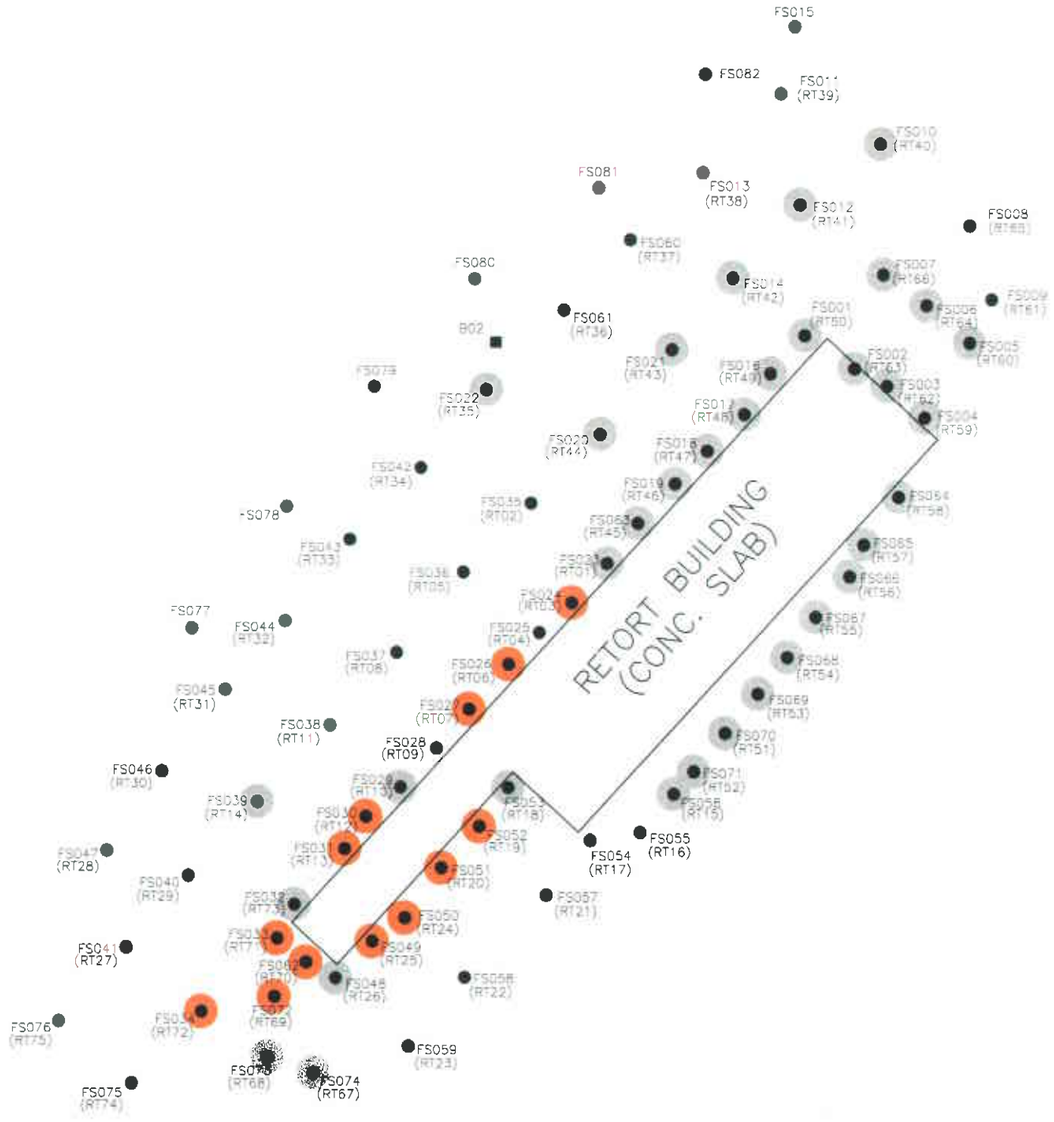
XRF Arsenic in Retort Building Area Soil (Sample Interval of 1.5-3.0 feet bgs)

Red Devil, Alaska

FIGURE 16

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		03/2001

File: 51192A23.DWG
Path: Q:\CAD\51192 RED DEVIL RA\
Date_Time: 03/11/01 14:07:01



Soil Boring or Field Screening Location	Corrected Arsenic Concentration (ppm)	Soil Boring or Field Screening Location	Corrected Arsenic Concentration (ppm)
RT01	78	RT48	250
RT02	39	RT49	87
RT03	3212	RT50	43
RT06	2858	RT51	93
RT07	3776	RT52	99
RT10	294	RT53	69
RT12	1097	RT54	68
RT13	2584	RT55	60
RT14	253	RT56	122
RT15	102	RT57	33
RT18	437	RT58	40
RT19	862	RT59	88
RT20	1639	RT60	50
RT24	996	RT62	111
RT25	1217	RT63	52
RT26	417	RT64	22
RT35	62	RT66	209
RT40	33	RT67	102
RT41	28	RT68	159
RT42	60	RT69	1753
RT43	41	RT70	1097
RT44	74	RT71	622
RT45	68	RT72	839
RT46	110	RT73	263
RT47	34		

Orange Text Denotes Sample Containing Arsenic at a Concentration >500 ppm

Harding Lawson Associates/ Wilder Construction Company
Joint Venture

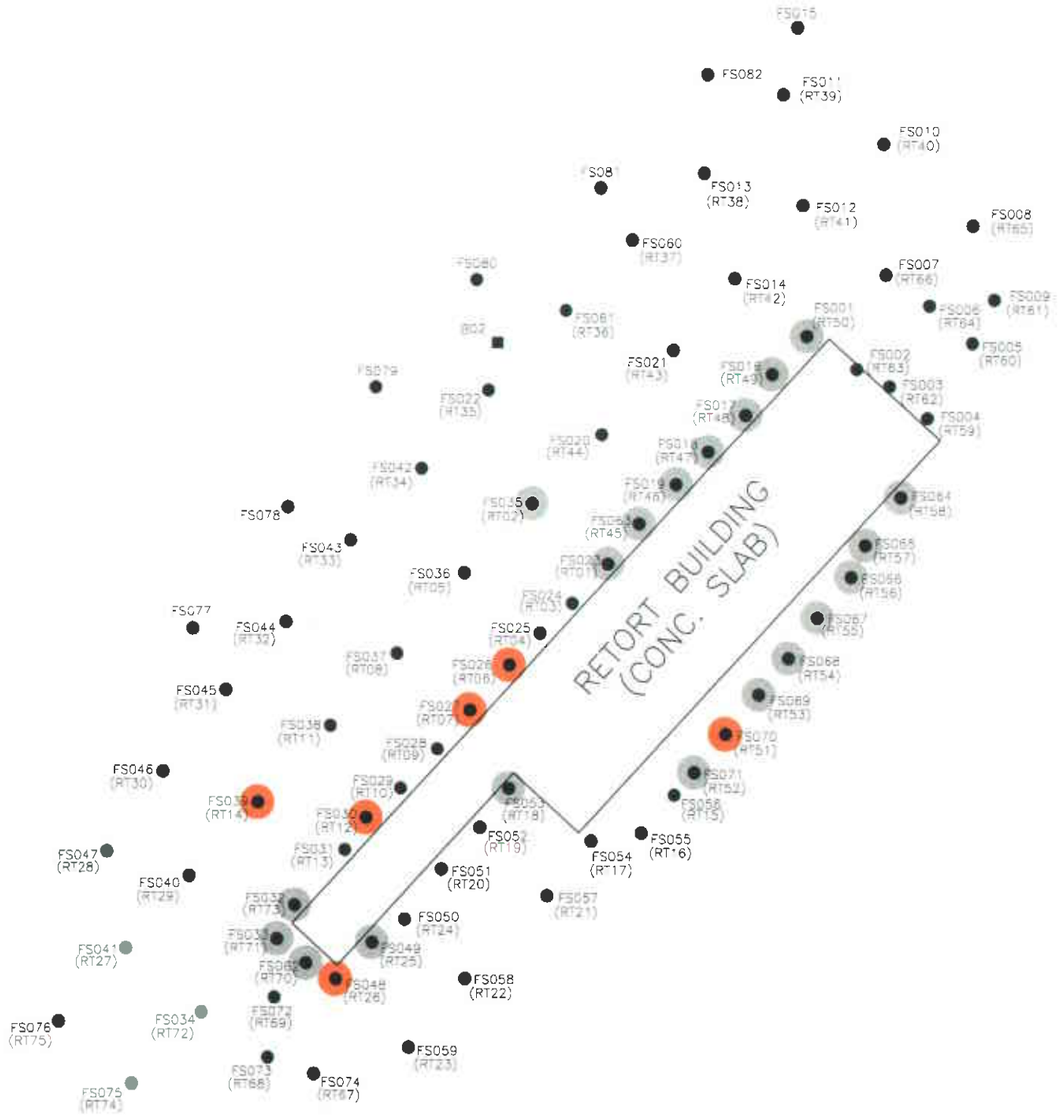
XRF Arsenic in Retort Building Area Soil (Sample Interval of 3.0-4.5 feet bgs)

Red Devil, Alaska

FIGURE **17**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		03/2001

File: 51192d24.DWG
Path: Q:\CAD\51192 RED DEVIL AK\
Date_Time: 03/11/01 14:12:37



Soil Boring or Field Screening Location	Corrected Arsenic Concentration (ppm)
RT01	76
RT02	49
RT06	6904
RT07	2577
RT12	822
RT14	567
RT18	267
RT25	359
RT26	715
RT45	93
RT46	93
RT47	40
RT48	33
RT49	28
RT50	47
RT51	186
RT52	78
RT53	62
RT54	101
RT55	104
RT56	52
RT57	48
RT58	<LOD
RT70	849
RT71	445
RT73	496

File: 51192s26.dwg
Path: Q:\LDATA\51192 red devil ro\
Date_Time: 03/09/01 18:12:26

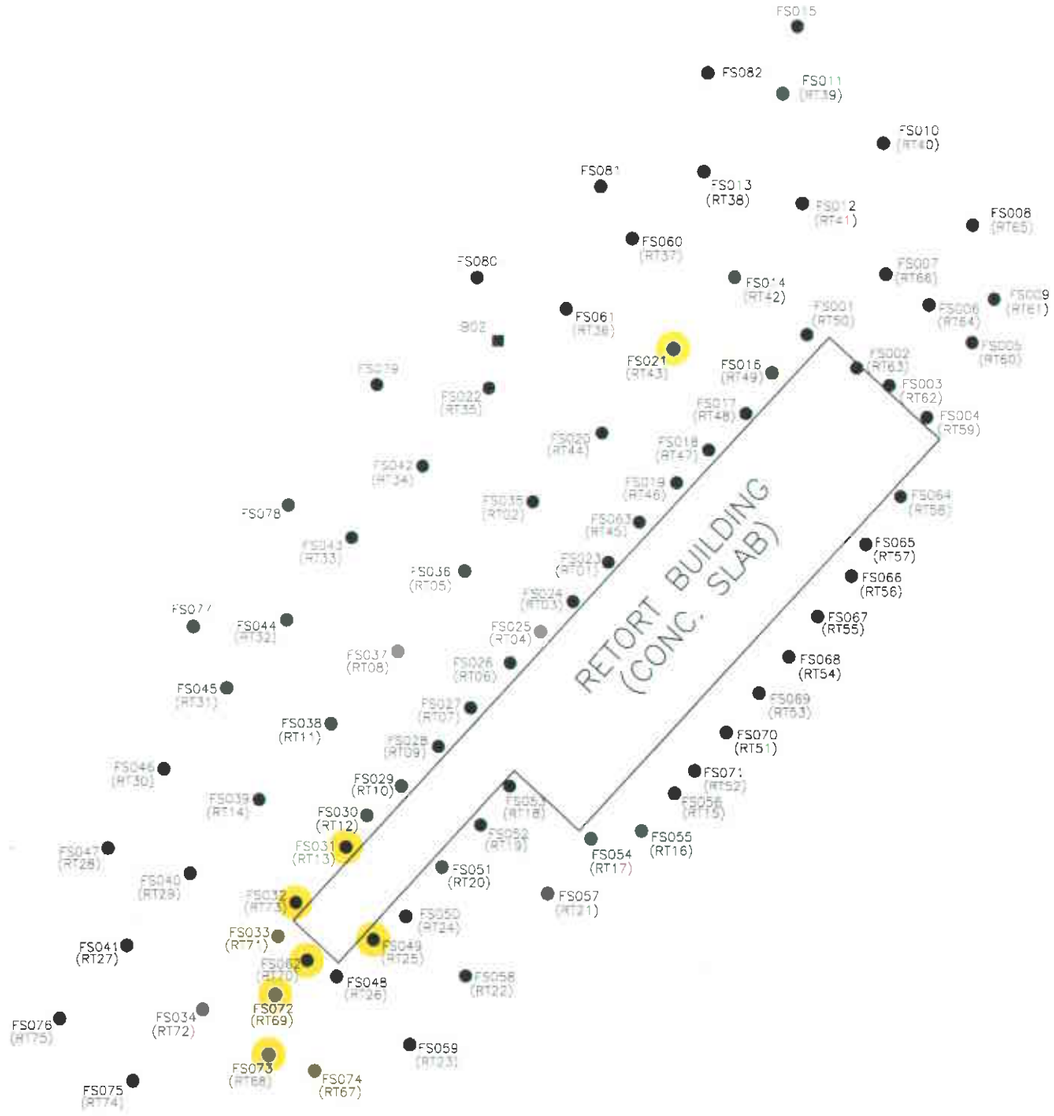
Harding Lawson Associates/
Wilder Construction Company
Joint Venture

XRF Arsenic in Retort Building Area Soil Sample Interval of 5.0-6.5 feet bgs

FIGURE 18

Red Devil, Alaska

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mjp	03/2001



Soil Boring Location	Corrected Arsenic Concentration (ppm)	Corrected Mercury Concentration (ppm)
RT09	5,618	3,042
RT13	30,947	13,048
RT25	17,217	7,648
RT43	6,703	18,400
RT50	3,675	10,496
RT68	5,047	4,096
RT69	5,227	5,400
RT70	10,991	12,944
RT71	3,085	7,448
RT73	10,519	16,800
RT75	7,641	1,213
	Red denotes arsenic concentration >5000 mg/kg	Blue denotes mercury concentration >5000 mg/kg

(1) Concentration of 4,096 was Retained in the Data Set

File: 51192A27.DWG
Path: Q:\CADD\51192 RED DEVIL RA\
Date_Time: 03/11/01 14:34:

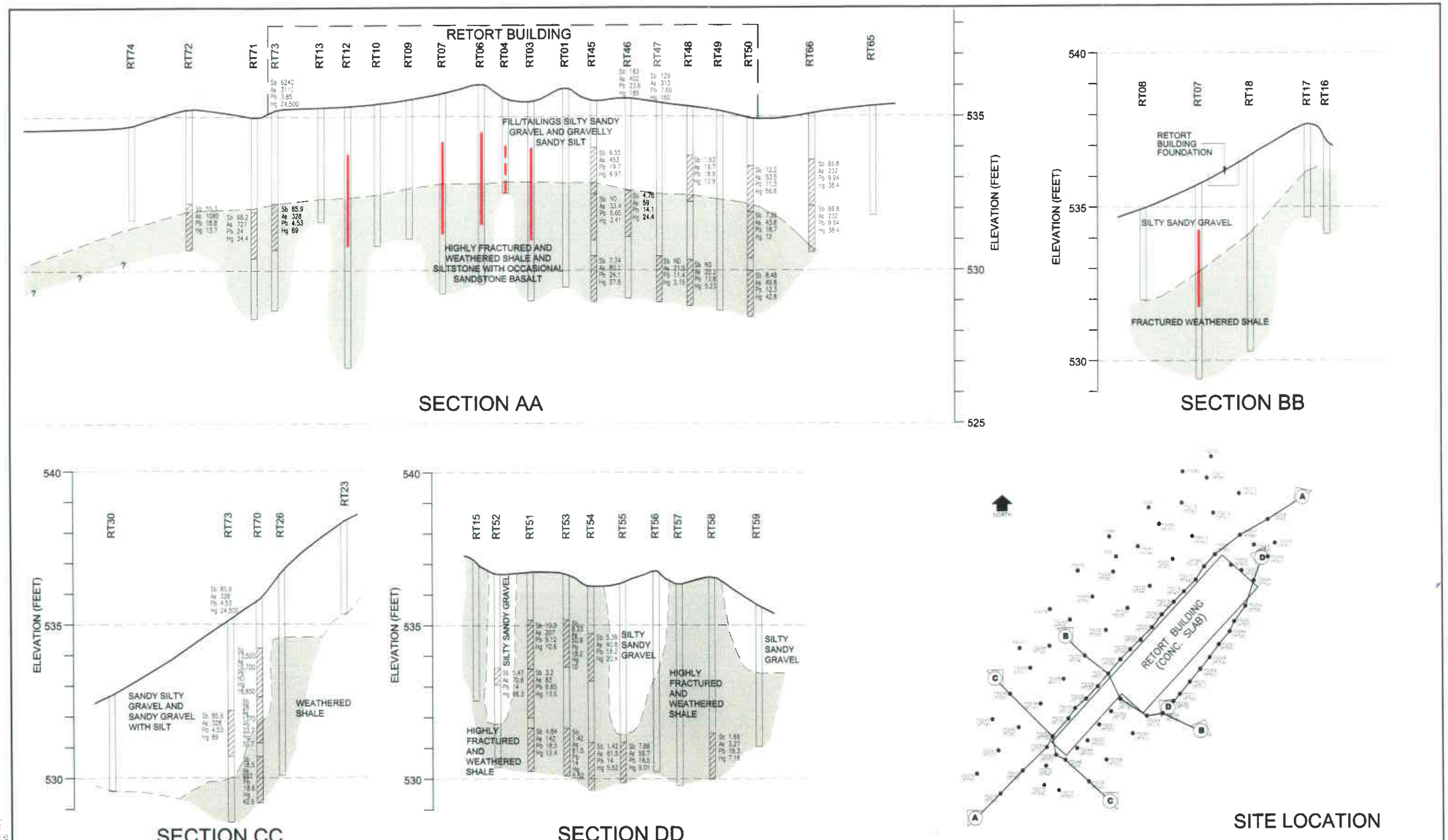
Harding Lawson Associates/
Wilder Construction Company
Joint Venture

Surface Soil Locations Containing Arsenic or Mercury at Concentrations ≥5,000 mg/kg

Red Devil, Alaska

FIGURE **19**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	MJP	03/2001



LEGEND

Sb	Antimony		Visible Mercury
As	Arsenic		
Pb	Lead		Interval Sampled and Laboratory Analysis Performed
Hg	Mercury		
mg/kg	Milligrams/Kilograms		

0 15 30 60
HORIZONTAL SCALE IN FEET

• The lines designating the interface between soil and rock materials on the subsurface profiles are determined by interpolation and are therefore approximations. The transition between the materials may be abrupt or gradual. The profiles should be considered as reasonably accurate only at the boring locations, and then only to the degree implied by the notes on the boring logs.

File: 51192Bs.dwg
Path: Q:\CADD\51192 red devil ro\
Date_Time: 03/11/01 17:41:55

HLA WILDER

Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Retort Building Area Subsurface Profiles

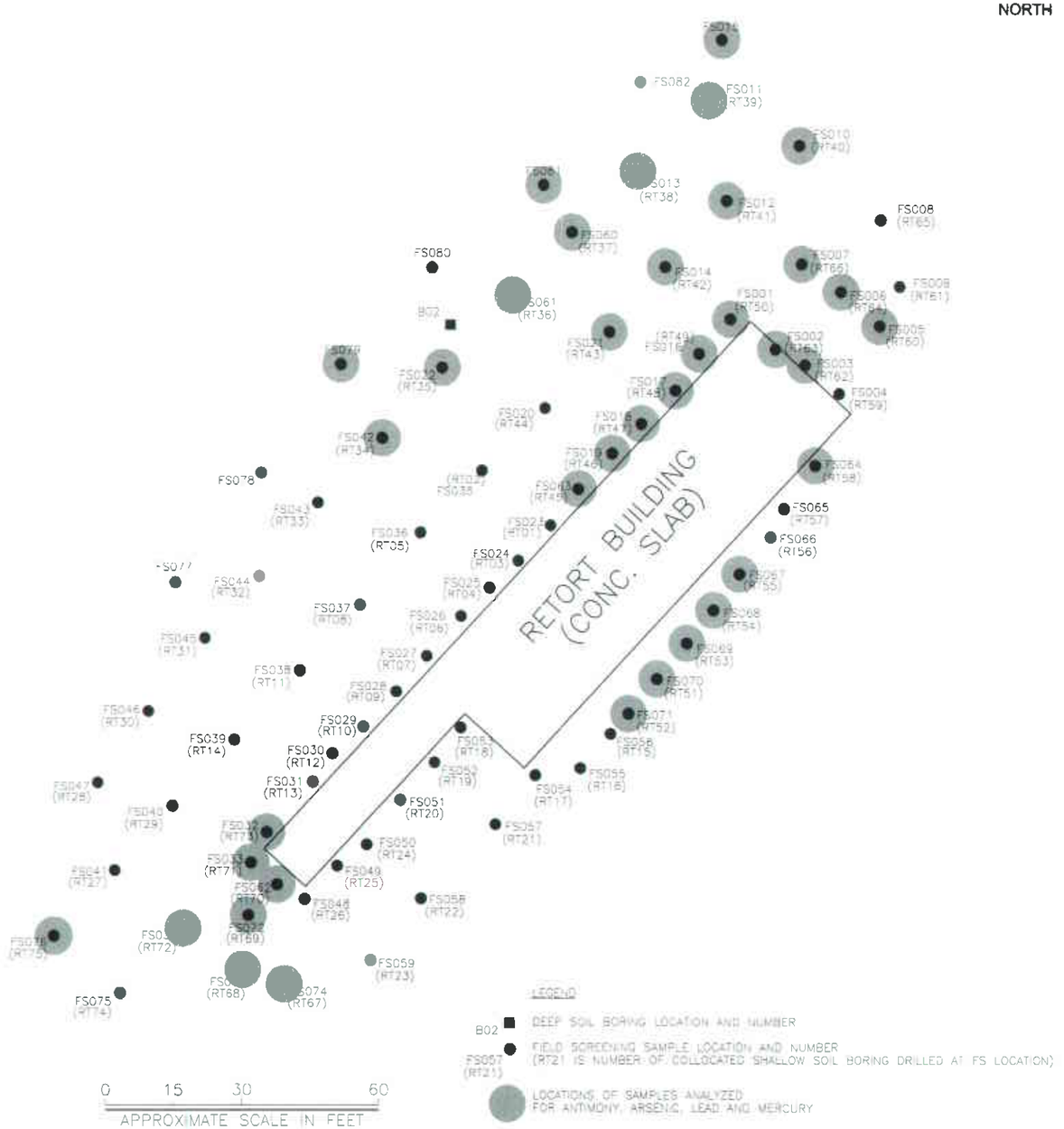
Source Area Removal and Investigation
Red Devil, Alaska

FIGURE **20**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	MJ	03/2001

Soil Boring or Field Screening Location	Sample Depth Interval (feet bgs)	Sample ID	Metals Analytical Result (mg/kg)			
			Antimony	Arsenic	Lead	Mercury
FS015	0 - 0.5	FS015	1010	3240	64.9	594
FS079	0 - 0.5	FS079	1290	3860	894	2410
FS081	0 - 0.5	FS081	1390	4180	339	1200
RT34	1.5 - 3.0	RT34/1.5-3	2.82	138	17.5	16.8
RT35	0 - 0.5	FS022	1320	2290	369	494
RT36	1.5 - 3.0	RT36/1.5-3	1.87	43	15.3	25.7
RT37	1.5 - 3.0	RT37/1.5-3	7.41	33.8	18.3	31.6
RT38	0 - 0.5	FS013	534	2630	43	1300
RT39	0 - 0.5	FS011	371	1750	93.8	1300
RT40	0 - 0.5	FS010	209	744	37.8	443
RT41	0 - 0.5	FS012	138	679	255	424
RT41	1.5 - 3.0	RT41/1.5-3	101	156	14	69.9
RT42	0 - 0.5	FS014	422	1330	22.9	1910
RT42	1.5 - 3.0	RT42/1.5-3	51.9	184	12.6	8.39
RT42	3.0 - 4.5	RT42/3-4.5	15.7	58	12.5	62.2
RT43	0 - 0.5	FS021	6100	7190	93.6	73300
RT43	3.0 - 4.5	RT43/3-4.5	10.2	43.2	15.3	69.6
RT44	0 - 0.5	FS020	190	555	14.4	111
RT45	1.5 - 3.0	RT45/1.5-3	6.55	453	19.7	6.97
RT45	3.0 - 4.5	RT45/3-4.5	6.91	33.4	22.9	3.41
RT45	5.0 - 6.5	RT45/5-6.5	7.74	80.1	24.1	57.8
RT46	0 - 0.5	FS019	183	402	23.6	189
RT46	3.0 - 4.5	RT46/3-4.5	4.78	59	14.1	24.4
RT47	0 - 0.5	FS018	129	313	7.89	160
RT47	5.0 - 6.5	RT47/5-6.5	ND(0.908)	21.5	11.4	2.15
RT48	1.5 - 3.0	RT48/1.5-3	1.63	19.7	18.9	12.9
RT48	5.0 - 6.5	RT48/5-6.5	ND(0.862)	22.2	12.8	5.23
RT49	0 - 0.5	FS016	650	726	7.38	530
RT49	3.0 - 4.5	RT49/3-4.5	ND(0.932)	29.1	20.7	6.9
RT49	5.0 - 6.5	RT49/5-6.5	1.33	17.9	19.1	3.82
RT50	1.5 - 3.0	RT50/1.5-3	12.2	53.5	11.3	56.6
RT50	3.0 - 4.5	RT50/3-4.5	7.35	43.8	18.7	12
RT50	5.0 - 6.5	RT50/5-6.5	8.48	49.6	12.3	42.8
RT51	1.5 - 3.0	RT51/1.5-3	10.3	207	9.12	10.6
RT51	3.0 - 4.5	RT51/3-4.5	3.2	83	6.65	13.5
RT51	5.0 - 6.5	RT51/5-6.5	4.84	142	18.5	12.4
RT52	3.0 - 4.5	RT52/3-4.5	5.47	70.6	14	98.3
RT53	1.5 - 3.0	RT53/1.5-3	6.23	50.9	18.2	10
RT53	5.0 - 6.5	RT53/5-6.5	ND(0.946)	21.3	18.4	4.36
RT54	1.5 - 3.0	RT54/1.5-3	5.38	40.8	18.2	20.4
RT54	5.0 - 6.5	RT54/5-6.5	1.42	61.5	14	5.52
RT55	5.0 - 6.5	RT55/5-6.5	7.86	59.7	18.5	9.01
RT58	5.0 - 6.5	RT58/5-6.5	1.66	3.27	18.3	7.18
RT60	1.5 - 3.0	RT60/1.5-3	6.02	94.9	8.54	25.9
RT60	3.0 - 4.5	RT60/3-4.5	3.12	48.8	6.12	12.1
RT62	3.0 - 4.5	RT62/3-4.5	13.5	61.9	19.8	102
RT63	1.5 - 3.0	RT63/1.5-3	486	663	12.7	237
RT63	3.0 - 4.5	RT63/3-4.5	6.86	63.2	6.72	20.8
RT64	1.5 - 3.0	RT64/1.5-3	3.53	33.2	15.4	10.3
RT64	3.0 - 4.5	RT64/3-4.5	1.64	19.2	8.19	9.54
RT66	1.5 - 3.0	RT66/1.5-3	86.8	232	9.94	38.4
RT66	3.0 - 4.5	RT66/3-4.5	36.3	148	11.9	29.3
RT67	1.5 - 3.0	RT67/1.5-3	5.34	106	9.21	19.4
RT67	3.0 - 4.5	RT67/3-4.5	4.46	57	15.1	39.5
RT68	0 - 0.5	FS073	7000	3420	ND(2.89)	11000
RT68	3.0 - 4.5	RT68/3-4.5	14.9	209	14.5	78.4
RT69	0 - 0.5	FS072	4630	5480	15.3	7360
RT70	1.5 - 3.0	RT70/1.5-3	13500	10700	ND(2.9)	18800
RT70	3.0 - 4.5	RT70/3-4.5	28	1370	22.7	30.7
RT70	5.0 - 6.5	RT70/5-6.5	18.5	997	18.6	42.9
RT71	3.0 - 4.5	RT71/3-4.5	68.2	727	24	34.4
RT72	3.0 - 4.5	RT72/3-4.5	55.3	1080	18.8	13.7
RT73	0 - 0.5	FS032	6240	3110	3.85	24500
RT73	3.0 - 4.5	RT73/3-4.5	85.9	328	4.53	89
RT75	0 - 0.5	FS076	9290	8350	ND(2.46)	1250
RT75	1.5 - 3.0	RT75/1.5-3	19.4	444	13.5	15.1

Bold Red Text Denotes Exceedance of Antimony, Arsenic and Mercury Background Concentrations Presented in Table 3-1.
bgs - below ground surface



Harding Lawson Associates/ Wilder Construction Company
Joint Venture

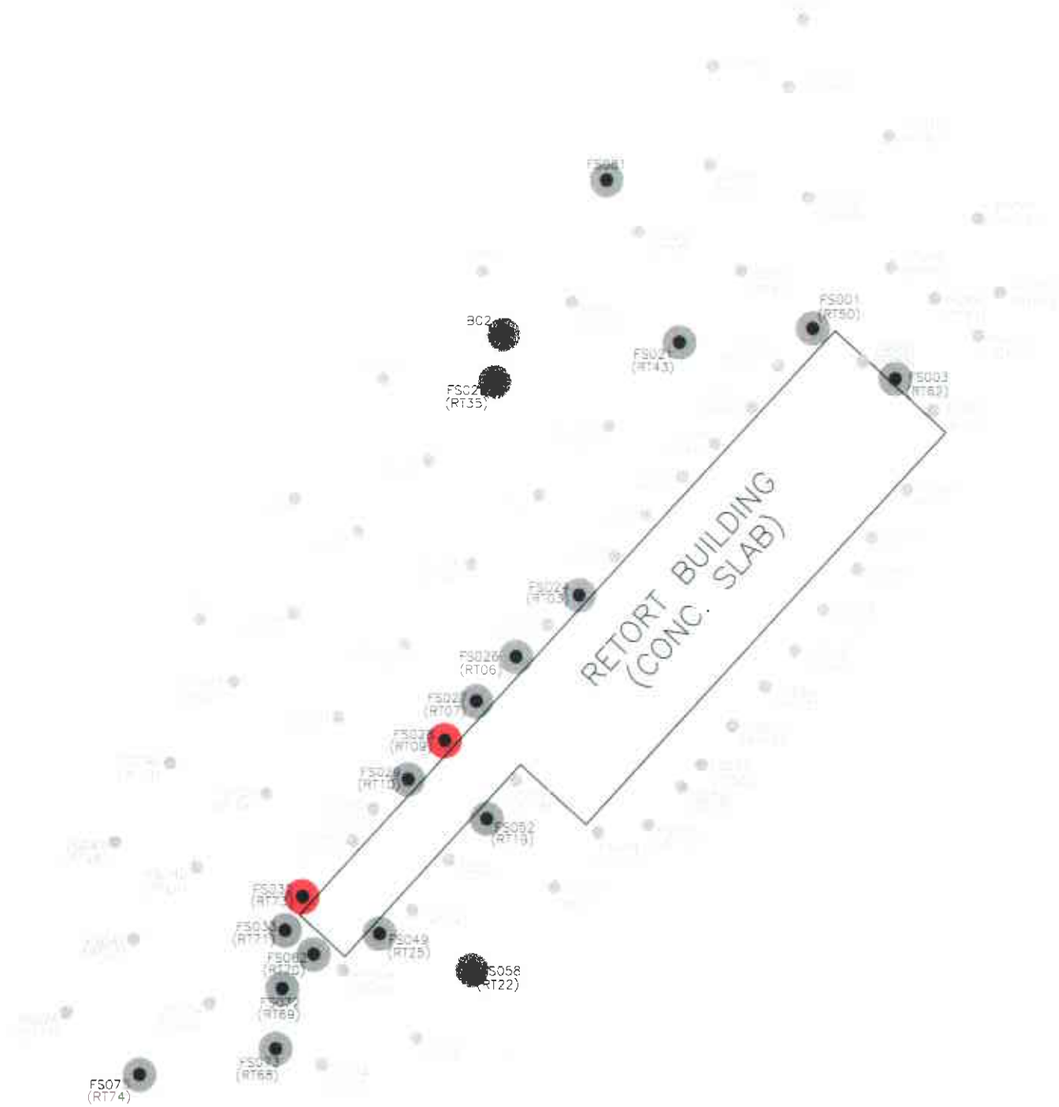
Antimony, Arsenic, Lead and Mercury in Retort Building Area Soil based on Laboratory Analyses

Red Devil, Alaska

FIGURE **21**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		03/2001

File: 51192A14.DWG
Path: Q:\CADD\51192 RED DEVIL BA\
Date_Time: 03/11/01 14:44:43



Soil Boring or Field Location	Sample Depth Interval (feet bgs)	Sample ID Number	TCLP Mercury Concentration (mg/L)
B02	14.0 - 15.5	00RDV42SL	ND(0.002)
FS081	0 - 0.5	00RDV53SL	ND(0.002)
RT03	0 - 0.5	00RDV31SL	0.0329
RT06	5.0 - 6.5	00RDV55SL	0.0248
RT07	0 - 0.5	00RDV33SL	0.0474
RT09	0 - 0.5	00RDV34SL	0.352
RT10	0 - 0.5	00RDV35SL	0.0699
RT19	1.5 - 3.0	00RDV37SL	0.0296
RT22	0 - 0.5	00RDV38SL	0.0121
RT25	0 - 0.5	00RDV40SL	0.0188
RT35	0 - 0.5	00RDV48SL	ND(0.002)
RT43	0 - 0.5	00RDV47SL	0.00207
RT50	0 - 0.5	00RDV54SL	ND(0.002)
RT62	1.5 - 3.0	00RDV36SL	0.0107
RT68	0 - 0.5	00RDV52SL	ND(0.002)
RT69	0 - 0.5	00RDV50SL	0.0169
RT70	0 - 0.5	00RDV49SL	0.0219
RT70	1.5 - 3.0	00RDV57SL	0.0125
RT71	1.5 - 3.0	00RDV58SL	0.015
RT73	0 - 0.5	00RDV51SL	0.429
RT74	1.5 - 3.0	00RDV56SL	0.00685

Note: Bold Red Text Denotes TCLP Failure
Regulatory Limit = 0.2 milligrams/Liter (Title 40, Code of Federal Regulations, 261.24)
bgs - below ground surface

LEGEND
B02 ■ SOIL BORING LOCATION AND NUMBER
FS057 (RT21) ● FIELD SCREENING SAMPLE LOCATION AND NUMBER (RT21 IS NUMBER OF COLOCATED SOIL BORING DRILLED AT FS LOCATION)
LOCATIONS OF SAMPLES ANALYZED FOR TCLP MERCURY
LOCATIONS OF SAMPLES EXCEEDING TCLP MERCURY REGULATORY CRITERIA OF 0.2 mg/L

0 15 30 60
SCALE IN FEET

File: 51192A2.DWG
Path: Q:\CADD\51192 RED DEVIL RA\
Date_Time: 03/11/01 14:47:06

HLA WILDER

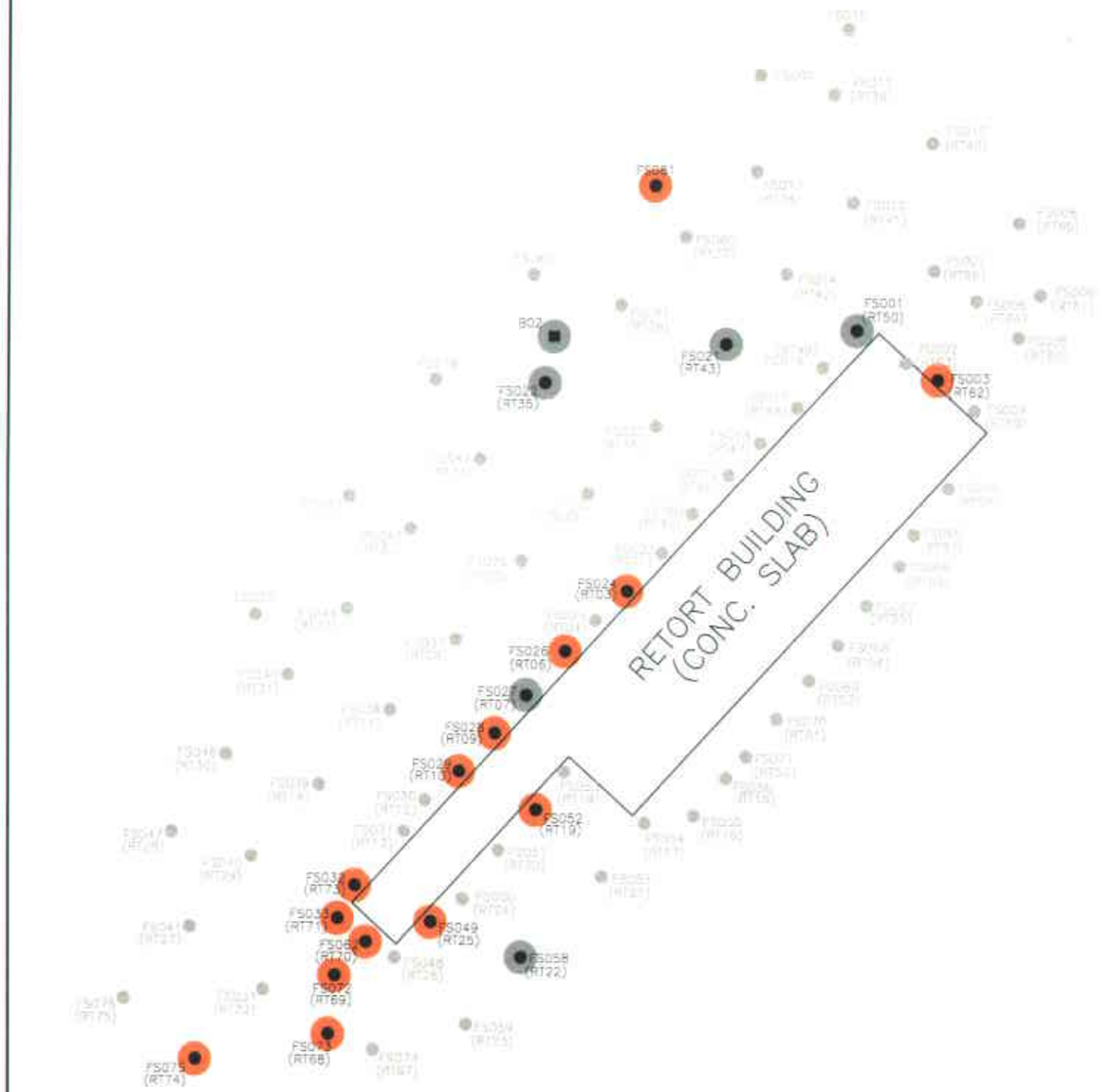
Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Analytical Results for TLCP Mercury in Retort Building Area Soil based on Laboratory Analyses

Red Devil, Alaska

FIGURE **22**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mp	03/2001



NORTH

Soil Boring or Field Location	Sample Depth Interval (feet bgs)	Sample ID Number	TCLP Arsenic Concentration (mg/L)
B02	14.0 - 15.5	00RDV42SL	0.017
FS061	0 - 0.5	00RDV53SL	7.93
RT03	0 - 0.5	00RDV31SL	22.8
RT06	5.0 - 6.5	00RDV55SL	8.88
RT07	0 - 0.5	00RDV33SL	3.05
RT09	0 - 0.5	00RDV34SL	8.79
RT10	0 - 0.5	00RDV35SL	5.31
RT19	1.5 - 3.0	00RDV37SL	22.2
RT22	0 - 0.5	00RDV38SL	4.07
RT25	0 - 0.5	00RDV39SL	9.68
RT35	0 - 0.5	00RDV48SL	0.76
RT43	0 - 0.5	00RDV47SL	0.266
RT50	0 - 0.5	00RDV54SL	1.16
RT62	1.5 - 3.0	00RDV36SL	19.9
RT68	0 - 0.5	00RDV52SL	373
RT69	0 - 0.5	00RDV50SL	31.3
RT70	0 - 0.5	00RDV49SL	1.2
RT70	1.5 - 3.0	00RDV57SL	34.3
RT71	1.5 - 3.0	00RDV58SL	9.64
RT73	0 - 0.5	00RDV51SL	8.76
RT74	1.5 - 3.0	00RDV56SL	6.43

Note: Bold Red Text Denotes TCLP Failure
Regulatory Limit = 5 milligrams/Liter (Title 40, Code of Federal Regulations, 261.24)
bgs - below ground surface

LEGEND

B02 ■ SOIL BORING LOCATION AND NUMBER

FS057 (RT21) ● FIELD SCREENING SAMPLE LOCATION AND NUMBER (RT2* IS NUMBER OF COLOCATED SOIL BORING DRILLED AT FS LOCATION)

● LOCATIONS OF SAMPLES ANALYZED FOR TCLP ARSENIC

● LOCATIONS OF SAMPLES EXCEEDING TCLP ARSENIC REGULATORY CRITERIA OF 5 mg/L

0 15 30 60
SCALE IN FEET

Harding Lawson Associates/
Wilder Construction Company
Joint Venture

HLA WILDER

Analytical Results for TLCP Arsenic in Retort Building Soil based on Laboratory Analyses

Red Devil, Alaska

FIGURE **23**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		03/2001

File: 51192A3.DWG
Path: Q:\CADD\51192 RED DEVIL (AK)\
Date_Time: 03/11/01 14:48:26

APPENDIX A

DELIVERY ORDER AND MODIFICATION 001

DELIVERY ORDER 0023

PROGRAM FILE

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
National Business Center
Denver Federal Center, Building 50
Denver, Colorado 80225-0047

RECEIVED
JUL 2 4 2000
HARDING LAWSON ASSOCIATES

In Reply Refer To:

1510 (BC-660) July 18, 2000

CC: BDL WCC

Mr. Steve Johnson
Harding Lawson Associates/Wilder Construction Co., JV
601 East 57th. Place
Anchorage, Alaska 99518

Subject: Delivery Order 0023, Red Devil Mine to Contract No. 1422-N660-C97-3025

Dear Mr. Johnson:

Enclosed for your records is a fully executed copy of Delivery Order No. 0023 to the above subject contract.

If you have any question, please do not hesitate to call me at (303) 236-9436.

Sincerely,

Joseph Bogus
Contracting Officer

1 - Enclosure
1 - Delivery Order No. 0023

cc: AK-930, Wayne Svejnoha, COR
AK-040, M. Alcorn, PI
BC-620, Finance

ORDER FOR SUPPLIES OR SERVICES

PAGE 1 OF PAGES 6

IMPORTANT: Mark all packages and papers with contract and/or order numbers.

1. DATE OF ORDER 7-18-00	2. CONTRACT NO. *(If any)* 1422-N660-C97-3025
3. ORDER NO. DELIVERY ORDER #023	4. REQUISITION/REFERENCE NO. R-0003751

5. ISSUING OFFICE *(Address correspondence to)*
BLM, BC660A, DENVER FEDERAL CENTER, DENVER, CO 80225

7. TO:

a. NAME OF CONTRACTOR
Mr. B. Lund, Project Manager

b. COMPANY NAME
Harding Lawson/Wilder Construction Co., J.V.

c. STREET ADDRESS
601 East 57th Place

Anchorage	e. STATE AK	f. ZIP CODE 99518

6. SHIP TO:

a. NAME OF CONSIGNEE
BLM, Anchorage district Office Attn: M. Alcorn, PI

b. STREET ADDRESS
6881 Abbott Loop Rd

c. CITY Anchorage	d. STATE AK	e. ZIP CODE 99507

f. SHIP VIA
Not Applicable

A

8. TYPE OF ORDER

☐ a. PURCHASE
REFERENCE YOUR: _____
Please furnish the following on the terms and conditions specified on both pages of this order and on the attached sheet, if any, including delivery as indicated.

☒ b. DELIVERY Except for billing instructions on page 2, this delivery order is subject to instructions contained on this page only of this form and is issued subject to the terms and conditions of the above-numbered contract.

9. ACCOUNTING AND APPROPRIATION DATA
SEE BLOCK 17

10. REQUISITIONING OFFICE
Anchorage District Office

11. BUSINESS CLASSIFICATION *(Check appropriate box(es))*
☐ a. SMALL ☒ b. OTHER THAN SMALL ☐ c. DISADVANTAGED ☐ d. WOMEN-OWNED

12. F.O.B. POINT	13. PLACE OF		14. GOVERNMENT B/L NO.	15. DELIVER TO F.O.B. POINT ON OR BEFORE *(Date)*	16. DISCOUNT TERMS
Destination	a. INSPECTION Destination	b. ACCEPTANCE Destination	Not Applicable	10-15-00	Net

17. SCHEDULE *(See page 2 for Rejections)*

ITEM NO. (a)	SUPPLIES OR SERVICES (b)	QUANTITY ORDERED (c)	UNIT (d)	UNIT PRICE (e)	AMOUNT (f)	QUANTITY ACCEPTED (g)
	Red Devil Mine All work to be in accordance with the terms and conditions of the basic contract and the Statement of Work, four pages, attached, and Contractors proposal of July 6, 2000, included by reference. ACCOUNTING & APPROPRIATION DATA: 2000 AK040 252R 1640HO AKZA - $ 25,000.00 2000 AK040 252R 2640HO AKZA - $425,000.00 2000 AK040 252R 1010HP LAA9 - $ 15,000.00				NOT TO EXCEED $465,000.00	

SEE BILLING INSTRUCTIONS ON PAGE 2	18. SHIPPING POINT N/A	19. GROSS SHIPPING WEIGHT N/A	20. INVOICE NO.	ESTIMATED ◀ 17(h) TOT. *(Cont. pages)*
	21. MAIL INVOICE TO: a. NAME BLM, Alaska State office, Attn: W. Svejnoha, AK-930, COR			
	b. STREET ADDRESS (or P.O. Box) 222 W. 7th Avenue			$465,000.00 ◀ 17(i) GRAND TOTAL
	c. CITY Anchorage	d. STATE AK	e. ZIP CODE 99513	

22. UNITED STATES OF AMERICA
BY *(Signature)*

23. NAME *(Typed)*
Joseph Bogus
TITLE: CONTRACTING/ORDERING OFFICER

AUTHORIZED FOR LOCAL REPRODUCTION
Previous edition not usable

OPTIONAL FORM 347 (REV. 6-95)
Prescribed by GSA/FAR (48 CFR) 53.213(e)

SUPPLEMENTAL INVOICING INFORMATION

If desired, this order (or a copy thereof) may be used by the Contractor as the Contractor's invoice, instead of a separate invoice, provided the following statement, (signed and dated) is on (or attached to) the order: "Payment is requested in the amount of $_____. No other invoice will be submitted." However, if the Contractor wishes to submit an invoice, the following information must be provided; contract number (if any), order number, item number(s), description of supplies or service, sizes, quantities, unit prices, and extended totals. Prepaid shipping costs will be indicated as a separate item on the invoice. Where shipping costs exceed $10 (except for parcel post), the billing must be supported by a bill of lading or receipt. When several orders are invoiced to an ordering activity during the same billing period, consolidated periodic billings are encouraged.

RECEIVING REPORT

Quantity in the "Quantity Accepted" column on the face of this order has been: ☐ inspected, ☐ accepted, ☐ received by me and conforms to contract. Items listed below have been rejected for the reasons indicated.

SHIPMENT NUMBER	PARTIAL		DATE RECEIVED	SIGNATURE OF AUTHORIZED U.S. GOV'T REP.	DATE
	FINAL				
TOTAL CONTAINERS		GROSS WEIGHT	RECEIVED AT	TITLE	

REPORT OF REJECTIONS

ITEM NO.	SUPPLIES OR SERVICES	UNIT	QUANTITY REJECTED	REASON FOR REJECTION

STATEMENT OF WORK FOR
DELIVERY ORDER NO. 0023
HAZARDOUS MATERIALS DISPOSAL CONTRACT STATE OF ALASKA
(Contract No. 1422-N660-C97-3025)

RED DEVIL MINE
NEAR THE COMMUNITY OF RED DEVIL, ALASKA

GENERAL/BACKGROUND:

The Red Devil mercury mine was operated sporadically from 1933 until 1971. During its operational life approximately 35,000 flasks of mercury were produced. The site consists of a surface mining area, a collapsed adit, a vertical shaft, three tailing piles, three settling ponds, three fuel tanks, drum storage areas, approximately 18 buildings used for housing, laboratory, mill, steam plant, and chemical storage sheds. A Site Investigation was completed in June 1989. A U.S. Environmental Protection Agency (EPA) Hazard Ranking Score of 14.95 was assigned. The EPA designated the site "No Further Action required" in 1990, but with renewed public pressure, has requested additional sampling to re-evaluate the site. The Alaska Department of Environmental Conservation has also requested sampling at the site. The BLM agreed in 1989 to remove or neutralize site chemicals and electrical transformers, to annually monitor surface water, post site warnings, and restrict site access. BLM has posted warnings, removed PCB contaminated oil, and restricted access, which has since been removed by unknown parties.

FY 99 field work was completed in July, 1999. D.O. 14, Mod. 1 initiated the Engineering Evaluation/Cost Analysis. D.O. 14, Mod. 2 initiated the FY 2000 Work Plan.

SITE LOCATION:

The Red Devil Mine is located approximately 250 miles west of Anchorage, Alaska, 8 miles northwest of Sleetmute, and 2 miles - southeast of the community of Red Devil. The mine is on the south side of the Kuskokwim River at T. 19 N., R. 44 W., Southeast quarter of Section 6, Seward Meridian.

DIRECTION TO SITE:

From Anchorage, air travel is the only practical mode of transportation. A commercial aircraft can be flown to Aniak, where a small aircraft can be chartered fly to the Red Devil Airstrip. A small aircraft could also be chartered in Anchorage and flown to the Red Devil Airstrip. An unimproved road leads to the mine two miles southeast. Heavy equipment may be barged on the Kuskokwim River.

SERVICES TO BE PROVIDED:

Implement FY 2000 Red Devil Mine Work Plan. Coordinate project variables or alterations with Project Inspector or higher contracting official.

1. Preliminary field visit: complete a one to one and a half day field visit to the site, currently scheduled for June 13, 2000, to assess equipment and personnel needs during the investigation and cleanup.
2. Attend a proposed public meeting in Red Devil during preliminary field visit. Meeting should not exceed one and a half hours.

Implement work plan developed under D.O. 14, mod. 2. Tasks include:

3. Asbestos and lead-based paint survey:
   Complete an asbestos and lead-based paint survey which meets the requirements under NESHAPs (National Emission Standards for Hazardous Air Pollutants) for building demolition.

   For asbestos: gather and analyze the minimum number of samples required for each homogeneous sampling area. Generally, the minimum number of samples per homogenous area less than 1,000 ft^2 of surfacing materials is 3. Thermal System Insulation (TSI) homogenous areas also require a minimum of 3 samples. The TSI exceptions are: 1) small sections less than 6 linear or square feet (1 required), and 2) areas of insulating cement (inspector determines). When submitting samples to the analytical lab, include the following in the request: When analyzing multiple samples from a homogeneous sampling area, discontinue analyzing from the sample group once a single sample in a group is determined to contain 1% or more asbestos. (One sample above 1% asbestos is all that is necessary to determine an entire homogenous sampling area is classified as an Asbestos Containing Material (ACM)).

4. Asbestos removal on retort building; scope for removal of 2 feet of Thermal System Insulation on upper condensing pipe.

5. Retort building decontamination and demolition; decontaminate by pressure washing contaminated components (condensing pipes and collection troughs). The decon water will be collected, filtered, analyzed, and released to the ground. The construction debris will be stored onsite, awaiting future Solid Waste Landfill construction. Remove and dispose of any hazardous wastes generated at the site by this operation (mercury, contaminated filters, asbestos).

6. Fuel pipe system and Aboveground Storage Tanks (ASTs) inspection and cleaning. Sample up to 20 locations around

the ASTs and pipeline with a hand auger, field screen soils, and lab analyze up to one sample per hole for hydrocarbon contamination. Recycle any recovered fuel in Anchorage. Remove, filter, analyze, and release water in ASTs. Coordinate sludge disposal options with BLM.

7. Further site characterization - grid surface and subsurface soil sampling around retort building; vertical sample intervals will be 6", 1.5', 3', and 5'. Samples will be field screened with XRF (x-ray fluorescence spectrometer; provided by BLM), to determine how deep to drill. Actual horizontal intervals will be determined with input from regulatory agencies and BLM. Use professional knowledge for estimate. Lab analyze a representative number of samples for confirmation of field screening accuracy. Coordinate specific number of holes drilled with Project Inspector; current estimate is 100 holes.

8. Installation of 6 monitoring wells (3 on each site of Red Devil Creek), for groundwater monitoring: sampling, flow direction, and gradient. Wells will only extend though the unconsolidated sediments; drilling will cease at contact with bedrock if not earlier (based on field screening and/or water table). If groundwater is not encountered, wells will not be installed. Follow Alaska Department of Environmental Conservation (ADEC) guidance: Recommended practices for monitoring well design, installation, and decommissioning, April 1992.

9. Install gate: Actual gate specifications may be refined before installation. Our current goal is to control site access and avoid having the gate destroyed. The gate should be vandalism and theft resistant; specifications: heavy steel gate constructed with material strengths similar to 4"OD (outside diameter) steel pipe; 6" OD concrete filled steel posts with adequate concrete foundation. Gate should be lockable with heavy duty combination lock, similar to or better than Master brand, model #175 with 5/16" shackle. Permanently attach a warning sign (provided by BLM) to the gate.

10. Acquire any necessary permits or approvals from state or federal agencies prior to work (EPA: NESHAP building demolition clearance, Alaska Department of Fish and Game stream crossing permit).

11. Complete a site survey to map soil borings, monitoring wells, buildings, and local topographic features.

DELIVERABLES:

1. 2000 Site characterization report: 2 draft copies, 12 final

copies, bound.

2. Asbestos and lead-based paint building survey for building demolition report.
3. Certificates of disposal or recycling for any wastes removed from the site.

PROJECT SCHEDULE:

1. Preliminary field visit and asbestos/lead-base paint survey is scheduled to start June 13, 2000 (Services 1, 2 above).
2. Public meeting is tentatively scheduled for June 14, at 10:00 AM. [items 1 & 2 have been completed]
3. Mobilization for primary field efforts (Services 4-11) should begin by mid-July and end by mid-August.
4. 2000 Site characterization report draft is due 4 weeks after demobilization of primary field effort. Final report is requested 10 days after comments are provided.
5. Asbestos and lead-based paint building survey for building demolition report is due 3 weeks after field survey is complete (sooner if possible).

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
NATIONAL BUSINESS CENTER
DENVER FEDERAL CENTER, BUILDING 50
P.O. BOX 25047
DENVER, COLORADO 80225-0047

JUL 1 8 2000

In Reply Refer To:
1510 (BC-660)

Memorandum

To: M. Alcorn, AK-930, PI

From: Joseph Bogus, Contracting Officer, BC-660

Subject: Appointment as Project Inspector (PI)

1. You are hereby appointed as Project Inspector for Delivery Order 0023 for Dynamac Corp., Contract Number 1422-N660-C97-3025, Red Devil Mine. This appointment is to help assure that the Contractor complies with the work statement, specifications, and delivery requirements of this contract. In this capacity, you shall coordinate with the Contracting Officer's Representative (COR) assigned to this contract to support his responsibility for review, approval and acceptance of supplies and services.

2. This appointment shall remain in effect for the life of the contract unless:

a. The appointment is terminated in writing by the undersigned Contracting Officer or by a successor Contracting Officer,

b. You are reassigned, or

c. Your employment with the government is terminated.

3. You shall represent the Contracting Officer for all inspection matters that arise under the aforesaid contract. In this respect, Federal Acquisition Regulations require that you:

a. Shall familiarize yourself with the work statement, specifications, and delivery requirements set forth in the contract.

b. Shall remain cognizant of the Contractor's efforts and progress, to determine if there has been physical progress commensurate with the contract requirements, and coordinate this information with the Contracting Officer's Representative.

c. Shall review Contractor's progress reporting.

d. Shall advise the Contracting Officer and Contracting Officer's Representative (COR) of any unusual problems which actually or potentially affect the work statement, specifications, and delivery requirements, such as delivery slippages, request for changes, and nonconformance of supplies/services.

4. Notwithstanding the authorities delegated in paragraph 3, above, you:

a. Shall not redelegate any authority to any other person,

b. Shall not change any of the terms or conditions of the contract or sign any modification to the contract,

c. Shall not obligate the payment of any money by the government, and

d. Shall not cause the Contractor to incur costs, not otherwise covered by the contract, with the expectation that such costs will be reimbursed by the government.

5. Contact the Contracting Officer for guidance in the event you are in doubt as to the extent of you authority or in any circumstance not covered above.

6. Forward to the Contracting Officer and the COR a copy of all correspondence initiated by you to the Contractor. This includes memorandum of verbal discussions of a significant nature.

Should you have questions concerning this contract, please contact me at (303) 236-9436.

/s/ JOSEPH BOGUS

1 Attachment
1 - Copy of Deliver Order 0023

cc: Harding Lawson Associates/Wilder Constr. Co, Joint Venture, Anchorage, AK
AK-930, W. Svejnoha, COR

MODIFICATION 0001

mp

RECEIVED
SEP 18 2000
HARDING LAWSON ASSOCIATES

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
National Business Center
Denver Federal Center, Building 50
Denver, Colorado 80225-0047

In Reply Refer To:

1510 (BC-660)

September 13, 2000

Mr. M. Schmetzer
Harding Lawson Associates/Wilder Construction Company
Joint Venture
601 East 57th Place
Anchorage, Alaska 99518

Subject: Modification No. 0001 to Delivery Order No. 0023, Red Devil Mine and Delivery Order No. 0024, Upper Cache Creek Mine Cleanup, Contract Number 1422-N660-C97-3025

Dear Mr. Schmetzer:

Enclosed for your records is a fully executed copy of Modification No. 0001 to Delivery Order No. 0023 and Delivery Order No. 0024 to the above subject contract.

Any questions, please contact me at (303) 236-9436.

Sincerely,

Joseph Bogus
Contracting Officer

2 - Enclosure
1 - Modification No. 0001 to Delivery Order No. 0023
1 - Delivery Order No. 0024

cc: AK-930 - W. Svejnoha, COR
AK-040 - M. Alcorn, PI
BC-620, Finance

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
N/A	1 | 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
0001	SEE BLOCK 16c	R-0005089	Red Devil Mine

6. ISSUED BY	CODE	7. ADMINISTERED BY *(If other than Item 6)*	CODE
U.S. Department of the Interior Bureau of Land Management Denver Federal Center, Bldg. 50 P.O. Box 25047 Denver, CO 80225-0047			

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*	(√)	9A. AMENDMENT OF SOLICITATION NO.
Harding Lawson Associates/Wilder Construction Co., Joint Venture 601 East 57th Place Anchorage, Alaska 99518		9B. DATED *(SEE ITEM 11)*
	X	10A. MODIFICATION OF CONTRACT/ORDER 1422-N660-C97-3025
		10B. DATED *(SEE ITEM 13)* 7-18-00

CODE FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended, ☐ is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*
See Page 2 of 2 for Accounting Classification

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(√)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation date, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER *(Specify type of modification and authority)* Terms and Conditions of Contract 1422-N660-C97-3025

E. IMPORTANT: Contractor ☒ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

DELIVERY ORDER 0023

RED DEVIL MINE

(Continued on page 2 of 2)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
		Joseph Bogus Contracting Officer, DS012	
15B. CONTRACTOR/OFFEROR *(Signature of person authorized to sign)*	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY *(Signature of Contracting Officer)*	16C. DATE SIGNED 9-13-00

The purpose of this modification is to provide additional funding for completion of the Red Devil Mine project. Therefore the subject delivery order is modified as follows:

A: Additional work as required above and in the attached Statement of Work, 3 pages, is in the estimated amount of $219,000.00. The total amount of the delivery order, as reads "Estimated Not to Exceed $465,000.00" is hereby changed to read "Estimated Not to Exceed $684,000.00".

B: All work required by this modification will be completed during the 2000 field season. Final deliverables due 30 calendar days from the date of completion of field activities.

C: Accounting & Appropriation Data:

2000 AK040 252R 1010HP LAA9 $ 60,260.00

2000 AK040 252R 1640HO AKZA $ 13,000.00

2000 AK040 252R 2640HO AKZA $145,740.00

- Last Item Modification 0001 -

STATEMENT OF WORK FOR
DELIVERY ORDER NO. 0023, MODIFICATION 1
HAZARDOUS MATERIALS DISPOSAL CONTRACT STATE OF ALASKA
(Contract No. 1422-N660-C97-3025)

RED DEVIL MINE
NEAR THE COMMUNITY OF RED DEVIL, ALASKA

GENERAL/BACKGROUND:

The Red Devil mercury mine was operated sporadically from 1933 until 1971. During its operational life approximately 35,000 flasks of mercury were produced. The site consists of a surface mining area, a collapsed adit, a vertical shaft, three tailing piles, three settling ponds, three fuel tanks, drum storage areas, approximately 18 buildings used for housing, laboratory, mill, steam plant, and chemical storage sheds. A Site Investigation was completed in June 1989. A U.S. Environmental Protection Agency (EPA) Hazard Ranking Score of 14.95 was assigned. The EPA designated the site "No Further Action required" in 1990, but with renewed public pressure, has requested additional sampling to re-evaluate the site. The Alaska Department of Environmental Conservation has also requested sampling at the site. The BLM agreed in 1989 to remove or neutralize site chemicals and electrical transformers, to annually monitor surface water, post site warnings, and restrict site access. BLM has posted warnings, removed PCB contaminated oil, and restricted access, which has since been removed by unknown parties.

FY 99 field work was completed in July, 1999. Delivery Order (DO) 14, Mod. 1 initiated the Engineering Evaluation/Cost Analysis. DO 14, Mod. 2 initiated the FY 2000 Work Plan. DO 23 directed the implementation of the 2000 Work Plan to demolish the retort building, inspect and clean the fuel system, install monitoring wells, complete soil borings, sampling and analysis around the retort building. During the process of demolishing the retort building, additional asbestos and mercury waste were encountered and required removal and disposal. Several other additional tasks were approved in the field to make the best use of equipment and personnel on-site.

SITE LOCATION:

The Red Devil Mine is located approximately 250 miles west of Anchorage, Alaska, 8 miles northwest of Sleetmute, and 2 miles - southeast of the community of Red Devil. The mine is on the south side of the Kuskokwim River at T. 19 N., R. 44 W., Southeast quarter of Section 6, Seward Meridian.

DIRECTION TO SITE:

From Anchorage, air travel is the only practical mode of transportation. A commercial aircraft can be flown to Aniak, where a small aircraft can be chartered fly to the Red Devil Airstrip. A small aircraft could also be chartered in Anchorage and flown to the Red Devil Airstrip. An unimproved road leads to the mine two miles southeast. Heavy equipment may be barged on the Kuskokwim River.

SERVICES TO BE PROVIDED:

1. Remove, transport, and dispose of additional mercury contaminated asbestos and slag that has been discovered during demolition. Any materials that can be decontaminated by pressure washing and/or otherwise classified as solid waste, will be left on-site for future disposal. If necessary, sample building materials that may be highly contaminated, in order to assess the material in a treatability study. [in process]
2. Additional samples:
   -Former retort pad on SW side of Red Devil Creek, 1 surface soil sample, analyze for Hg, Pb, Sb, As.
   -Red Devil Lodge water system (from kitchen sink), 1 water sample, analyze for Hg, Pb, Sb, As, total fecal coliform/fecal strep. [in process]
   -Up to 6 additional POL soil samples for fuel system. To be approved in field as needed by Project Inspector.
3. Backfill 6 mine openings and 3 subsidence pits using excavator. Some small trees will need cutting to allow road access. Push down the wooden ore hopper next to the main shaft. The hopper is listing and is endanger of falling. [complete]
4. Install one additional monitoring well and 4 geotechnical borings to satisfy requirements for planning, design, and operation of future solid waste landfill. [the additional well was drilled but not installed due to lack of groundwater.]
5. Inspect and clean additional fuel system components (pipes) on-site (as time and resources allow; on both sides of Red Devil Creek). This follows the original intent of Task Order 23, but the extent of the system may not have been understood by contractor prior to mobilization. Leave fuel tanks open after inspection to allow aeration.

DELIVERABLES:

1. Manifests and certificates of disposal or recycling for any wastes removed from the site.
2. This mod includes the deliverables indicated under DO 23.

PROJECT SCHEDULE:

Previous schedules apply as indicated under DO 23.

APPENDIX B

PHOTOGRAPHIC LOG

July 21, 2000 – Asbestos removal, west side of Retort Building

July 21, 2000 – Track hoe used to remove brush and improve access to lower ASTs No. 1 and 2

July 23, 2000 – Retort Building before removal of condenser pipe manifold

July 23, 2000 – Cutting of metal supports holding retort manifold piping

July 23, 2000 – Removal of fiberglass condensing piping

July 23, 2000 – Removal of metal condensing piping with the excavator

July 26, 2000 – Demolition activities with the excavator
(Removal of conveyor belt)

July 26, 2000 – Demolition of north end of Retort Building

July 28,2000 – Retout Building pad cleaning activities.

July 30, 2000 – Demolition activities with manlift (Preparing to drop upper furnace)

July 31, 2000 – Unloading Lynden Hercules (drill supplies)

August 2000 – Retort shallow soil boring

August 2000 – Drill support work station

August 2000 – Drilling on east side of Retort Building pad

August 2000 – Drilling activities on southeast end of the Retort Building pad area.

October 2000 – Starting work day. Note rubber booties (foot protection). Northwest of retort area.

October 2000 – Retort pad and building area

October 2000 – Recording data for the Red Devil project

October 2000 – Survey benchmark located west side of Red Devil creek

October 2000 – Survey personnel close to AST No. 3

October 2000 – From retort pad area, looking northwest

October 2000 – From south of the retort area, looking northwest

October 2000 – From west side of Red Devil Creek looking east to the retort area

October 2000 – Monitoring well MW04 in the background.
Photograph taken from benchmark #3, looking northeast

October 2000 – Obtaining elevation on MW04

October 2000 – From MW04 looking north to old mine building

October 2000 – Mine access road with survey crew at MW06

October 2000 – Bureau of Land Management's new gate

APPENDIX C

PUBLIC MEETING SUMMARY

RED DEVIL PUBLIC MEETING NOTES
June 14, 2000
RED DEVIL SCHOOL

Notification: A notice of site and meeting plans were sent for posting on May 26 to the Red Devil Post Office, the Tundra Drum Newspaper (published June 1, 2000), associated native corporations, ADEC, EPA, Kuspuk School System, and the Administrative Records (Red Devil, Anchorage).

Attendance:		
	Harrison Griffin	BLM
	Jeff Nelson	The Kuskokwim Corporation
	David Stimson	BLM
	Bryan Lund	HLA
	Peter Ditton	BLM
	June McAtee	Calista Corporation
	Mark Erickson	Wilder Construction Co.
	Bryan Lund	Harding Lawson Associates
	Bill Diel	BLM
	Steve Hill	Kuspuk School District
	Linda Marley	Kuspuk School District
	Pyakzlg(?)	Red Devil
	Theodore Gordon	Red Devil Traditional Council

Meeting begins 10:30 A.M. Introductions were made.

Mike Alcorn:
BLM remains concerned about local population and contamination at the Red Devil mine site. Draft work plan will be made available for public comment. The plan includes drilling, soil sampling around retort building and above-ground storage tanks, removal of asbestos from retort building, and demolition of retort building. This will occur in about three weeks.

BLM will also install a gate at the site's entrance and is in the process of evaluating and removing physical hazards associated with shafts and adits.

Theodore Gordon:
The Red Devil Traditional Council wants to restrict access as much as possible to the Red Devil mine because of PCBs and building material contamination.

Steve Hill:
Red Devil does not have a community dump. A dump site for the local community would solve this problem and meet community needs. There is more contamination on local private property than at the Red Devil mine because much of the contaminated material from the site has been pilfered by local residents. Building a central landfill near the community would allow residents an opportunity to dispose of these materials and the materials at the Red Devil mine.

There is also concern about the collapse of underground workings.

June McAtee:
A "remote" dump site would distribute additional trash along the roadway leading to the dump.

Mike Alcorn:
The proposed landfill at the site would be for non hazardous waste. There is agreement that the community needs their own landfill. ADEC solid waste division should be contacted regarding the need for a community landfill.

Bill Diel is currently inspecting and closing the mine openings.

Steve Hill:
A lot of debris around the local community came from the mine site. This material should be removed to protect the local population, especially the children who play on and around this stuff. The biggest obstacle lies in the site location for the dump.

Other than fuel from the storage tanks, there is no contamination at the Red Devil Mine.

Mike Alcorn:
We have sample results which show elevated levels of mercury, antimony, arsenic and lead at the site related to the retort operation.

The BLM has already removed the PCBs and additional soil sampling shows no further PCB contamination.

Jeff Nelson:
We have looked at other dump [landfill] sites, but land ownership is the problem.

Mike Alcorn:
Most, if not all of the federal land is soon to be transferred to the Kuskokwim Corporation and Calista Corporation. The corporations could then grant land to the community to site the landfill.

Mark Erickson:
BLM will have a drill rig on site this summer. The rig availability could be an opportunity to gather required information about a prospective landfill site for the community. Mobilization costs are some of the highest expenses for this type of project.

Theodore Gordon:
Groundwater from local wells is brown and of poor quality. They have concerns this may be related to the mining activities. Old freezers may have asbestos in the lining and these came from the mine site. Could we get sampling done?

Mike Alcorn:
Local groundwater is high in iron, which turns the water orange/brown. It is very unlikely there

is any connection of the site groundwater to the village, based on the distance and the nature of the geology. Regional groundwater quality concerns should be addressed with ADEC. We have no knowledge of the freezers or their association to the mine. We can only address problems directly associated with the mine. Community environmental problems should be addressed with ADEC.

Theodore Gordon:
Red Devil was not originally a native community. The mine operators barged material to a storage warehouse in what is now the Red Devil community and transported it to the Red Devil mine.

We also have seen brown water coming from Red Devil Creek.

Mike Alcorn:
The brown-colored water in Red Devil Creek comes from high iron content and is not contamination.

Steve Hill:
The water at the mine was high in arsenic. ADEC needs to know Red Devil community concerns. Where is the contamination coming from?

Antimony was coming from the tailings piles.

Mike Alcorn:
BLM has, and continues to test the site soils/tailings. We have supplied an Administrative Record that contains all site reports describing the site. We will find a contact at ADEC to address your concerns and questions.

June McAtee:
Testing shows that there is more arsenic in the Red Devil community than at the Red Devil mine site due to the nature of the local geology. The community is faced with natural as well as man-made arsenic from mine sites.

Theodore Gordon:
Drinkable water is around 150 - 200 feet down. [information gathered for BLM's CERCLA Site Investigation indicate most area wells are screened in the surficial aquifer, less than 30' below ground surface (bgs). The school well is screened at about 80' bgs in a different formation, and produces good quality water.]

Steve Hill:
Villages are in the dark about what is happening out at Red Devil mine site. The problem seems to be getting a hold of these documents. Teachers at the school couldn't find them or didn't know where to look.

Mike Alcorn:

BLM has an Administrative Record at Red Devil which has all communications between BLM, the State of Alaska, EPA, our reports and plans, etc. While we could not locate the Record today, we will locate it and make it available. [the school in which the Record is kept is closed for the summer; we have placed the latest update of the record in the Post Office for the summer]

unknown participant:
How much is it going to cost to cleanup the mine?

Mike Alcorn:
BLM's options for the tailing piles at the mine include construction of an on-site landfill for $1.5 million, to $43 million to ship the waste out to a treatment facility. These and other options are laid out and analyzed in our Engineering/Cost Analysis report and a second report summarizing site data and the EE/CA options. Both reports will be in the Administrative Record and mailed to interested parties [done].

Steve Hill:
Why not treat it [tailings] as an ore to offset cleanup costs?

Mike Alcorn:
BLM would not treat the tailings as ore, but as contaminated soil. There is concern about the environmental aspects of ore processing [state and federal permits, CWA, CAA requirements]. The cost to bring in the equipment and the time required to process would be far more expensive than the proposed option of constructing a landfill. Reprocessing may have been an option for one of the former operators.

Theodore Gordon:
Expressed concern for mercury in fish.

Mike Alcorn:
Scientific studies show the fish in the Kuskokwim watershed do not contain hazardous levels of mercury. One study showed slightly elevated levels of mercury in the livers of the fish in the Kuskokwim watershed.

The site contains mercury sulfide (cinnabar) and elemental mercury from the retorting process. The most hazardous form of mercury is methyl mercury. Methyl mercury is more toxic than the other types of mercury and has not been found at the site.

Theodore Gordon:
Natives eat every part of the fish.

Mike Alcorn:
June, would you explain to the group the nature of the regional geology and the distribution of the metals in the rock.

June McAtee:

The mercury belt appears to extend from Red Devil to Decoursey Mountain; mercury in soil samples have higher levels than areas outside this province.

If there is elevated mercury levels in fish, pike would be the most likely fish to show this and there is no evidence to support that. Salmon do not feed once they reach fresh water.

Theodore Gordon:
Salmon do eat in fresh water, out of habit. Have examined the stomach contents of salmon that prove this.

Mike Alcorn:
Red Devil Creek and the Kuskokwim have been tested for metals. The Kuskokwim River meets EPA drinking water quality standards for metals. The Red Devil Creek does show elevated levels of metals, but the contamination is confined to the site.

Red Devil creek may be too small to support a fish population. The Creek is not classified as anadromous by ADNR. Anadromous means they spend only a fraction of their life in fresh waters, and most of their life in the ocean.

BLM will make draft copies of work plan available.

Steve Hill:
Why not send contaminants back down the main shaft?

Mike Alcorn:
Shaft is full of water and this would further contaminate the ground water. Crushed ore has a higher surface area which increases the risk of further contamination to the environment.

Meeting adjourned 11:45 A.M.

APPENDIX D

WASTE STREAM SUMMARY, SHIPPING MANIFESTS, AND DISPOSAL CERTIFICATES

- **Hazardous and Nonhazardous Waste Log**
- **Hazardous Waste Manifests**
- **Certificates of Treatment, Recycling, and/or Disposal**
- **Asbestos Waste Shipment Record**
- **Shipper's Declaration of Dangerous Goods**
- **Nonhazardous Waste Manifest and Certificate of Reclamation for Used Oil**

HAZARDOUS AND NONHAZARDOUS WASTE LOG

RED DEVIL MINE (EPA ID#: AKD980495618)

Manifest, Line #	GTW manifest		Container ID #	Waste Description	Container	Weight	SHIPPING NAME	profile #
0264A, 1b	25611		00-RDV-01	Mercury contaminated soil, >260ppm	dm55(1A2)	525	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-02	Mercury contaminated soil, >260ppm	dm55(1A2)	582	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-03	Mercury contaminated soil, >260ppm	dm55(1A2)	741	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-04	Mercury contaminated soil, >260ppm	dm55(1A2)	487	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-05	Mercury contaminated soil, >260ppm	dm55(1A2)	525	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-06	Mercury contaminated soil, >260ppm	dm55(1A2)	650	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-07	Mercury contaminated soil, >260ppm	dm55(1A2)	755	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-08	Mercury contaminated soil, >260ppm	dm55(1A2)	600	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-09	Mercury contaminated soil, >260ppm	dm55(1A2)	769	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-10	Mercury contaminated soil, >260ppm	dm55(1A2)	600	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-11	Mercury contaminated soil, >260ppm	dm55(1A2)	204	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-12	Mercury contaminated soil, >260ppm	dm55(1A2)	636	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-13	Mercury contaminated soil, >260ppm	dm55(1A2)	538	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1b			00-RDV-34	Mercury contaminated soil, >260ppm	dm55(1A2)	883	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-01
0264A, 1c		CF-01	00-RDV-23	1 c.y. supersack with ACBM (Hg contaminated)	13H3/Y IBC	695	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-02	00-RDV-24	1 c.y. supersack with ACBM (Hg contaminated)	13H3/Y IBC	558	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-02	00-RDV-70	supersack with Asbestos/Hg from furnace	13H3/Y IBC	900	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-03	00-RDV-37	1 c.y. supersack with ACBM (Hg contaminated)	13H3/Y IBC	602	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-03	00-RDV-71	supersack with Asbestos/Hg from furnace	13H3/Y IBC	974	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-04	00-RDV-25	1 c.y. supersack with ACBM (Hg contaminated)	13H3/Y IBC	541	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-04	00-RDV-26	1 c.y. supersack with ACBM (Hg contaminated)	13H3/Y IBC	970	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-05	00-RDV-21	1 c.y. supersack with ACBM (Hg contaminated)	13H3/Y IBC	700	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-05	00-RDV-39	supersack with Asbestos/Hg from furnace	13H3/Y IBC	948	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-06	00-RDV-64	supersack with Asbestos/Hg from furnace	13H3/Y IBC	1924	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-07	00-RDV-65	supersack with Asbestos/Hg from furnace	13H3/Y IBC	2036	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-08	00-RDV-67	supersack with Asbestos/Hg from furnace	13H3/Y IBC	1977	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c	25592	CF-09	00-RDV-73	supersack with Asbestos/Hg from furnace	13H3/Y IBC	1398	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-10	00-RDV-72	supersack with Asbestos/Hg from furnace	13H3/Y IBC	1651	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-11	00-RDV-38	supersack with Asbestos/Hg from furnace	13H3/Y IBC	924	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-11	00-RDV-40	supersack with Asbestos/Hg from furnace	13H3/Y IBC	870	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-12	00-RDV-68	supersack with Asbestos/Hg from furnace	13H3/Y IBC	1968	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-13	00-RDV-62	supersack with Asbestos/Hg from furnace	13H3/Y IBC	1994	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-14	00-RDV-61	supersack with Asbestos/Hg from furnace	13H3/Y IBC	2200	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-15	00-RDV-20	1 c.y. supersack with ACBM (Hg contaminated)	13H3/Y IBC	700	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-15	00-RDV-28	1 c.y. supersack with ACBM,shop vac (w/Hg)	13H3/Y IBC	465	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-16	00-RDV-22	1 c.y. supersack with ACBM (Hg contaminated)	13H3/Y IBC	501	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-16	00-RDV-69	supersack with Asbestos/Hg from furnace	13H3/Y IBC	829	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-17	00-RDV-66	supersack with Asbestos/Hg from furnace	13H3/Y IBC	2153	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-18	00-RDV-63	supersack with Asbestos/Hg from furnace	13H3/Y IBC	2044	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264A, 1c		CF-19	00-RDV-80	supersack with Asbestos/Hg from furnace	13H3/Y IBC	1955	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1a			00-RDV-36	Metallic mercury	dm5 (1A2)	20	Mercury, 8, UN2809, pgII	162411-01
0264B, 1b			00-RDV-49	Sock filters from water treatment	dm55(1A2)	579	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-00
0264B, 1b			00-RDV-75	Sock filters from water treatment	dm55(1A2)	444	Hazardous Waste Solid, NOS (Mercury,>260ppm)	162412-00
0264B, 1c			00-RDV-16	Mercury contaminated Fiber (ACM)	dm55(1A2)	220	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-17	Asbestos containing building materials (ACBM)	dm55(1A2)	282	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-18	Asbestos containing building materials (ACBM)	dm55(1A2)	141	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-19	Asbestos containing building materials (ACBM)	dm55(1A2)	201	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00

Manifest, Line #	GTW manifest		Container ID #	Waste Description	Container	Weight	SHIPPING NAME	profile #
0264B, 1c			00-RDV-42	dm55 with Asbestos/Hg from furnace	dm55(1A2)	593	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-43	dm55 with Asbestos/Hg from furnace	dm55(1A2)	321	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-44	dm55 with Asbestos/Hg from furnace	dm55(1A2)	653	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-45	dm55 with Asbestos/Hg from furnace	dm55(1A2)	601	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-46	dm55 with Asbestos/Hg from furnace	dm55(1A2)	431	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-47	dm55 with Asbestos/Hg from furnace	dm55(1A2)	522	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-48	dm55 with Asbestos/Hg from furnace	dm55(1A2)	513	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-41	dm55 with Asbestos/Hg from furnace	dm55(1A2)	614	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-50	dm55 with Asbestos/Hg from furnace	dm55(1A2)	532	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-51	dm55 with Asbestos/Hg from furnace	dm55(1A2)	511	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-52	dm55 with Asbestos/Hg from furnace	dm55(1A2)	529	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-53	dm55 with Asbestos/Hg from furnace	dm55(1A2)	589	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-54	dm55 with Asbestos/Hg from furnace	dm55(1A2)	740	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-55	dm55 with Asbestos/Hg from furnace	dm55(1A2)	747	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-56	dm55 with Asbestos/Hg from furnace	dm55(1A2)	686	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-57	dm55 with Asbestos/Hg from furnace	dm55(1A2)	552	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-58	dm55 with Asbestos/Hg from furnace	dm55(1A2)	304	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-59	dm55 with Asbestos/Hg from furnace	dm55(1A2)	647	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1c			00-RDV-60	dm55 with Asbestos/Hg from furnace	dm55(1A2)	601	Hazardous Waste Solid, NOS (Mercury,>260ppm)	169522-00
0264B, 1d			00-RDV-76	Mercury contaminated PPE, **<260ppm (ssack)**	13H3/Y IBC	313	Hazardous Waste Solid, NOS (Mercury,<260ppm)	162413-00
0264B, 1d			00-RDV-14	Mercury contaminated PPE, **<260ppm**	dm55(1A2)	139	Hazardous Waste Solid, NOS (Mercury,<260ppm)	162413-01
0264B, 1d			00-RDV-15	Mercury contaminated Garbage, **<260ppm**	dm55(1A2)	172	Hazardous Waste Solid, NOS (Mercury,<260ppm)	162413-01
0264B, 2a			00-RDV-31	Fuel oil recovered from pipelines	dm55(1A1) in dm85	484	Diesel Fuel, 3, NA1993, pgIII	162420-01
0264B, 2b			00-RDV-81	Zeolite Filtering Media from water treatment system	dm55(1A2)	1000	Hazardous Waste Solid, NOS (Mercury,<260ppm)	169653-00
0264B, 2c			00-RDV-82	Carbon Filtering Media from water treatment system	dm55(1A2)	850	Hazardous Waste Solid, NOS (Mercury,<260ppm)	169653-00
0264C, 1a			00-RDV-30	Used Oil [suspected non PCB transformer oil], Blue drum left from 1999 (1999 ID#: D-25?)	dm55(1A1) in dm85	538	Material Not Regulated By DOT (used oil)	CL2510
0264C, 1a			00-RDV-32	Used oil found near shop building (~25 gal)	dm55(1A1) in dm85	362	Material Not Regulated By DOT (used oil)	CL2510
Asbestos Manifest			00-RDV-35	1 c.y. supersack with ACBM, brake,clutch pads	13H3/Y IBC	472	RQ, Asbestos, 9, NA2212, pgIII	AAC
Asbestos Manifest			00-RDV-74	1 cy supersack with ACBM, brake,clutch pads	13H3/Y IBC	451	RQ, Asbestos, 9, NA2212, pgIII	AAC
Not Manifested			00-RDV-27	1 c.y. supersack with visqueen	13H3/Y IBC	158	Non-hazardous, Non-Regulated Material	Wilder
Not Manifested			00-RDV-29	Non-Contaminated Visqueen from containment berm	13H3/Y IBC	301	Non-hazardous, Non-Regulated Material	Wilder
Not Manifested			00-RDV-33	Non-Contaminated Visqueen from containment berm	13H3/Y IBC	507	Non-hazardous, Non-Regulated Material	Wilder
Not Manifested			00-RDV-77	Supersack with general trash	13H3/Y IBC		Non-hazardous, Non-Regulated Material	Wilder

HAZARDOUS WASTE MANIFESTS

( ) 00A264 08/14/00

WR 50643

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UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: AKD980495618
Manifest Document No.: 0264A
2. Page 1 of 3
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
USDOI, BLM-RED DEVIL MINE, AK T19N, R44W, SEC.6
6881 ABBOTT LOOP ROAD
4. Generator's Phone ANCHORAGE AK 99507 (907)267-1442

A. State Manifest Document Number
B. State Generator's ID
C. State Transporter's ID
D. Transporter's Phone (907)243-6150
E. State Transporter's ID
F. Transporter's Phone (907)272-9007
G. State Facility's ID
H. Facility's Phone (206) 762-3362

5. Transporter 1 Company Name: LYNDEN AIR CARGO
6. US EPA ID Number: AKR000001909
7. Transporter 2 Company Name: Burlington Environmental, Inc.
8. US EPA ID Number: AKD983068602
9. Designated Facility Name and Site Address: BURLINGTON ENVIRONMENTAL INC.
734 South Lucile Street
Seattle , WA 98108
10. US EPA ID Number: WAD000812909

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	HM		12. Containers No	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	~~RQ~~	~~WASTE MERCURY 8 UN2809 PGIII (1) ERG#(172)~~ DELETED		~~DM~~		~~P~~	~~D009~~
b.	RQ	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY) 9 NA3077 PGIII (1) ERG#(171)	14	DM	8495	P	D009D004D010 U151
c.	RQ	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY) 9 NA3077 PGIII (ASBESTOS) ERG#(171)	19	~~BA~~ CF	32477	P	D009 U151
d.		~~HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY) 9 NA3077 PGIII (1) ERG#(171)~~ DELETED		~~DM~~		~~P~~	~~D009~~

J. Additional Descriptions for Materials Listed Above
~~a) 162411-01 METALLIC MERCURY REC13 (3)~~ b) 162412-01 - - MERCURY CONTAMINATED SOIL,DEBRIS - REC14 (4) ~~c) 169522-00 MERCURY CONTAMINATED~~ ASBESTOS,DEBRIS - REC14 (8) ~~d) 162413-00 MERCURY CONTAMINATED PPE, <260PPM STAB07 STABS07 (6)~~

K. Handling Codes for Wastes Listed Above
a) b) c) d)

15. Special Handling Instructions and Additional Information

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: Michael Alcorn
Signature: [signature]
Month Day Year: 08 16 00

17. Transporter 1 Acknowledgment of Receipt of Materials
Printed/Typed Name: STEPHEN E THOMPSON
Signature: [signature]
Month Day Year: 08 16 00

18. Transporter 2 Acknowledgment of Receipt of Materials
Printed/Typed Name: Richard Hennagin
Signature: [signature]
Month Day Year: 08 17 00

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: RICK GILBERT
Signature: [signature]
Month Day Year: 09 20 00

GENERATOR / TRANSPORTER / FACILITY

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ORIGINAL-RETURN TO GENERATOR

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UNIFORM HAZARDOUS WASTE MANIFEST (Continuation Sheet)

21. Generator's US EPA ID No.	Manifest Document No.	22. Page 2 of 3	Information in the shaded areas is not required by Federal law.
AKD980495618	0264A		

23. Generator's Name
USDOI, BLM-RED DEVIL MINE, AK T19N, R44W, SEC.6
6881 ABBOTT LOOP ROAD
ANCHORAGE AK 99507 (907)267-1442
03

L. State Manifest Document Number

M. State Generator's ID

24. Transporter 3 Company Name: Alaska Railroad Corporation — 25. US EPA ID Number: AKD981767403

N. State Transporter's ID

O. Transporter's Phone (907) 265-2476

26. Transporter 4 Company Name: Crowley Marine Service — 27. US EPA ID Number: WAD008958027

P. State Transporter's ID

Q. Transporter's Phone (206) 340-2901

28. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	HM	29. Containers No.	29. Containers Type	30. Total Quantity	31. Unit Wt/Vol	R. Waste No.
a. ~~WASTE PETROLEUM DISTILLATES, N.O.S. 3 UN1268 PGIII (D001)~~ RQ UN1268 DELETED			~~BM~~		~~P~~	~~D001~~
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						

S. Additional Descriptions for Materials Listed Above
a) 162420-01 - FUEL OIL (DIESEL) - AF01 AF02 AF03 AF04 (9)

T. Handling Codes for Wastes Listed Above
a)

32. Special Handling Instructions and Additional Information

GENERATOR

TRANSPORTER

33. Transporter ____ Acknowledgment of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
James B. Seeberger	[signature]	08 25 00

34. Transporter ____ Acknowledgment of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
Regina Palmer	[signature] for Crowley	08 28 00

FACILITY

35. Discrepancy Indication Space

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UNIFORM HAZARDOUS WASTE MANIFEST (Continuation Sheet)

21. Generator's US EPA ID No.	Manifest Document No.	22. Page 3 of 6	Information in the shaded areas is not required by Federal law.
AKD980495618	0264A		

23. Generator's Name
USDOI, BLM-RED DEVIL MINE, AK T19N, R44W, SEC.6
6881 ABBOTT LOOP ROAD
ANCHORAGE, AK 99507 (907) 267-1442

L. State Manifest Document Number

M. State Generator's ID

24. Transporter 05 Company Name
Union Pacific Railroad Co.

25. US EPA ID Number
MED001792910

N. State Transporter's ID

O. Transporter's Phone (800) 925-6989

26. Transporter ___ Company Name

27. US EPA ID Number

P. State Transporter's ID

Q. Transporter's Phone

28. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	HM	29. Containers No.	29. Containers Type	30. Total Quantity	31. Unit Wt/Vol	R. Waste No.
a.						
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						

S. Additional Descriptions for Materials Listed Above

T. Handling Codes for Wastes Listed Above

32. Special Handling Instructions and Additional Information

GENERATOR

TRANSPORTER

33. Transporter 5 Acknowledgment of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)
FOR UPRR RICK GILBERT	Rick Gilbert	09 20 00

34. Transporter ___ Acknowledgment of Receipt of Materials

Printed/Typed Name	Signature	Date (Month Day Year)

FACILITY

35. Discrepancy Indication Space

EPA Form 8700-22A (Rev. 9-88) Previous edition is obsolete.

***FOR 24 HOUR EMERGENCY RESPONSE INFORMATION, CALL (907) 272-9007 ***

( ) 00A264 08/14/00

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) WR# 50644 Form Approved. OMB no. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of 3	Information in the shaded areas is not required by Federal law.
AKD980495618	0264B		

3. Generator's Name and Mailing Address
USDOI, BLM-RED DEVIL MINE, AK T19N, R44W, SEC.6
6881 ABBOTT LOOP ROAD
4. Generator's Phone ANCHORAGE AK 99507 (907)267-1442

A. State Manifest Document Number
B. State Generator's ID

5. Transporter 1 Company Name	6. US EPA ID Number	C. State Transporter's ID / D. Transporter's Phone
LYNDEN AIR CARGO	AKR000001909	(907)243-6150
7. Transporter 2 Company Name	8. US EPA ID Number	E. State Transporter's ID / F. Transporter's Phone
Burlington Environmental, Inc.	AKD983068602	(907)272-9007

9. Designated Facility Name and Site Address	10. US EPA ID Number	G. State Facility's ID / H. Facility's Phone
BURLINGTON ENVIRONMENTAL INC. 734 South Lucile Street Seattle , WA 98108	WAD000812909	(206) 762-3362

GENERATOR

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	HM	12. Containers No	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. WASTE MERCURY 8 UN2809 PGIII (1) ERG#(172)	RQ	1	DM	19	P	D009, U151
b. HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY) 9 NA3077 PGIII (1) ERG#(171)	RQ	2	DM	1023	P	D009D004D010 U151
c. HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY) 9 NA3077 PGIII (ASBESTOS) ERG#(171)	RQ	23	~~DA~~ DM	11530	P	D009 U151
d. HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY) 9 NA3077 PGIII (1) ERG#(171)	X	2 1	DM CF	624	P	D009

J. Additional Descriptions for Materials Listed Above
a) 162411-01 - - METALLIC MERCURY - MEC13 (3) b) 162412-01 - - MERCURY CONTAMINATED SOIL,DEBRIS - MEC14 (4) c) 169522-00 - - MERCURY CONTAMINATED ASBESTOS,DEBRIS - MEC14 (8) d) 162413-00 - - MERCURY CONTAMINATED PPE, <260PPM - STAB07 STAB507 (6)

K. Handling Codes for Wastes Listed Above
a) b) c) d)

15. Special Handling Instructions and Additional Information

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	Month	Day	Year
Michael Alcorn		08	16	00

TRANSPORTER

17. Transporter 1 Acknowledgment of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Jason Wells		8	19	00

18. Transporter 2 Acknowledgment of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Richard Hennagin		08	21	00

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
RICK GILBERT		09	20	00

EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete

ORIGINAL - RETURN TO GENERATOR

OA264

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB no. 2050-0039. Expires 9-30-99

UNIFORM HAZARDOUS WASTE MANIFEST (Continuation Sheet)

21. Generator's US EPA ID No.: AKD980495618

Manifest Document No.: 0264B

22. Page 2 of 3

Information in the shaded areas is not required by Federal law.

23. Generator's Name: USDOI, BLM-RED DEVIL MINE, AK T19N, R44W, SEC.6
6881 ABBOTT LOOP ROAD
ANCHORAGE AK 99507 (907)267-1442

L. State Manifest Document Number

M. State Generator's ID

24. Transporter 03 Company Name: Alaska Railroad Corporation

25. US EPA ID Number: AKD981767403

N. State Transporter's ID

O. Transporter's Phone: (907) 265-2476

26. Transporter 04 Company Name: Crowley Marine Service

27. US EPA ID Number: WAD008958027

P. State Transporter's ID

Q. Transporter's Phone: (206) 340-2901

	HM	28. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	29. Containers No.	Type	30. Total Quantity	31. Unit Wt/Vol	R. Waste No.
a.	RQ	WASTE PETROLEUM DISTILLATES, N.O.S. 3 UN1268 PGII (D001) ERG# (128)	1	DM	484	P	D001
b.	X	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY) 9 NA 3077 PG III (1) ERG # (171)	1	DM	APPX 1000	P	D009 [redacted]
c.	X	HAZARDOUS WASTE, SOLID, N.O.S (MERCURY) 9 NA 3077 PG III (1) ERG # (171)	1	DM	APPX 850	P	D009 [redacted]
d.							
e.							
f.							
g.							
h.							
i.							

S. Additional Descriptions for Materials Listed Above: a) 162420-01 - FUEL OIL (DIESEL) - AF01 AF02 AF03 AF04 (9)

T. Handling Codes for Wastes Listed Above: a)

32. Special Handling Instructions and Additional Information

33. Transporter ____ Acknowledgment of Receipt of Materials

Printed Typed Name: James B. Seeburger / Jason Wells Jr.

Signature: James B. Seeburger

Date: Month 8 Day 25 Year 00

34. Transporter ____ Acknowledgment of Receipt of Materials

Printed Typed Name: Regina Palmer

Signature: Regina Palmer for Crowley

Date: Month 09 Day 08 Year 00

35. Discrepancy Indication Space

GENERATOR

TRANSPORTER

FACILITY

EPA Form 8700-22A (Rev. 9-88) Previous edition is obsolete

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB no. 2050-0039. Expires 9-30-99

UNIFORM HAZARDOUS WASTE MANIFEST (Continuation Sheet)

21. Generator's US EPA ID No. AKD980495618

Manifest Document No. 026HB

22. Page 3 Information in the shaded areas is not required by Federal

23. Generator's Name
USDOI, BLM-RED DEVIL MINE, AK: T19N, R44W, SEC. 6
6881 ABBOTT LOOP ROAD
ANCHORAGE AK 99507 (907) 267-1442

L. State Manifest Document Number

M. State Generator's ID

N. State Transporter's ID

24. Transporter 05 Company Name
Union Pacific Railroad Co.

25. US EPA ID Number
MED001792910

O. Transporter's Phone (800) 925-6989

P. State Transporter's ID

26. Transporter ___ Company Name

27. US EPA ID Number

Q. Transporter's Phone

28. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	HM	29. Containers No.	29. Containers Type	30. Total Quantity	31. Unit Wt/Vol	R. Waste No.
a.						
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						

GENERATOR

S. Additional Descriptions for Materials Listed Above

T. Handling Codes for Wastes Listed Abo

32. Special Handling Instructions and Additional Information

TRANSPORTER

33. Transporter 5 Acknowledgment of Receipt of Materials

Printed/Typed Name FOR UPRR RICK GILBERT

Signature

Date Month Day Ye 09 20

34. Transporter ___ Acknowledgment of Receipt of Materials

Printed/Typed Name

Signature

Date Month Day Y

FACILITY

35. Discrepancy Indication Space

CERTIFICATES OF TREATMENT, RECYCLING, AND/OR DISPOSAL

JAN 2 2 2001

Date: 01/16/01 CERTIFICATE OF TREATMENT, RECYCLING, AND/OR DISPOSAL

This is to certify that the following waste material was received, managed, and treated in compliance with all applicable Federal and Washington State Laws and regulations.

Facility: BURLINGTON ENVIRONMENTAL INC. 734 SOUTH LUCILE STREET
GEORGETOWN FACILITY SEATTLE WA 98108
EPA ID: WAD000812909

Generator: 32697 - USDOI, BLM-RED DEVIL MINE, AK EPA ID: AKD980495618

Manifest: 0264A Waste Receipt #: GTW-50643 Date Received: 09/20/00

Line	Profile	Material Description	Treatment/Disposal Description	Final Treatment/ Disposal Facility	Final PSC Manifest	PgLn	Final Date/ Date Shipped
1B	162412-01	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY)	M012 RETORTING	SUPERIOR SPECIAL SERVICES	25611-GTW	1C	11/20/00
1C	169522-00	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY)	M012 RETORTING	SUPERIOR SPECIAL SERVICES	25592-GTW	1D	10/30/00

Name: Wanda Grondahl Signature : Wanda Grondahl Title : Certificate Production Specialist

JAN 2 2 2001

Date: 01/16/01 CERTIFICATE OF TREATMENT, RECYCLING, AND/OR DISPOSAL

This is to certify that the following waste material was received, managed, and treated in compliance with all applicable Federal and Washington State Laws and regulations.

Facility: BURLINGTON ENVIRONMENTAL INC. 734 SOUTH LUCILE STREET
GEORGETOWN FACILITY SEATTLE WA 98108
EPA ID: WAD000812909

Generator: 32697 - USDOI, BLM-RED DEVIL MINE, AK EPA ID: AKD980495618

Manifest: 0264B Waste Receipt #: GTW-50644 Date Received: 09/20/00

Line	Profile	Material Description	Treatment/Disposal Description	Final Treatment/ Disposal Facility	Final PSC Manifest	PgLn	Final Date/ Date Shipped
1A	162411-01	WASTE MERCURY	M012 RETORTING	SUPERIOR SPECIAL SERVICES	25611-GTW	1C	11/20/00
1B	162412-01	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY)	M012 RETORTING	SUPERIOR SPECIAL SERVICES	25611-GTW	1C	11/20/00
1C	169522-00	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY)	M012 RETORTING	SUPERIOR SPECIAL SERVICES	25592-GTW	1C	10/30/00
				SUPERIOR SPECIAL SERVICES	25592-GTW	1A	10/30/00
				SUPERIOR SPECIAL SERVICES	25611-GTW	1A	11/20/00
1D	162413-00	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY)	M111 STABILIZATION/CHEMICAL FIXATION/CEMENT	COLUMBIA RIDGE LANDFILL	17550-KNT	1A	10/27/00
2A	162420-01	WASTE PETROLEUM DISTILLATES, N.O.S.	M061 FUEL BLENDING	SYSTECH ENVIRONMENTAL	25648-GTW	1A	12/14/00
2B	169653-00	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY,ARSENIC)	M111 STABILIZATION/CHEMICAL FIXATION/CEMENT	COLUMBIA RIDGE LANDFILL	17483-KNT	1A	10/17/00
2C	169653-00	HAZARDOUS WASTE, SOLID, N.O.S. (MERCURY,ARSENIC)	M111 STABILIZATION/CHEMICAL FIXATION/CEMENT	COLUMBIA RIDGE LANDFILL	17483-KNT	1A	10/17/00

Name: Wanda Grondahl Signature : Wanda Grondahl Title : Certificate Production Specialist

ASBESTOS WASTE SHIPMENT RECORD

MUNICIPALITY OF ANCHORAGE, SOLID WASTE SERVICES
ASBESTOS WASTE SHIPMENT RECORD

GENERATOR

1. Work Site Name & Mailing Address: Retort Building, Red Devil Mine, Red Devil, AK 99656 AAC #254-00

Owner's Name: US Dept. of Interior, BLM

Owner's Phone: 907-267-1442

2. Operator's Name & Address: Alaska Abatement Corp., 520 W. 58th Ave., Suite J, Anchorage, AK 99518

Operator's Phone: 907-563-0088

3. Waste Disposal Site: MUNICIPALITY OF ANCHORAGE, SOLID WASTE SERVICES
ANCHORAGE REGIONAL LANDFILL, HILAND ROAD
ANCHORAGE, ALASKA
TELE 907-428-0664 FAX 907-428-1697

SWS Authorization: AS# 20150 expires 1800 10/31/00

SWS Contact Phone: 907-343-6278

4. Name & Address of Responsible Agency: EPA REGION 10, ASBESTOS PROGRAM
1200 Sixth Avenue, Seattle, WA 98101
1-800-424-4372

5. Description of Materials: TSI, VAT & CAB

6. Containers No.	Type	7. Total Quantity (Cubic Yards)
3	5 BA	3.0

8. Special Handling Instructions & Additional Information: "Asbestos 9, NA2212 III, RQ"

9. Operator's Certification: I HEREBY DECLARE THAT THE CONTENTS OF THIS CONSIGNMENT ARE FULLY AND ACCURATELY DESCRIBED ABOVE BY PROPER SHIPPING NAME & ARE CLASSIFIED, PACKED, MARKED, AND LABELED AND ARE IN ALL RESPECTS IN PROPER CONDITION FOR TRANSPORT BY HIGHWAY ACCORDING TO APPLICABLE INTERNATIONAL & GOVERNMENTAL REGULATIONS.

Printed/Typed Name & Title: Richard Scheideman - Supervisor

Signature: [signature]

Date: 7-26-00

TRANSPORTER

10. Transporter 1 (Acknowledgment of Receipt of Materials)

Printed/Typed Name & Title: Lynden Air Cargo

Address & Telephone: 6441 So. Airpark Place Anchorage, AK 99502 243-6150

Signature: [signature]

Date: 7-31-00

11. Transporter 2 (Acknowledgment of Receipt of Materials)

Printed/Typed Name & Title: Rick Scheideman, Driver

Address & Telephone: 520 West 58th Ave. Ste J. Anchorage, AK 99518 563-0088

Signature: [signature]

Date: 8-2-00

DISPOSAL SITE

12. Discrepancies Noted:

13. Waste Disposal Site Owner or Operator:
I certify that I have received the asbestos materials noted in Section 5 except as noted in Section 12. Discrepancies.

Arrival Time: 9:20 Departure Time: 9:30 Total Time: 10 min

Printed/Typed Names & Title: Kurt W. Bernstiel RDU

Signature: [signature]

Date: 8-2-00

SWS Weight Invoice #: 147864

31/00

Recieved Time Jul.31. 9:05AM

MUNICIPALITY OF ANCHORAGE, SOLID WASTE SERVICES
ASBESTOS WASTE SHIPMENT RECORD

1. Work Site Name & Mailing Address: Retort Building, Red Devil Mine, Red Devil, AK 99656 AAC #254-00	Owner's Name: US Dept. of Interior, BLM	Owner's Phone: 907-267-14[illegible]
2. Operator's Name & Address: Alaska Abatement Corp., 520 W. 58th Ave., Suite J, Anchorage, AK 99518		Operator's Phone: 907-563-0088
3. Waste Disposal Site: MUNICIPALITY OF ANCHORAGE, SOLID WASTE SERVICES ANCHORAGE REGIONAL LANDFILL, HILAND ROAD ANCHORAGE, ALASKA TELE 907-428-0864 FAX 907-428-1697	SWS Authorization: AS# 20150 expires 1600 10/31/00	SWS Contact Phone: 907-343-6278

4. Name & Address of Responsible Agency: EPA REGION 10, ASBESTOS PROGRAM 1200 Sixth Avenue, Seattle, WA 98101 1-800-424-4372

GENERATOR

5. Description of Materials:	6. Containers No.	Type	7. Total Quantity (Cubic Yards)
VAT CAB GASKETS Brake pads	3	BA	2
clutch pads			

8. Special Handling Instructions & Additional Information:
K.Q. ASBESTOS NA2212 Class 9 PG III

9. Operator's Certification: I HEREBY DECLARE THAT THE CONTENTS OF THIS CONSIGNMENT ARE FULLY AND ACCURATELY DESCRIBED ABOVE BY PROPER SHIPPING NAME & ARE CLASSIFIED, PACKED, MARKED, AND LABELED AND ARE IN ALL RESPECTS IN PROPER CONDITION FOR TRANSPORT BY HIGHWAY ACCORDING TO APPLICABLE INTERNATIONAL & GOVERNMENTAL REGULATIONS.

Printed/Typed Name & Title	Signature	Date
Rich Scheideman Supervisor	[signature]	8-9-00

TRANSPORTER

10. Transporter 1 (Acknowledgment of Receipt of Materials)

Printed/Typed Name & Title / Address & Telephone	Signature	Date
Jason Wells Pilot LAC Glen Sunrise Pl Anchorage AK	[signature]	8/19/00

11. Transporter 2 (Acknowledgment of Receipt of Materials)

Printed/Typed Name & Title / Address & Telephone	Signature	Date
Phillip Roberson Driver 520 W. 58th Ave., Ste J Anchorage AK 99518 563-0088	[signature]	08/23/00

DISPOSAL SITE

12. Discrepancies Noted:

13. Waste Disposal Site Owner or Operator:
I certify that I have received the asbestos materials noted in Section 8 except as noted in Section 12, Discrepancies.

Arrival Time: 2:05 Departure Time: 2:10 Total Time: 5 min.

Printed/Typed Names & Title	Signature	Date	SWS Weight Invoice #
[illegible] W. Bernstine RDU 1	[signature]	8-23-00	150467

SHIPPER'S DECLARATION OF DANGEROUS GOODS

SHIPPER'S DECLARATION FOR DANGEROUS GOODS

Shipper: Wilder Construction

Air Waybill No. 26774066

Page of Pages

Shipper's Reference Number *(optional)*

Consignee: Burlington Environmental

Two completed and signed copies of this Declaration must be handed to the operator

TRANSPORT DETAILS

This shipment is within the limitations prescribed for: *(delete non-applicable)*

~~PASSENGER AND CARGO AIRCRAFT~~	CARGO AIRCRAFT ONLY

Airport of Departure: Red Dog

Airport of Destination: Anchorage

WARNING

Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties. This Declaration must not, in any circumstances, be completed and/or signed by a consolidator, a forwarder or an IATA cargo agent.

Shipment type: *(delete non-applicable)*

NON-RADIOACTIVE	~~RADIOACTIVE~~

NATURE AND QUANTITY OF DANGEROUS GOODS

Dangerous Goods Identification: Proper Shipping Name	Hazard Class & Subsid. risk	UN or ID No.	Quantity & Description	Packing	Auth.	ERG#
Engine Internal combustion (Flammable liquid powered)	9	UN 3166	Sky Truck forklift 19000 lbs	—	—	128
Hazardous waste, solid, nos.	9	NA 3077	Mercury contaminated Soil, debris 31 steel drums 10231 lbs	III		171
Hazardous waste, solid, nos.	9	NA 3077	Mercury contaminated asbestos, debris 23 steel drums 11,530 lbs	III		171
Hazardous waste, solid nos.	9	NA 3077	Mercury Contaminated PPE 2 steel drums @ 24 lbs.	III		171
Mercury	8	UN 2809	n/a Elemental mercury 1 steel drum 19 lbs	III		172

Additional Handling Information

24 HR. EMERGENCY CONTACT TEL. NO. (907) 322-3607

This shipment prepared according to: ☑ 49CFR ☐ IATA Regulations ☐ ICAO Regulations

I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labelled, and are in all respects in the proper condition for transport by air according to the applicable International and National Government Regulations.

Name/Title of Signatory: KC Smith Foreman Wilder Const

Place and Date: Red Dog AK 9-11-08

Signature *(see warning above)*

F-83 DETAILED

NONHAZARDOUS WASTE MANIFEST AND CERTIFICATE OF RECLAMATION FOR USED OIL

*** FOR 24 HOUR EMERGENCY RESPONSE INFORMATION, CALL (907) 272-9007 ***

( ) 00A264

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of
AKD980495618	0264C	2

3. Generator's Name and Mailing Address

USDOI, BLM-RED DEVIL MINE, AK T19N, R44W, SEC.6
6881 ABBOTT LOOP ROAD
ANCHORAGE, AK 99507

4. Generator's Phone ( )

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
LYNDEN AIR CARGO	AKR000001505	(907)243-6150
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone
Alaska Environmental, Inc.	AKR000000000	(907)272-9007
9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
CHEMRON ALASKA 13460 HERMANN AVE PALMER, AK 99645	AKD980984405	(907) 746-0399

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. COMBUSTIBLE LIQUID, N.O.S. (PETROLEUM OIL) Combustible liquid NA1993 PGIII ERG#(128)	2	DM	1000	P
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above

a) CL2510-00 - OFF SPEC USED OIL - OIL01 (10)

E. Handling Codes for Wastes Listed Above

a)

15. Special Handling Instructions and Additional Information

SEND Bill and Original Copy of Manifest To Philip Services

16. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
Michael Alcorn		08	16	90

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
STEPHEN E TIMPSON		08		

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Richard Hennagin		08	17	90

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Jeffrey D Steenhoven		10	19	90

COPY
Transporter 2

GENERATOR — TRANSPORTER — FACILITY

Organic Pulling to Philip Services 1111 West 8th

( )

[redacted] lite (12-pitch) typewriter.)

NON HAZARDOUS WASTE MANIFEST (Continuation Sheet)	21. Generator's US EPA ID No.	Manifest Document No.	22. Page 2 of 2	Information in the shaded areas is not required by Federal law.
	AKD980495618	0264C		

23. Generator's Name
USDOI, BLM-RED DEVIL MINE, AK T19N, R44W, SEC.6
6881 ABBOTT LOOP ROAD
ANCHORAGE AK 99507 (907)267-1442

L. State Manifest Document Number
M. State Generator's ID
N. State Transporter's ID
O. Transporter's Phone (907) 746-0399
P. State Transporter's ID
Q. Transporter's Phone ( )

24. Transporter 03 Company Name
*ALASKA POLLUTION CONTROL, INC.

25. US EPA ID Number
AKD980984405

26. Transporter ___ Company Name

27. US EPA ID Number

28. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	HM	29. Containers No.	Type	30. Total Quantity	31. Unit Wt/Vol	R. Waste No.
a.						
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						

S. Additional Descriptions for Materials Listed Above

T. Handling Codes for Wastes Listed Above

32. Special Handling Instructions and Additional Information

33. Transporter 3 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month Day Year
Richard Cortez	Richard Cortez	10 19 00

34. Transporter ___ Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month Day Year

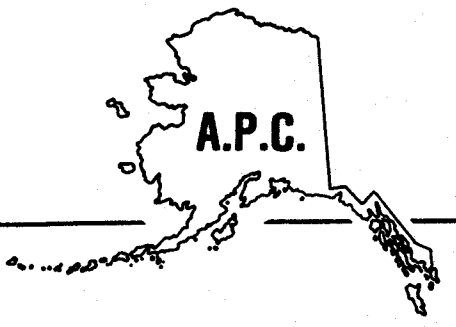
35. Discrepancy Indication Space
*24 Chemnor Alaska
*0 907 349 5036

GENERATOR

TRANSPORTER

FACILITY

Alaska Pollution Control, Inc.



RECYCLING ALASKA'S PETROLEUM PRODUCTS

CERTIFICATE OF RECLAMATION

Alaska Pollution Control, Inc., hereby certifies that the material referenced below was reclaimed for beneficial reuse at its facility located at its CHEMRON ALASKA facility located at: 13460 Hermann Ave., Palmer, AK 99645. EPA identification number AKD980984405.

Generator: USDOI BLM-Red Devil Mine, AK T19N, R44W, Sec.6
6881 Abbott Loop Road, Anchorage, AK 99507

Date Material Received: 10/19/00

Date of Reclamation: 10/23/00

Manifest Number: 0264C

APC Invoice Number: 201247

Material Received: Used Oil

Quantity Received: 110 gallons (1000 pounds)

Reclamation Process: Removal of water, grit and volatile organics from oil, then used as blending agent in the manufacture of industrial boiler fuel. Water was sent to APC Springer facility and treated in a WTU; grit was processed and disposed of; volatiles were burned in Chemron boiler. Drums were cut, washed, crushed and sent to a metal recycler.

Disposition of Reclaimed Products: Industrial boiler fuel was burned for energy recovery by EPA approved burner. Treated water after testing to be discharged to the City of Palmer sewer.

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

ALASKA POLLUTION CONTROL, INC.

Cecilia M. Hidalgo
Office Manager

Recycled Paper

P.O. Box 110374 • Anchorage, Alaska 99511-0374 • (907) 344-5036 • Fax: (907) 349-6925

APPENDIX E

SAMPLE RECORD LOG

Red Devil Sample Record Log

HLA Sample ID Number	Soil Boring and Well Locations	Field Screening Location	Field Location	Quality Control Sample Number	BLM Sample Number	Matrix	Sample Depth Interval	Date Collected	Time Collected	Collected By	Sample Type	Lab Analix Requested	Hard Copy Received	XRF Field Screen	Geotech	DRO (AK102)	GRO (AK101)	RRO (AK103)	BTEX - 8021 (solids)	BTEX - 602 (liquid)	TaqH (610)	Antimony (6020)	Arsenic (6020)	Mercury (7471)	Lead (6020)	TCLP (As - Hg)	TCLP (RCRA 8)	TCLP (Hg)	TCLP (As)	TCLP (Sb)	TCLP (Pb)	PLM(EPA600/M4/82/020)	cPAH (8270)	Total Fecal	TAL Metals	TOC
	B01					SL	0.5 - 2.0	8/1/00	4:00:00 PM	KV/BM	PR			X																						
	B01					SL	11.0 - 13.0	8/1/00	4:42:00 PM	KV/BM	PR			X																						
	B01					SL	14.0 - 16.0	8/1/00	4:48:00 PM	KV/BM	PR			X																						
	B01					SL	19.0 - 21.0	8/1/00	5:02:00 PM	KV/BM	PR			X																						
	B01					SL	24.0 - 25.0	8/1/00	5:20:00 PM	KV/BM	PR			X																						
	B01					SL	29.0 - 31.0	8/1/00	5:40:00 PM	KV/BM	PR			X																						
	B02					SL	0.5 - 2.0	8/7/00	4:50:00 PM	KV	PR			X																						
	B02					SL	19.0 - 20.5	8/8/00	8:05:00 AM	KV	PR			X																						
	B02					SL	24.0- 25.0	8/8/00	8:20:00 AM	KV	PR			X																						
	B02					SL	29.0 - 30.5	8/8/00	8:45:00 AM	KV	PR			X																						
	B02					SL	34.0 - 35.5	8/8/00	9:15:00 AM	KV	PR			X																						
	B02					SL	39.0 - 40.0	8/8/00	11:25:00 AM	KV	PR			X																						
	B02					SL	4.0 - 5.5	8/7/00	4:55:00 PM	KV	PR			X																						
	B02					SL	9.0 - 10.5	8/7/00	5:00:00 PM	KV	PR			X																						
	B03					SL	10.0 - 11.5	8/8/00	2:50:00 PM	KV	PR			X																						
	B03					SL	16.5 - 18.0	8/8/00	3:30:00 PM	KV	PR			X																						
	B03					SL	20.0 - 21.5	8/8/00	3:35:00 PM	KV	PR			X																						
	B03					SL	25.0 - 26.5	8/8/00	3:45:00 PM	KV	PR			X																						
	B03					SL	5.0 - 6.5	8/8/00	2:40:00 PM	KV	PR			X																						
	B04					SL	10.0 - 11.5	8/9/00	9:10:00 AM	KV	PR			X																						
	B04					SL	15.0 - 16.5	8/9/00	9:20:00 AM	KV	PR			X																						
	B04					SL	20.0 - 21.5	8/9/00	9:30:00 AM	KV	PR			X																						
	B04					SL	25.0 - 26.5	8/9/00	9:45:00 AM	KV	PR			X																						
	B04					SL	30.0 - 31.5	8/9/00	10:40:00 AM	KV	PR			X																						
	B04				B4/5-6.5	SL	5.0 - 6.5	8/9/00	9:00:00 AM	KV	PR	X	X	X								B	B	B	B										
	B05				B5/10-11.5	SL	10.0 - 11.5	8/9/00	2:20:00 PM	KV	PR	B	X	X								B	B	B	B										
	B05					SL	15.0 - 16.5	8/9/00	2:30:00 PM	KV	PR			X																						
	B05					SL	20.0 - 21.5	8/9/00	2:45:00 PM	KV	PR			X																						
	B05					SL	25.0 - 26.5	8/9/00	3:45:00 PM	KV	PR			X																						
	B05				B5/30-31.5	SL	30.0 - 31.5	8/9/00	4:25:00 PM	KV	PR	B	X	X								B	B	B	B										
	B05					SL	31.5	8/9/00	5:10:00 PM	KV	PR			X																						
	B05				B5/5-6.5	SL	5.0 - 6.5	8/9/00	2:10:00 PM	KV	PR	X	X	X								B	B	B	B										
	B06				B6/14-15.5	SL	14.0 - 15.5	8/10/00	8:50:00 AM	KV	PR	X	X	X								B	B	B	B										
	B06					SL	19.0 - 21.5	8/10/00	9:10:00 AM	KV	PR			X																						
	B06					SL	23.0 - 24.5	8/10/00	10:00:00 AM	KV	PR			X																						
	B06					SL	4.0 - 5.5	8/10/00	8:25:00 AM	KV	PR			X																						
	B06					SL	9.0 - 10.5	8/10/00	8:35:00 AM	KV	PR			X																						
	B07					SL	0.5 - 1.0	8/2/00	3:00:00 PM	KV/BM	PR			X																						
	B07					SL	14.0 - 15.5	8/2/00	3:40:00 PM	KV/BM	PR			X																						
	B07					SL	19.0 - 20.0	8/2/00	4:05:00 PM	KV/BM	PR			X																						
	B07					SL	4.0 - 6.0	8/2/00	3:15:00 PM	KV/BM	PR			X																						
	B07					SL	9.0 - 11.0	8/2/00	3:30:00 PM	KV/BM	PR			X																						
	RT50	FS001			RT50/1.5-3	SL	1.5 - 3.0	8/6/00	11:45:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT50	FS001			RT50/3-4.5	SL	3.0 - 4.5	8/6/00	11:50:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT50	FS001			RT50/5-6.5	SL	5.0 - 6.5	8/6/00	11:55:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT63	FS002				SL	0 - 0.5	7/30/00	10:05:00 AM	KV	PR			X																						
	RT63	FS002	RT63/1.5-3		RT63/1.5-3	SL	1.5 - 3.0	8/7/00	10:00:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT63	FS002			RT63/3-4.5	SL	3.0 - 4.5	8/7/00	10:05:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT62	FS003				SL	0 - 0.5	7/30/00	10:15:00 AM	KV	PR			X																						
	RT62	FS003				SL	1.5 - 3.0	8/7/00	9:35:00 AM	KV	PR			X																						
	RT62	FS003			RT62/3-4.5	SL	3.0 - 4.5	8/7/00	9:40:00 AM	KV	PR	X	X	X								B	B	B	B										
	RT59	FS004				SL	0 - 0.5	7/30/00	10:20:00 AM	KV	PR			X																						
	RT59	FS004				SL	1.5 - 3.0	8/7/00	8:35:00 AM	KV	PR			X																						
	RT59	FS004				SL	3.0 - 4.5	8/7/00	8:40:00 AM	KV	PR			X																						
	RT60	FS005				SL	0 - 0.5	7/30/00	10:30:00 AM	KV	PR			X																						
	RT60	FS005			RT60/1.5-3	SL	1.5 - 3.0	8/7/00	9:05:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT60	FS005			RT60/3-4.5	SL	3.0 - 4.5	8/7/00	9:10:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT64	FS006				SL	0 - 0.5	7/30/00	10:45:00 AM	KV	PR			X																						
	RT64	FS006			RT64/1.5-3	SL	1.5 - 3.0	8/7/00	10:15:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT64	FS006			RT64/3-4.5	SL	3.0 - 4.5	8/7/00	10:20:00 AM	KV	PR	B	X	X								B	B	B	B										
	RT66	FS007				SL	0 - 0.5	7/30/00	10:55:00 AM	KV	PR			X																						
	RT66	FS007			RT66/1.5-3	SL	1.5 - 3.0	8/7/00	10:45:00 AM	KV	PR	B	X	X								B	B	B	B										

Red Devil Sample Record Log

HLA Sample ID Number	Soil Boring and Well Locations	Field Screening Location	Field Location	Quality Control Sample Number	BLM Sample Number	Matrix	Sample Depth Interval	Date Collected	Time Collected	Collected By	Sample Type	Lab Analx Requested	Hard Copy Received	XRF Field Screen	Geotech	DRO (AK102)	GRO (AK101)	RRO (AK103)	BTEX - 8021 (solids)	BTEX - 602 (liquid)	TaqH (610)	Antimony (6020)	Arsenic (6020)	Mercury (7471)	Lead (6020)	TCLP (As - Hg)	TCLP (RCRA 8)	TCLP (Hg)	TCLP (As)	TCLP (Sb)	TCLP (Pb)	PLM(EPA600/M4/82/020)	cPAH (8270)	Total Fecal	TAL Metals	TOC
	RT66	FS007			RT66/3-4.5	SL	3.0 - 4.5	8/7/00	10:50:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT65	FS008				SL	0 - 0.5	7/30/00	11:05:00 AM	KV	PR			X																							
	RT65	FS008				SL	1.5 - 3.0	8/7/00	10:30:00 AM	KV	PR			X																							
	RT61	FS009				SL	0 - 0.5	7/30/00	11:30:00 AM	KV	PR			X																							
	RT61	FS009				SL	1.5 - 3.0	8/7/00	9:30:00 AM	KV	PR			X																							
	RT40	FS010			FS010	SL	0 - 0.5	8/1/00	10:25:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT40	FS010				SL	1.5 - 3.0	8/5/00	4:40:00 PM	KV	PR			X																							
	RT40	FS010				SL	3.0 - 4.5	8/5/00	4:43:00 PM	KV	PR			X																							
	RT39	FS011			FS011	SL	0 - 0.5	8/1/00	10:30:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT39	FS011				SL	1.5 - 3.0	8/5/00	4:20:00 PM	KV	PR			X																							
	RT41	FS012			FS012	SL	0 - 0.5	8/1/00	10:35:00 AM	KV	PR	B		X								B	B	B	B											
	RT41	FS012			RT41/1.5-3	SL	1.5 - 3.0	8/5/00	4:55:00 PM	KV	PR	X	X	X								B	B	B	B											
	RT41	FS012				SL	3.0 - 4.5	8/5/00	4:55:00 PM	KV	PR			X																							
	RT38	FS013			FS013	SL	0 - 0.5	8/1/00	10:37:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT38	FS013				SL	1.5 - 3.0	8/5/00	4:10:00 PM	KV	PR			X																							
	RT42	FS014			FS014	SL	0 - 0.5	8/1/00	10:40:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT42	FS014			RT42/1.5-3	SL	1.5 - 3.0	8/6/00	8:50:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT42	FS014			RT42/3-4.5	SL	3.0 - 4.5	8/6/00	8:55:00 AM	KV	PR	X	X	X								B	B	B	B											
		FS015			FS015	SL	0 - 0.5	8/1/00	10:45:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT49	FS016			FS016	SL	0 - 0.5	8/1/00	11:00:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT49	FS016				SL	1.5 - 3.0	8/6/00	11:25:00 AM	KV	PR			X																							
	RT49	FS016			RT49/3-4.5	SL	3.0 - 4.5	8/6/00	11:30:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT49	FS016			RT49/5-6.5	SL	5.0 - 6.5	8/6/00	11:35:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT48	FS017				SL	0 - 0.5	8/1/00	11:04:00 AM	KV	PR			X																							
	RT48	FS017	FS017 (RT48) 1.5 - 3.0		RT48/1.5-3	SL	1.5 - 3.0	8/6/00	11:05:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT48	FS017	FS017 (RT48) 3.0 - 4.5			SL	3.0 - 4.5	8/6/00	11:10:00 AM	KV	PR			X																							
	RT48	FS017	FS017 (RT48) 5.0 - 6.5		RT48/5-6.5	SL	5.0 - 6.5	8/6/00	11:15:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT47	FS018	FS018 (RT47) 0 - 0.5		FS018	SL	0 - 0.5	8/1/00	11:07:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT47	FS018	FS018 (RT47) 1.5 - 3.0			SL	1.5 - 3.0	8/6/00	10:40:00 AM	KV	PR			X																							
	RT47	FS018	FS018 (RT47) 3.0 - 4.5			SL	3.0 - 4.5	8/6/00	10:45:00 AM	KV	PR			X																							
	RT47	FS018	FS018 (RT47) 5.0 - 6.5		RT47/5-6.5	SL	5.0 - 6.5	8/6/00	10:50:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT46	FS019	FS019 (RT46) 0 - 0.5		FS019	SL	0 - 0.5	8/1/00	11:10:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT46	FS019	FS019 (RT46) 1.5 - 3.0			SL	1.5 - 3.0	8/6/00	10:08:00 AM	KV	PR			X																							
	RT46	FS019	FS019 (RT46) 3.0 - 4.5		RT46/3-4.5	SL	3.0 - 4.5	8/6/00	10:13:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT46	FS019	FS019 (RT46) 5.0 - 6.5			SL	5.0 - 6.5	8/6/00	10:18:00 AM	KV	PR			X																							
	RT44	FS020	FS020 (RT44) 0 - 0.5		FS020	SL	0 - 0.5	8/1/00	11:15:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT44	FS020	FS020 (RT44) 1.5 - 3.0			SL	1.5 - 3.0	8/6/00	9:24:00 AM	KV	PR			X																							
	RT44	FS020	FS020 (RT44) 3.0 - 4.5			SL	3.0 - 4.5	8/6/00	9:30:00 AM	KV	PR			X																							
	RT43	FS021	FS021 (RT43) 1.5 - 3.0			SL	1.5 - 3.0	8/6/00	9:07:00 AM	KV	PR			X																							
	RT43	FS021	FS021 (RT43) 3.0 - 4.5		RT43/3-4.5	SL	3.0 - 4.5	8/6/00	9:12:00 AM	KV	PR			X																							
	RT35	FS022	FS022 (RT35) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	3:25:00 PM	KV	PR			X																							
	RT35	FS022	FS022 (RT35) 3.0 - 4.5			SL	3.0 - 4.5	8/5/00	3:35:00 PM	KV	PR			X																							
	RT01	FS023	FS023 (RT1) 0 - 0.5			SL	0 - 0.5	8/3/00		KV/BM	PR			X																							
	RT01	FS023	FS023 (RT1) 1.5 - 3.0			SL	1.5 - 3.0	8/3/00	10:30:00 AM	KV/BM	PR			X																							
	RT01	FS023	FS023 (RT1) 3.0 - 4.5			SL	3.0 - 4.5	8/3/00	10:35:00 AM	KV/BM	PR			X																							
	RT01	FS023	FS023 (RT1) 5.0 - 6.5			SL	5.0 - 6.5	8/3/00	10:40:00 AM	KV/BM	PR			X																							
	RT03	FS024	FS024 (RT3) 1.5 - 3.0			SL	1.5 - 3.0	8/3/00	11:25:00 AM	KV/BM	PR			X																							
	RT03	FS024	FS024 (RT3) 3.0 - 4.5			SL	3.0 - 4.5	8/3/00	11:30:00 AM	KV/BM	PR																										
	RT04	FS025	FS025 (RT4) 0 - 0.5			SL	0 - 0.5	8/3/00		KV/BM	PR			X																							
	RT04	FS025	FS025 (RT4)1.5 - 3.0			SL	1.5 - 3.0	8/3/00	2:40:00 PM	KV/BM	PR			X																							
	RT06	FS026	FS026 (RT6) 0 - 0.5			SL	0 - 0.5	8/3/00		KV/BM	PR			X																							
	RT06	FS026	FS026 (RT6) 1.5 - 3.0			SL	1.5 - 3.0	8/3/00	3:20:00 PM	KV/BM	PR			X																							
	RT06	FS026	FS026 (RT6) 3.0 - 4.5			SL	3.0 - 4.5	8/3/00	3:30:00 PM	KV/BM	PR			X																							
	RT06	FS026	FS026 (RT6) 6.0 - 6.5			SL	6.0 - 6.5	8/3/00	3:40:00 PM	KV/BM	PR			X																							
	RT07	FS027	FS027 (RT7) 1.5 - 3.0			SL	1.5 - 3.0	8/3/00	4:00:00 PM	KV/BM	PR			X																							
	RT07	FS027	FS027 (RT7) 3.0 - 4.5			SL	3.0 - 4.5	8/3/00	4:10:00 PM	KV/BM	PR			X																							
	RT07	FS027	FS027 (RT7) 5.0 - 6.5			SL	5.0 - 6.5	8/3/00	4:15:00 PM	KV/BM	PR			X																							
	RT09	FS028	FS028 (RT9) 1.5 - 3.0			SL	1.5 - 3.0	8/3/00	4:45:00 PM	KV/BM	PR			X																							
	RT09	FS028	FS028 (RT9) 3.0 - 4.5			SL	3.0 - 4.5	8/3/00	4:50:00 PM	KV/BM	PR																										
	RT10	FS029	FS029 (RT10) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00	8:45:00 AM	KV/BM	PR			X																							
	RT10	FS029	FS029 (RT10) 3.0 - 4.5			SL	3.0 - 4.5	8/4/00	8:50:00 AM	KV/BM	PR			X																							
	RT12	FS030	FS030 (RT12) 0 - 0.5			SL	0 - 0.5	8/4/00		KV/BM	PR			X																							

Red Devil Sample Record Log

HLA Sample ID Number	Soil Boring and Well Locations	Field Screening Location	Field Location	Quality Control Sample Number	BLM Sample Number	Matrix	Sample Depth Interval	Date Collected	Time Collected	Collected By	Sample Type	Lab Analx Requested	Hard Copy Received	XRF Field Screen	Geotech	DRO (AK102)	GRO (AK101)	RRO (AK103)	BTEX - 8021 (solids)	BTEX - 602 (liquid)	TaqH (610)	Antimony (6020)	Arsenic (6020)	Mercury (7471)	Lead (6020)	TCLP (As - Hg)	TCLP (RCRA 8)	TCLP (Hg)	TCLP (As)	TCLP (Sb)	TCLP (Pb)	PLM(EPA600/M4/82/020)	cPAH (8270)	Total Fecal	TAL Metals	TOC
	RT12	FS030	FS030 (RT12) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00	9:40:00 AM	KV/BM	PR			X																						
	RT12	FS030	FS030 (RT12) 3.0 - 4.5			SL	3.0 - 4.5	8/4/00	9:52:00 AM	KV/BM	PR			X																							
	RT12	FS030	FS030 (RT12) 5.0 - 6.5			SL	5.0 - 6.5	8/4/00	10:05:00 AM	KV/BM	PR			X																							
	RT13	FS031	FS031 (RT13) 0 - 0.5			SL	0 - 0.5	8/4/00		KV/BM	PR																									
	RT13	FS031	FS031 (RT13) 3.0 - 4.5			SL	3.0 - 4.5	8/4/00	11:05:00 AM	KV/BM	PR			X																							
	RT73	FS032	FS032 (RT73) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	3:30:00 PM	KV	PR			X																							
	RT73	FS032	FS032 (RT73) 3.0 - 4.5		RT73/3-4.5	SL	3.0 - 4.5	8/7/00	3:35:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT73	FS032	FS032 (RT73) 5.0 - 6.5			SL	5.0 - 6.5	8/7/00	3:40:00 PM	KV	PR			X																							
	RT71	FS033	FS033 (RT71) 0 - 0.5			SL	0 - 0.5	8/7/00		KV	PR			X																							
	RT71	FS033	FS033 (RT71) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	2:40:00 PM	KV	PR			X																							
	RT71	FS033	FS033 (RT71) 3.0 - 4.5		RT71/3-4.5	SL	3.0 - 4.5	8/7/00	2:40:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT71	FS033	FS033 (RT71) 5.0 - 6.5			SL	5.0 - 6.5	8/7/00	2:45:00 PM	KV	PR			X																							
	RT72	FS034	FS034 (RT72) 0 - 0.5			SL	0 - 0.5	8/7/00		KV	PR			X																							
	RT72	FS034	FS034 (RT72) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	3:05:00 PM	KV	PR			X																							
	RT72	FS034	FS034 (RT72) 3.0 - 4.5		RT72/3-4.5	SL	3.0 - 4.5	8/7/00	3:10:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT02	FS035	FS035 (RT2) 0 - 0.5			SL	0 - 0.5	8/3/00		KV/BM	PR			X																							
	RT02	FS035	FS035 (RT2) 1.5 - 3.0			SL	1.5 - 3.0	8/3/00	10:55:00 AM	KV/BM	PR			X																							
	RT02	FS035	FS035 (RT2) 3.0 - 4.5			SL	3.0 - 4.5	8/3/00	11:05:00 AM	KV/BM	PR			X																							
	RT02	FS035	FS035 (RT2) 5.0 - 6.5			SL	5.0 - 6.5	8/3/00	11:10:00 AM	KV/BM	PR			X																							
	RT05	FS036	FS036 (RT5) 0 - 0.5			SL	0 - 0.5	8/3/00		KV/BM	PR			X																							
	RT05	FS036	FS036 (RT5) 1.5 - 3.0			SL	1.5 - 3.0	8/3/00	2:45:00 PM	KV/BM	PR			X																							
	RT08	FS037	FS037 (RT8) 0 - 0.5			SL	0 - 0.5	8/3/00		KV/BM	PR			X																							
	RT08	FS037	FS037 (RT8) 1.5 - 3.0			SL	1.5 - 3.0	8/3/00	4:25:00 PM	KV/BM	PR			X																							
	RT11	FS038	FS038 (RT11) 0 - 0.5			SL	0 - 0.5	8/4/00		KV/BM	PR			X																							
	RT11	FS038	FS038 (RT11) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00	9:10:00 AM	KV/BM	PR			X																							
	RT14	FS039	FS039 (RT14) 0 - 0.5			SL	0 - 0.5	8/4/00		KV/BM	PR			X																							
	RT14	FS039	FS039 (RT14) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00	11:25:00 AM	KV/BM	PR																									
	RT14	FS039	FS039 (RT14) 3.0 - 4.5			SL	3.0 - 4.5	8/4/00	11:30:00 AM	KV/BM	PR			X																							
	RT14	FS039	FS039 (RT14) 5.0 - 6.5			SL	5.0 - 6.5	8/4/00	11:35:00 AM	KV/BM	PR			X																							
	RT29	FS040	FS040 (RT29) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT29	FS040	FS040 (RT29) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	11:45:00 AM	KV/BM	PR			X																							
	RT27	FS041	FS041 (RT27) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT27	FS041	FS041 (RT27) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	11:10:00 AM	KV/BM	PR			X																							
	RT34	FS042	FS042 (RT34) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT34	FS042	FS042 (RT34) 1.5 - 3.0		RT34/1.5-3	SL	1.5 - 3.0	8/5/00	3:15:00 PM	KV/BM	PR	B	X	X								B	B	B	B											
	RT33	FS043	FS043 (RT33) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT33	FS043	FS043 (RT33) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	2:55:00 PM	KV/BM	PR			X																							
	RT33	FS043	FS043-(RT33) 3.0 - 4.5			SL	3.0 - 4.0	8/5/00	3:05:00 PM	KV/BM	PR																									
	RT32	FS044	FS044 (RT32) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT32	FS044	FS044 (RT32) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	2:45:00 PM	KV/BM	PR			X																							
	RT31	FS045	FS045 (RT31) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT31	FS045	FS045 (RT31) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	2:25:00 PM	KV/BM	PR			X																							
	RT30	FS046	FS046 (RT30) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT30	FS046	FS046 (RT30) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	2:05:00 PM	KV/BM	PR			X																							
	RT28	FS047	FS047 (RT28) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT28	FS047	FS047 (RT28) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	11:26:00 AM	KV/BM	PR			X																							
	RT26	FS048	FS048 (RT26) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT26	FS048	FS048 (RT26) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	10:25:00 AM	KV/BM	PR			X																							
	RT26	FS048	FS048 (RT26) 3.0 - 4.5			SL	3.0 - 4.5	8/5/00	10:40:00 AM	KV/BM	PR			X																							
	RT26	FS048	FS048 (RT26) 5.0 - 6.5			SL	5.0 - 6.5	8/5/00	10:50:00 AM	KV/BM	PR			X																							
	RT25	FS049	FS049 (RT25) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	9:30:00 AM	KV/BM	PR			X																							
	RT25	FS049	FS049 (RT25) 3.0 - 4.5			SL	3.0 - 4.5	8/5/00	9:50:00 AM	KV/BM	PR			X																							
	RT25	FS049	FS049 (RT25) 5.0 - 6.5			SL	5.0 - 6.5	8/5/00	10:10:00 AM	KV/BM	PR			X																							
	RT24	FS050	FS050 (RT24) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT24	FS050	FS050 (RT24) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	8:55:00 AM	KV/BM	PR			X																							
	RT24	FS050	FS050 (RT24) 3.0 - 4.5			SL	3.0 - 4.5	8/5/00	9:15:00 AM	KV/BM	PR			X																							
	RT20	FS051	FS051 (RT20) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT20	FS051	FS051 (RT20) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00	5:05:00 PM	KV/BM	PR			X																							
	RT20	FS051	FS051 (RT20) 3.0 - 4.5			SL	3.0 - 4.5	8/4/00	5:10:00 PM	KV/BM	PR			X																							
	RT19	FS052	FS052 (RT19) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT19	FS052	FS052 (RT19) 3.0 - 4.5			SL	3.0 - 4.5	8/4/00	4:45:00 PM	KV/BM	PR			X																							
	RT18	FS053	FS053 (RT18) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00	3:50:00 PM	KV/BM	PR			X																							

Red Devil Sample Record Log

HLA Sample ID Number	Soil Boring and Well Locations	Field Screening Location	Field Location	Quality Control Sample Number	BLM Sample Number	Matrix	Sample Depth Interval	Date Collected	Time Collected	Collected By	Sample Type	Lab Analx Requested	Hard Copy Received	XRF Field Screen	Geotech	DRO (AK102)	GRO (AK101)	RRO (AK103)	BTEX - 8021 (solids)	BTEX - 602 (liquid)	TaqH (610)	Antimony (6020)	Arsenic (6020)	Mercury (7471)	Lead (6020)	TCLP (As - Hg)	TCLP (RCRA 8)	TCLP (Hg)	TCLP (As)	TCLP (Sb)	TCLP (Pb)	PLM(EPA600/M4/82/020)	cPAH (8270)	Total Fecal	TAL Metals	TOC
	RT18	FS053	FS053 (RT18) 3.0 - 4.5			SL	3.0 - 4.5	8/4/00	4:00:00 PM	KV/BM	PR			X																						
	RT18	FS053	FS053 (RT18) 5.0 - 6.5			SL	5.0 - 6.5	8/4/00	4:10:00 PM	KV/BM	PR			X																							
	RT17	FS054	FS054 (RT17) 0 - 0.5			SL	0 - 0.5	8/4/00	3:24:00 PM	KV/BM	PR																										
	RT16	FS055	FS055 (RT16) 0 - 0.5			SL	0 - 0.5	8/4/00	2:50:00 PM	KV/BM	PR			X																							
	RT16	FS055	FS055 (RT16) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT16	FS055	FS055 (RT16) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00		KV/BM	PR			X																							
	RT15	FS056	FS056 (RT15) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT15	FS056	FS056 (RT15) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00	2:28:00 PM	KV/BM	PR			X																							
	RT15	FS056	FS056 (RT15) 3.0 - 4.5			SL	3.0 - 4.5	8/4/00	2:42:00 PM	KV/BM	PR			X																							
	RT21	FS057	FS057 (RT21) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT21	FS057	FS057 (RT21) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	8:00:00 AM	KV/BM	PR			X																							
	RT22	FS058	FS058 (RT22) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	8:25:00 AM	KV/BM	PR			X																							
	RT23	FS059	FS059 (RT23) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																							
	RT23	FS059	FS059 (RT23) 1.5 - 3.0			SL	1.5 - 3.0	8/5/00	8:40:00 AM	KV/BM	PR			X																							
	RT37	FS060	FS060 (RT37) 0 - 0.5			SL	0 - 0.5			KV	PR			X																							
	RT37	FS060	FS060 (RT37) 1.5 - 3.0		RT37/1.5-3	SL	1.5 - 3.0	8/5/00	4:00:00 PM	KV	PR	X	X	X								B	B	B	B											
	RT36	FS061	FS061 (RT36) 0 - 0.5			SL	0 - 0.5			KV	PR			X																							
	RT36	FS061	FS061 (RT36) 1.5 - 3.0		RT36/1.5-3	SL	1.5 - 3.0	8/5/00	3:45:00 PM	KV	PR	X	X	X								B	B	B	B											
	RT70	FS062	FS062 (RT70) 3.0 - 4.5		RT70/3-4.5	SL	3.0 - 4.5	8/7/00	2:10:00 PM	KV	PR	X	X	X								B	B	B	B											
	RT70	FS062	FS062 (RT70) 5.0 - 6.5		RT70/5-6.5	SL	5.0 - 6.5	8/7/00	2:15:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT45	FS063	FS063 (RT45) 0 - 0.5			SL	0 - 0.5	8/6/00	9:38:00 AM	KV	PR			X																							
	RT45	FS063	FS063 (RT45) 1.5 - 3.0		RT45/1.5-3	SL	1.5 - 3.0	8/6/00	9:46:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT45	FS063	FS063 (RT45) 3.0 - 4.5		RT45/3-4.5	SL	3.0 - 4.5	8/6/00	9:52:00 AM	KV	PR	B		X								B	B	B	B											
	RT45	FS063	FS063 (RT45) 5.0 - 6.5		RT45/5-6.5	SL	5.0 - 6.5	8/6/00	9:57:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT58	FS064	FS064 (RT58) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	8:05:00 AM	KV	PR			X																							
	RT58	FS064	FS064 (RT58) 3.0 - 4.5			SL	3.0 - 4.5	8/7/00	8:10:00 AM	KV	PR			X																							
	RT58	FS064	FS064 (RT58) 5.0 - 6.5		RT58/5-6.5	SL	5.0 - 6.5	8/7/00	8:24:00 AM	KV	PR	B	X	X								B	B	B	B											
	RT57	FS065	FS065 (RT57) 1.5 - 3.0			SL	1.5 - 3.0	8/6/00	5:05:00 PM	KV	PR			X																							
	RT57	FS065	FS065 (RT57) 3.0 - 4.5			SL	3.0 - 4.5	8/6/00	5:10:00 PM	KV	PR			X																							
	RT57	FS065	FS065 (RT57) 5.0 - 6.5			SL	5.0 - 6.5	8/6/00	5:15:00 PM	KV	PR			X																							
	RT56	FS066	FS066 (RT56) 1.5 - 3.0			SL	1.5 - 3.0	8/6/00	4:35:00 PM	KV	PR			X																							
	RT56	FS066	FS066 (RT56) 3.0 - 4.5			SL	3.0 - 4.5	8/6/00	4:40:00 PM	KV	PR			X																							
	RT56	FS066	FS066 (RT56) 5.0 - 6.5			SL	5.0 - 6.5	8/6/00	4:45:00 PM	KV	PR			X																							
	RT55	FS067	FS067 (RT55) 1.5 - 3.0			SL	1.5 - 3.0	8/6/00	4:12:00 PM	KV	PR			X																							
	RT55	FS067	FS067 (RT55) 3.0 - 4.5			SL	3.0 - 4.5	8/6/00	4:17:00 PM	KV	PR			X																							
	RT55	FS067	FS067 (RT55) 5.0 - 6.5		RT55/5-6.5	SL	5.0 - 6.5	8/6/00	4:22:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT54	FS068	FS068 (RT54) 1.5 - 3.0		RT54/1.5-3	SL	1.5 - 3.0	8/6/00	3:20:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT54	FS068	FS068 (RT54) 3.0 - 4.5			SL	3.0 - 4.5	8/6/00	3:25:00 PM	KV	PR			X																							
	RT54	FS068	FS068 (RT54) 5.0 - 6.5		RT54/5-6.5	SL	5.0 - 6.5	8/6/00	3:30:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT53	FS069	FS069 (RT53) 1.5 - 3.0		RT53/1.5-3	SL	1.5 - 3.0	8/6/00	2:55:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT53	FS069	FS069 (RT53) 3.0 - 4.5			SL	3.0 - 4.5	8/6/00	3:00:00 PM	KV	PR			X																							
	RT53	FS069	FS069 (RT53) 5.0 - 6.5		RT53/5-6.5	SL	5.0 - 6.5	8/6/00	3:05:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT51	FS070	FS070 (RT51) 0 - 0.5			SL	0 - 0.5	8/6/00	2:00:00 PM	KV				X																							
	RT51	FS070	FS070 (RT51) 1.5 - 3.0		RT51/1.5-3	SL	1.5 - 3.0	8/6/00	2:06:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT51	FS070	FS070 (RT51) 3.0 - 4.5		RT51/3-4.5	SL	3.0 - 4.5	8/6/00	2:11:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT51	FS070	FS070 (RT51) 5.0 - 6.5		RT51/5-6.5	SL	5.0 - 6.5	8/6/00	2:16:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT52	FS071	FS071 (RT52) 0 - 0.5			SL	0 - 0.5	8/6/00	2:22:00 PM	KV	PR			X																							
	RT52	FS071	FS071 (RT52) 1.5 - 3.0			SL	1.5 - 3.0	8/6/00	2:26:00 PM	KV	PR			X																							
	RT52	FS071	FS071 (RT52) 3.0 - 4.5		RT52/3-4.5	SL	3.0 - 4.5	8/6/00	2:31:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT52	FS071	FS071 (RT52) 5.0 - 6.5			SL	5.0 - 6.5	8/6/00	2:36:00 PM	KV	PR			X																							
	RT69	FS072	FS072 (RT69) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	1:55:00 PM	KV	PR			X																							
	RT69	FS072	FS072 (RT69) 3.0 - 4.5			SL	3.0 - 4.5	8/7/00	2:00:00 PM	KV	PR			X																							
	RT68	FS073	FS073 (RT68) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	1:40:00 PM	KV	PR			X																							
	RT68	FS073	FS073 (RT68) 3.0 - 4.5		RT68/3-4.5	SL	3.0 - 4.5	8/7/00	1:45:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT67	FS074	FS074 (RT67) 0 - 0.5			SL	0 - 0.5	8/7/00	1:20:00 PM	KV	PR			X																							
	RT67	FS074	FS074 (RT67) 1.5 - 3.0		RT67/1.5-3	SL	1.5 - 3.0	8/7/00	1:25:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT67	FS074	FS074 (RT67) 3.0 - 4.5		RT67/3-4.5	SL	3.0 - 4.5	8/7/00	1:30:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT74	FS075	FS075 (RT74) 0 - 0.5			SL	0 - 0.5	8/7/00	4:00:00 PM	KV	PR			X																							
	RT74	FS075	FS075 (RT74) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	4:05:00 PM	KV	PR			X																							
	RT75	FS076	FS076 (RT75) 0 - 0.5		FS076	SL	0 - 0.5	8/7/00	4:10:00 PM	KV	PR	B	X	X								B	B	B	B											
	RT75	FS076	FS076 (RT75) 1.5 - 3.0		RT75/1.5-3	SL	1.5 - 3.0	8/7/00	4:10:00 PM	KV	PR	B	X	X								B	B	B	B											
		FS077	FS077 0 - 0.5			SL	0 - 0.5	8/8/00	10:50:00 AM	KV	PR			X																							

Red Devil Sample Record Log

HLA Sample ID Number	Soil Boring and Well Locations	Field Screening Location	Field Location	Quality Control Sample Number	BLM Sample Number	Matrix	Sample Depth Interval	Date Collected	Time Collected	Collected By	Sample Type	Lab Analtx Requested	Hard Copy Received	XRF Field Screen	Geotech	DRO (AK102)	GRO (AK101)	RRO (AK103)	BTEX - 8021 (solids)	BTEX - 602 (liquid)	TaqM (610)	Antimony (6020)	Arsenic (6020)	Mercury (7471)	Lead (6020)	TCLP (As - Hg)	TCLP (RCRA 8)	TCLP (Hg)	TCLP (As)	TCLP (Sb)	TCLP (Pb)	PLM(EPA600/M4/82/020)	cPAH (8270)	Total Fecal	TAL Metals	TOC
		FS078	FS078 0 - 0.5			SL	0 - 0.5	8/8/00	11:00:00 AM	KV	PR			X																						
		FS079	FS079 0 - 0.5		FS079	SL	0 - 0.5	8/8/00	11:10:00 AM	KV	PR	B	X	X								B	B	B	B											
		FS080	FS080 0 - 0.5			SL	0 - 0.5	8/8/00	11:20:00 AM	KV	PR			X																						
		FS082	FS082 0 - 0.5			SL	0 - 0.5	8/8/00	11:40:00 AM	KV	PR			X																						
			N/A		N/A	SL						X																							
00RDV01MI			Building Materials			MI		7/20/00	10:10:00 AM	CM	PR	X															X								
00RDV01SL			Trip blank			SL		7/26/00	4:00:00 PM	CM	PR	X	X				X		X																
00RDV01WA	MW01		Well MW-1 /B-1			WA		8/14/00	2:50:00 PM	CM/KV	PR	X	X									B	B	B	B											
00RDV02MI			Building Materials			MI		7/20/00	10:15:00 AM	CM	PR	X															X								
00RDV02SL			Pipeline Station 1-6			SL	0 - 0.5	7/26/00	4:30:00 PM	CM	PR	X	X			X	X	X	X																
00RDV02WA	MW01		Well MW-1 /B-1			WA		8/14/00	3:00:00 PM	CM/KV	QC	X	X									B	B	B	B											
00RDV03MI			Upper furnace lining @ Retort			MI		7/21/00	11:20:00 AM	CM	PR	X																				X			
00RDV03SL			Pipeline Station 1-18			SL	0 - 0.5	7/26/00	5:00:00 PM	CM	PR	X	X			X	X	X	X																
00RDV03WA	MW03		Well MW-3 /B-3			WA	NA	8/14/00	3:30:00 PM	CM/KV	PR	X	X									B	B	B	B											
00RDV04MI			Fire brick from upper retort furnace			MI	NA	7/21/00	11:30:00 AM	CM	PR	X																				X			
00RDV04SL			Storage tank #1 valve #2			SL	0 - 0.5	7/27/00	7:45:00 AM	CM	PR	X	X			X	X	X	X																
00RDV04WA	MW04		Well MW-4 /B-4			WA		8/14/00	4:00:00 PM	CM/KV	PR	X	X									B	B	B	B											
00RDV05MI			Fire brick from upper retort furnace			MI		7/26/00	9:50:00 AM	CM	PR	X	X														X								
00RDV05SL			Storage tank #1 valve #2	00RDV06SL		SL	0 - 0.5	7/27/00	8:30:00 AM	CM	PR	X	X			X	X	X	X															X		
00RDV05WA	MW06		Well MW-6 /B-6			WA		8/14/00	4:45:00 PM	CM/KV	PR	X	X									B	B	B	B											
00RDV06MI			Wood from Ret. Bldg.			MI		7/31/00	1:45:00 PM	CM	PR	X														X									
00RDV06SL			Storage tank #1 valve #2	00RDV05SL		SL	0 - 0.5	7/27/00	8:35:00 AM	CM	QC	X	X			X	X	X	X																
00RDV06WA	MW07		Well MW-7/B-7			WA		8/14/00	5:05:00 PM	CM/KV	PR	X	X									B	B	B	B											
00RDV07MI			Wood from Ret. Bldg.			MI		7/31/00	1:50:00 PM	CM	PR	X														X									
00RDV07SL			Pipeline Station 2-4			SL	0 - 0.5	7/27/00	9:20:00 AM	CM	PR	X	X			X	X	X	X																
00RDV07WA			RDV Lodge (kichen)			WA		8/15/00	11:30:00 AM	CM	PR	X	X																					X	X	
00RDV08MI			Fiber Board, Retort building			MI		7/31/00	2:00:00 PM	CM	PR	X														X									
00RDV08SL			Pipeline Station 2-4			SL	0 - 0.5	7/27/00	9:30:00 AM	CM	PR	X	X			X	X	X	X																
00RDV09MI			Decon water holding pond			MI		8/2/00	9:00:00 AM	BL	PR	X	X							X	X	X	X	X	X									
00RDV09SL			Storage tank #2 valve #2			SL	0 - 0.5	7/27/00	10:20:00 AM	CM	PR	X	X			X	X	X	X															X		
00RDV10MI			Trip blank			MI		8/2/00	9:05:00 AM	BL	PR	X	X							X															
00RDV10SL			Storage tank #2 valve #2			SL	0 - 0.5	7/27/00	10:30:00 AM	CM	PR	X	X			X	X	X	X																
00RDV11MI			Decon water holding pond			MI		8/5/00	12:10:00 PM	BL	PR	X	X								X													
00RDV11SL			Pipeline Station 3-3			SL	0 - 0.5	7/27/00	10:50:00 AM	CM	PR	X	X			X	X	X	X															X		
00RDV12SL			Pipeline Station 3-3			SL	1 - 1.5	7/27/00	11:20:00 AM	CM	PR	X	X			X	X	X	X																
00RDV13SL			Storage tank #3 valve #1			SL	0 - 0.5	7/27/00	11:40:00 AM	CM	PR	X	X			X	X	X	X																
00RDV14SL			Pipeline Station 4-6			SL	1.0 - 1.5	7/27/00	1:40:00 PM	CM	PR	X	X			X	X	X	X																
00RDV15SL			Pipeline Station 4-6			SL	2.0 - 2.5	7/27/00	2:05:00 PM	CM	PR	X	X			X	X	X	X																
00RDV16SL			Storage tank #4 valve #1			SL	1.5	7/27/00	2:30:00 PM	CM	PR	X	X			X	X	X	X																
00RDV17SL			Pipeline Station 5-2			SL	0.8	7/27/00	2:45:00 PM	CM	PR	X	X			X	X	X	X																
00RDV18SL			Storage tank #5 valve #2			SL	2	7/27/00	3:10:00 PM	CM	PR	X	X			X	X	X	X																
00RDV19SL			Supply line Station SP-5			SL	2.5 - 3.0	7/27/00	3:40:00 PM	CM	PR	X	X			X	X	X	X																
00RDV20SL			Supply line Station SP-7			SL	1.5	7/27/00	4:15:00 PM	CM	PR	X	X			X	X	X	X																
00RDV21SL			Supply line Station SP-7	00RDV22SL		SL	3	7/27/00	4:25:00 PM	CM	PR	X	X			X	X	X	X																
00RDV22SL			Supply line Station SP-7	00RDV21SL		SL	3	7/27/00	4:35:00 PM	CM	QC	X	X			X	X	X	X																
00RDV23SL			Pipeline Station 0-4			SL	2.5 - 3.0	7/28/00	8:00:00 AM	CM	PR	X	X			X	X	X	X																
00RDV24SL			Surface grab			SL	0 - 0.5	8/12/00	10:45:00 AM	KV	PR	X	X									X	X	X	X										
00RDV25SL			Surface grab			SL	0 - 0.5	8/12/00	10:55:00 AM	KV	PR	X	X									X	X	X	X										
00RDV26SL			Surface grab			SL	0 - 0.5	8/12/00	11:00:00 AM	KV	PR	X	X									X	X	X	X										
00RDV27SL			Surface grab	00RDV28SL		SL	0 - 0.5	8/12/00	11:10:00 AM	KV	PR	X	X									X	X	X	X										
00RDV28SL			Surface grab	00RDV27SL		SL	0 - 0.5	8/12/00	11:20:00 AM	KV	QC	X	X									X	X	X	X										
00RDV29SL			Background sample			SL	0 - 0.5	8/12/00	9:45:00 AM	CM/KV	PR	X	X																						X
00RDV30SL			Background sample			SL	0 - 0.5	8/12/00	10:00:00 AM	CM/KV	PR	X	X																						X
00RDV31SL	RT03	FS024	FS024 (RT3) 0 - 0.5			SL	0 - 0.5	8/3/00	11:20:00 AM	KV/BM	PR	X	X	X														X	X	X	X				
00RDV32SL	RT07	FS027	FS027 (RT7) 0 - 0.5	00RDV33SL		SL	0 - 0.5	8/3/00	3:45:00 PM	KV/BM	PR	X	X	X														X	X	X	X				
00RDV33SL	RT07	FS027	FS027 (RT7) 0 - 0.5	00RDV32SL		SL	0 - 0.5	8/3/00	3:55:00 PM	KV/BM	QC	X	X	X														X	X	X	X				
00RDV34SL	RT09	FS028	FS028 (RT9) 0 - 0.5			SL	0 - 0.5	8/2/00	4:40:00 PM	KV/BM	PR	X	X	X														X	X	X	X				
00RDV35SL	RT10	FS029	FS029 (RT10) 0 - 0.5			SL	0 - 0.5	8/4/00	8:30:00 AM	KV/BM	PR	X	X	X														X	X	X	X				
00RDV36SL	RT62	FS003	FS003 (RT62) 1.5 - 3.0			SL	1.5 - 3.0	8/4/00	10:55:00 AM	KV/BM	PR	X	X	X														X	X	X	X				

Red Devil Sample Record Log

HLA Sample ID Number	Soil Boring and Well Locations	Field Screening Location	Field Location	Quality Control Sample Number	BLM Sample Number	Matrix	Sample Depth Interval	Date Collected	Time Collected	Collected By	Sample Type	Lab Analy Requested	Hard Copy Received	XRF Field Screen	Geotech	DRO (AK102)	GRO (AK101)	RRO (AK103)	BTEX - 8021 (solids)	BTEX - 602 (liquid)	TaqH (610)	Antimony (6020)	Arsenic (6020)	Mercury (7471)	Lead (6020)	TCLP (As - Hg)	TCLP (RCRA 8)	TCLP (Hg)	TCLP (As)	TCLP (Sb)	TCLP (Pb)	PLM(EPA600/M4/82/020)	cPAH (8270)	Total Fecal	TAL Metals	TOC
00RDV37SL	RT19	FS052	FS052 (RT19) 0 - 0.5			SL	1.5 - 3.0	8/4/00	4:30:00 PM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV38SL	RT22	FS058	FS058 (RT22) 0 - 0.5			SL	0 - 0.5	8/4/00	3:30:00 PM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV39SL	RT25	FS049	FS049 (RT25) 0 - 0.5	00RDV40SL		SL	0 - 0.5	8/4/00	8:00:00 AM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV40SL	RT25	FS049	FS049 (RT25) 0 - 0.5	00RDV39SL		SL	0 - 0.5	8/4/00	8:15:00 AM	KV/BM	QC	X	X	X														X	X	X	X					
00RDV41SL	B01					SL	4.0 - 6.0	8/1/00	4:08:00 PM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV42SL	B02					SL	14.0 - 15.5	8/8/00	7:45:00 AM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV43SL	B03				B3/0.5-2	SL	0.5 - 2.0	8/8/00	2:30:00 PM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV44SL	B04				B4/0.5-2	SL	0.5 - 2.0	8/9/00	8:50:00 AM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV45SL	B05				B5/0.5-2	SL	0.5 - 2.0	8/9/00	2:00:00 PM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV46SL	B06				B6/0.5-2	SL	0.5 - 2.0	8/10/00	8:15:00 AM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV47SL	RT43	FS021	FS021 (RT43) 0 - 0.5		FS021	SL	0 - 0.5	8/1/00	11:22:00 AM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV48SL	RT35	FS022	FS022 (RT35) 0 - 0.5		FS022	SL	0 - 0.5	8/1/00	11:57:00 AM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV49SL	RT70	FS062	FS062 (RT70) 0 - 0.5			SL	0 - 0.5	8/5/00	10:05:00 AM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV50SL	RT69	FS072	FS072 (RT69) 0 - 0.5		FS072	SL	0 - 0.5	8/7/00	1:55:00 PM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV51SL	RT73	FS032	FS032 (RT73) 0 - 0.5		FS032	SL	0 - 0.5	8/7/00	3:30:00 PM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV52SL	RT68	FS073	FS073 (RT68) 0 - 0.5		FS073	SL	0 - 0.5	8/7/00	1:55:00 PM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV53SL		FS081	FS081 0 - 0.5		FS081	SL	0 - 0.5	8/8/00	11:30:00 AM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV54SL	RT50	FS001				SL	0 - 0.5	7/30/00	10:00:00 AM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV55SL	RT06	FS026	FS026 (RT6) 5.0 - 6.5			SL	5.0 - 6.5	8/3/00	3:35:00 PM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV56SL	RT74	FS075	FS075 (RT74) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	4:05:00 PM	KV/BM	PR	X	X	X														X	X	X	X					
00RDV57SL	RT70	FS062	FS062 (RT70) 1.5 - 3.0		RT70/1.5-3	SL	1.5 - 3.0	8/7/00	2:05:00 PM	KV/BM	PR	X	X	X								B	B	B	B			X	X	X	X					
00RDV58SL	RT71	FS033	FS033 (RT71) 1.5 - 3.0			SL	1.5 - 3.0	8/7/00	2:35:00 PM	KV/BM	PR	X	X	X														X	X	X	X					
FS053 0 - 0.5	RT18	FS053	FS053 (RT18) 0 - 0.5			SL	0 - 0.5			KV/BM	PR			X																						
GT-1/0.5 - 2.0	GT-1		GT-1/0.5 - 2.0			SL	0.5 - 2.0	8/10/00	2:45:00 PM	KV	PR				X																					
GT-1/14.0 - 15.5	GT-1		GT-1/14.0 - 15.5			SL	14.0 - 15.5	8/10/00	3:20:00 PM	KV	PR				X																					
GT-1/19.0 - 20.5	GT-1		GT-1/19.0 - 20.5			SL	19.0 - 20.5	8/10/00	3:45:00 PM	KV	PR				X																					
GT-1/23.0 - 24.5	GT-1		GT-1/23.0 - 24.5			SL	23.0 - 24.5	8/10/00	4:20:00 PM	KV	PR				X																					
GT-1/4.0 - 5.5	GT-1		GT-1/4.0 - 5.5			SL	4.0 - 5.5	8/10/00	3:00:00 PM	KV	PR				X																					
GT-1/9.0 - 10.5	GT-1		GT-1/9.0 - 10.5			SL	9.0 - 10.5	8/10/00	3:10:00 PM	KV	PR				X																					
GT-2/0.5 - 2.0	GT-2		GT-2/0.5 - 2.0			SL	0.5 - 2.0	8/10/00	4:55:00 PM	KV	PR				X																					
GT-2/10.0 - 11.5	GT-2		GT-2/10.0 - 11.5			SL	10.0 - 11.5	8/10/00	5:15:00 PM	KV	PR				X																					
GT-2/15.0 - 16.5	GT-2		GT-2/15.0 - 16.5			SL	15.0 - 16.5	8/11/00	7:45:00 AM	KV	PR				X																					
GT-2/20.0 - 21.5	GT-2		GT-2/20.0 - 21.5			SL	20.0 - 21.5	8/11/00	8:05:00 AM	KV	PR				X																					
GT-2/23.5 - 24.0	GT-2		GT-2/23.5 - 24.0			SL	23.5 - 24.0	8/11/00	8:30:00 AM	KV	PR				X																					
GT-2/5.0 - 6.5	GT-2		GT-2/5.0 - 6.5			SL	5.0 - 6.5	8/10/00	5:05:00 PM	KV	PR				X																					
GT-3/0.5 - 2.0	GT-3		GT-3/0.5 - 2.0			SL	0.5 - 2.0	8/11/00	9:10:00 AM	KV	PR				X																					
GT-3/10.0 - 11.5	GT-3		GT-3/10.0 - 11.5			SL	10.0 - 11.5	8/11/00	9:30:00 AM	KV	PR				X																					
GT-3/15.0 - 16.5	GT-3		GT-3/15.0 - 16.5			SL	15.0 - 16.5	8/11/00	9:35:00 AM	KV	PR				X																					
GT-3/5.0 - 6.5	GT-3		GT-3/5.0 - 6.5			SL	5.0 - 6.5	8/11/00	9:20:00 AM	KV	PR				X																					
GT-4/0.5 - 2.0	GT-4		GT-4/0.5 - 2.0			SL	0.5 - 2.0	8/11/00	10:00:00 AM	KV	PR				X																					
GT-4/14.0 - 15.5	GT-4		GT-4/14.0 - 15.5			SL	14.0 - 15.5	8/11/00	10:20:00 AM	KV	PR				X																					
GT-4/19.0 - 20.5	GT-4		GT-4/19.0 - 20.5			SL	19.0 - 20.5	8/11/00	10:40:00 AM	KV	PR				X																					
GT-4/4.0 - 5.5	GT-4		GT-4/4.0 - 5.5			SL	4.0 - 5.5	8/11/00	10:05:00 AM	KV	PR				X																					
GT-4/9.0 - 10.5	GT-4		GT-4/9.0 - 10.5			SL	9.0 - 10.5	8/11/00	10:15:00 AM	KV	PR				X																					

APPENDIX F

SOIL BORING LOGS

LOG OF BORING RT1(FS023)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.95 Date Drilled 8-3-00
Northing (ft) 2835436.50 Easting (ft) 1759163.21

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS023	0	FILL/TAILINGS
SS	10	NO		1	"rocky", loose, moist, gray and black, occasional orange iron oxide, gravel-sand, gravel is angular
	7				
	6			2	
SS	8	NO		3	GRAVELLY SANDY SILT (ML) very dense, moist, dark brown, gravel is angular, up to 1-1/2 inch diameter
	15				
	19			4	
SS	8	NO		5	GRAVELLY SANDY SILT (ML) medium dense, moist, brown, angular gravel up to 3/4 inch diameter, orange iron oxide staining
	11				
	10			6	SHALE ROCK (highly weathered)

LOG OF BORING RT2(FS035)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.51 Date Drilled 8-3-00
Northing (ft) 2835448.59 Easting (ft) 1759148.11

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS035	0	FILL/TAILINGS - SANDY GRAVEL (GP) moist, angular gravel
SS	10	NO		1	
	18				
	23			2	GRAVELLY SANDY SILT (ML) dense, moist, brown, with layers (<1/4 inch of black and orange), angular gravel 2 to 5 %, sands range to coarse grained
SS	7	NO		3	
	11				
	13			4	becomes drier
SS	9	NO		5	
	11				
	13			6	

LOG OF BORING RT3(FS024)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.51 Date Drilled 8-3-00
Northing (ft) 2835428.70 Easting (ft) 1759156.10

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS024 00RDV31SL	0	SANDY GRAVELLY SILT (ML) medium dense, moist, brown, angular gravel up to 3/4 inch diameter
SS	9	YES		1	
	16				
	13			2	
SS	8	YES		3	Hg blebs are < 1 mm
	8				
	11			4	slightly visible Hg (w/o handlens)
SS	9	NO		5	SILTY SANDY GRAVEL (GM) dense, moist, brown, gravel is < 2 inch diameter subrounded siltstone or fine sandstone
	16				
	30			6	

LOG OF BORING RT4(FS025)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.47 Date Drilled 8-3-00
Northing (ft) 2835422.80 Easting (ft) 1759149.65

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS025	0	SANDY GRAVEL (GP) "rocky", medium dense, moist gray and black, angular gravels
SS	7	YES		1	
	10				
	10			2	possible visible Hg
				3	

LOG OF BORING RT5(FS036)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.02 Date Drilled 8-3-00
Northing (ft) 2835434.90 Easting (ft) 1759134.64

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS036	0	SANDY GRAVEL (GP) "rocky", medium dense, moist, gray and black, occasional orange iron oxide, gravel is angular
SS	13	NO		1	
	14				
	13			2	
				3	

LOG OF BORING RT6(FS026)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.05 Date Drilled 8-3-00
Northing (ft) 2835416.50 Easting (ft) 1759143.52

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS026	0	FILL
SS	4	YES		1	GRAVELLY SAND WITH SILT (SP) very loose, moist, brown with red throughout, gravel and sand is subrounded, angular red (cinnabar or realgar) fragments
	3				
	1			2	
SS	3	YES		3	SAND WITH SILT (SP) medium dense, moist, dark brown, < 2 % gravel up to 1 inch diameter, sand is fine to coarse
	3				
	7			4	abundant Hg beads
SS	3	YES	00RDV55SL	5	SILTY GRAVELLY SAND (SM) medium dense, moist, dark brown, with orange iron oxide, (weathered shale or siltstone)
	4				visible Hg 5.0 to 6.0 feet
	8			6	ND Hg (no visible Hg 6.0 to 6.5 feet)

LOG OF BORING RT7(FS027)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.79 Date Drilled 8-3-00
Northing (ft) 2835407.66 Easting (ft) 1759135.57

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS027 00RDV32SL 00RDV33SL	0	SILTY SANDY GRAVEL (GM) medium dense, moist, brown, subrounded gravel up to 2 inch diameter, glass fragments, visible Hg
SS	5	YES		1	
	4				becomes dense, more shale fragments
	15			2	
SS	11	YES		3	SILTY GRAVELLY SAND (SM) dense, moist, brown, gravel is fine sandstone/ siltstone
	28				
	15			4	visible Hg beads
SS	10	NO		5	SANDY GRAVEL WITH SILT (GP) (weathered shale)
	11				
	17			6	

LOG OF BORING RT8(FS037)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.94 Date Drilled 8-3-00
Northing (ft) 2835418.93 Easting (ft) 1759121.30

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS037	0	SILTY SANDY GRAVEL (GM) dense, moist, brown, with occasional orange iron oxide, especially in silt clumps, gravels are siltstone or very fine sandstone up to 1 inch diameter
SS	10	NO		1	
	13				
	36			2	"low" Hg reading
				3	

LOG OF BORING RT9(FS028)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.57 Date Drilled 8-3-00
Northing (ft) 2835399.87 Easting (ft) 1759129.23

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS028 00RDV34SL	0	SILTY GRAVELLY SAND (SM) dense, moist, brown, angular gravel/sand up to 1 inch diameter, red fragments of cinnabar or realgar throughout
SS	9	NO		1	
	29				low Hg detection, abundant cinnabar or realgar
	13			2	
SS	9	NO		3	SANDY SILT (ML) very stiff, moist, brown, orange iron oxide staining, 2 to 5 % gravel of angular shale and sandstone fragments, up to 1-1/2 inch diameter
	15				
	12			4	

Note: Hg field readings are below detection unless otherwise noted.

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Harding Lawson Associates/
Wilder Construction Company
Joint Venture

Boring Logs
RT1-RT9

Source Area Removal and Investigation
Red Devil, Alaska

FIGURE
1

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mp	01/01

LOG OF BORING RT10(FS029)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.40 Date Drilled 8-4-00
Northing (ft) 2835392.13 Easting (ft) 1759121.95

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS029 00RDV355L	0		Surface Hg = 729 ppm, visibility at surface
SS	10	NO		1		
	9					
	9			2		Hg = 109 ppm
SS	7	NO		3		**SILT (ML)** very stiff, moist, brown, with orange iron oxide throughout (weathered shale)
	8					
	10			4		

LOG OF BORING RT11(FS038)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.68 Date Drilled 8-4-00
Northing (ft) 2835404.52 Easting (ft) 1759108.00

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS038	0		
SS	11	NO		1		
	14					
	13			2		**SILTY SANDY GRAVEL (GM)** medium dense, moist, brown with orange on some gravels, gravel is fine sandstone or siltstone, subangular
				3		

LOG OF BORING RT12(FS030)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.34 Date Drilled 8-3-00
Northing (ft) 2835386.27 Easting (ft) 1759115.06

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS030	0		
SS	11	YES		1		
	10					abundant Hg beads throughout sample <1 mm
	18			2		**SILT (ML)** very stiff, moist, brown with layers (<1/4 inch) of orange, sand/gravel <10% angular red (cinnabar or realgar) fragments Hg = ND (but visible)
SS	5	YES		3		**SILTY SANDY GRAVEL (GM)** very dense, moist, brown with orange iron oxide (weathered siltstone or shale)
	44					
	52			4		
SS	13	NO		5		**SANDY GRAVEL WITH SILT (GP)** very dense, moist, brown, angular gravel up to 2 inch diameter of siltstone, possibly broken by drilling
	44					
	43			6		becomes less dense
SS	17	NO		7		**SILTY SANDY GRAVEL (GM)** dense, moist, brown, angular fragments up to 1 inch diameter (weathered shale bedrock and possible basalt fragments), orange iron oxide staining
	18					
	28			8		

LOG OF BORING RT13(FS031)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.26 Date Drilled 8-4-00
Northing (ft) 2835379.88 Easting (ft) 1759110.84

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS031	0		FILL
SS	4	NO		1		
	8					**CLAY (CL)** very stiff, moist, gray, with layers <1/8 inch of yellow iron oxide or orpiment, clay is light gray, <2% angular gravel up to 2-1/2 inch diameter Hg and As = "high" readings
	11			2		
SS	12	NO				**SILTY SANDY GRAVEL (GM)** very dense, moist, brown, angular fragments up to 1-3/4 inch diameter, some iron oxide (orange) staining, (weathered shale or siltstone rock) Refusal at 3.7 feet
	100			3		

LOG OF BORING RT14(FS039)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.02 Date Drilled 8-4-00
Northing (ft) 2835389.28 Easting (ft) 1759093.57

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS039	0		
SS	9	NO		1		"Hg detected" **SANDY SILT (ML)** dense, moist, brown, gravel up to 2 inch diameter, comprises < 2%, <1/4 inch fragments of cinnabar or realgar, occasional Hg detected
	22			2		
	22			3		
SS	9	NO		4		**GRAVELLY CLAY (CL)** hard, moist, brown "slight" Hg reading
	16			5		
	22					**GRAVELLY SILT (ML)** medium dense, moist, brown, contains clay, but less than above interval, gravel up to 1-1/2 inch diameter
SS	6	NO		6		
	9					
	14					

LOG OF BORING RT15(FS056)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 537.11 Date Drilled 8-4-00
Northing (ft) 2835390.52 Easting (ft) 1759176.29

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS056	0		
SS	5	NO		1		
	23					**SILTY SANDY GRAVEL (GM)** dense, moist, brown, with occasional orange iron oxide on gravels, gravel is angular up to 1-1/2 inch diameter
	19			2		
SS	9	NO		3		gravels become smaller
	18					
	24			4		

LOG OF BORING RT16(FS055)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 537.18 Date Drilled 8-4-00
Northing (ft) 2835382.98 Easting (ft) 1759169.67

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS055	0		
SS	5	NO		1		
	20					[no log description; field notes indicate material is silty sandy gravel as in other borings]
	87			2		
				3		

LOG OF BORING RT17(FS054)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 537.69 Date Drilled 8-4-00
Northing (ft) 2835381.43 Easting (ft) 1759159.71

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS054	0		
SS	18	NO		1		
	39					**SILTY SANDY GRAVEL (GM)** very dense, moist, brown, angular fragments up to 1 inch diameter, (weathered shale or siltstone) iron oxide staining on some fragments
	52			2		
				3		

LOG OF BORING RT18(FS053)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.67 Date Drilled 8-4-00
Northing (ft) 2835391.95 Easting (ft) 1759143.36

Sampling Method	Blows/6 Inch / Foot	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS053 0-0.5	0		
SS	8	--		1		
	7					**GRAVELLY SANDY SILT (ML)** medium dense, moist, brown, contains clay (CL) possible hydrocarbon odor
	10			2		
SS	8	--		3		**SILTY SANDY GRAVEL (GM)** dense, moist, brown with iron oxide (orange) throughout, gravels angular, up to 1 inch diameter sandstone/siltstone
	16					
	17			4		
SS	14	--		5		very dense, moist, brown to gray, (weathered shale/siltstone), only occasional iron oxide (orange)
	27					
	43			6		

Note: Hg field readings are below detection unless otherwise noted.

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Boring Logs RT10-RT18

Source Area Removal and Investigation
Red Devil, Alaska

FIGURE **2**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mp	01/01

LOG OF BORING RT19(FS052)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.10 Date Drilled 8-4-00
Northing (ft) 2835384.25 Easting (ft) 1759137.59

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS052	0	
SS	14	NO	00RDV37SL	1	
	20			2	
	35			3	
SS	19	NO		4	
	63				
	100				

"clay-like" material, light gray
SILTY SANDY GRAVEL (GM)
very dense, moist, brown with orange iron oxide throughout, (weathered siltstone or fine sandstone)

SANDY GRAVEL (GP)
very dense, dry, brown to gray, (broken bedrock of gray sandstone with iron oxide)

refusal a 4.25 feet

LOG OF BORING RT20(FS051)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.95 Date Drilled 8-4-00
Northing (ft) 2835376.06 Easting (ft) 1759130.00

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS051	0	
SS	10	NO		1	
	29			2	
	38			3	
SS	30	NO			
	100				

SILTY SANDY GRAVEL (GM)
very dense, moist, brown, some white coating on individual pieces, angular fragments up to 1 inch diameter (weathered shale and siltstone)

SANDY GRAVEL WITH SILT (GP)
very dense, moist, brown to gray, gravel size is gray sandstone (broken rock fragments)

refusal at 3.9 feet

LOG OF BORING RT21(FS057)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 537.77 Date Drilled 8-5-00
Northing (ft) 2835370.62 Easting (ft) 1759150.92

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS057	0	
SS	16	NO		1	
	22			2	
	25			3	

surface Hg = 157 ppm

SANDY GRAVEL WITH SILT (GP)
dense, moist, brown with orange iron oxide staining throughout, gravel/sand is mainly sandstone and siltstone fragments

LOG OF BORING RT22(FS058)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 538.08 Date Drilled 8-5-00
Northing (ft) 2835354.35 Easting (ft) 1759134.56

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS058 00RDV38SL	0	
SS	19	NO		1	
	20			2	
	63			3	

hydrocarbon odor, (61 ppm), light gray silty/clay layer

LOG OF BORING RT23(FS059)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 538.13 Date Drilled 8-5-00
Northing (ft) 2835340.79 Easting (ft) 1759123.43

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS059	0	
SS	60	NO		1	
	35			2	
	30			3	

wood, rootlets

SANDY GRAVEL WITH SILT (GP)
very dense, moist, brown, gravel fragments up to 2 inch diameter, <2% are very fine sandstone

LOG OF BORING RT24(FS050)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.34 Date Drilled 8-5-00
Northing (ft) 2835366.15 Easting (ft) 1759122.70

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS050	0	
SS	23	NO		1	
	100			2	
SS	32	NO		3	
	100			4	

SANDY GRAVEL (GP)
very dense, moist, brown to gray (weathered very fine sandstone or siltstone)
possible hydrocarbon odor; Hg detected

GRAVEL (GP)
very dense, dry, brown to gray (weathered very fine siltstone or sandstone)

refusal at 4.0 feet

LOG OF BORING RT25(FS049)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.82 Date Drilled 8-4-00
Northing (ft) 2835361.50 Easting (ft) 1759116.20

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS049 00RDV40SL	0	
SS	43	NO		1	
	38			2	
	43			3	
SS	22	NO		4	
	60			5	
	54			6	
SS	8	NO			
	37				
	69				

hydrocarbon odor (19.6 ppm); Hg = 32 ppm

SANDY GRAVEL WITH SILT (GP)
very dense, moist, brown to gray, gravel is gray sandstone and siltstone (broken rock)

hydrocarbon odor; Hg = 32.4 ppm

SILTY SANDY GRAVEL (GM)
very dense, moist, brown with moderate iron oxide (orange) on surface of gravel, gravel is siltstone or very fine sandstone (weathered bedrock)

very dense, moist, dark brown with orange (iron oxide) stain on gravel-sized siltstone fragments (weathered shale/siltstone)

LOG OF BORING RT26(FS048)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.59 Date Drilled 8-4-00
Northing (ft) 2835354.26 Easting (ft) 1759108.94

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS048	0	
SS	5	NO		1	
	28			2	
	38			3	
SS	15	NO		4	
	41			5	
	33			6	
SS	15	NO			
	28				
	30				

SILTY SANDY GRAVEL (GM)
very dense, moist, brown with orange iron oxide on gravel surface
(weathered very fine sandstone or shale)

less orange

Hg = 23 ppm (As per M. Alcorn of BLM this reading is low enough to terminate boring)

LOG OF BORING RT27(FS041)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 533.12 Date Drilled 8-5-00
Northing (ft) 2835360.49 Easting (ft) 1759067.33

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS041	0	
SS	15	NO		1	
	13			2	
	11			3	

SILTY SANDY GRAVEL (GM)
medium dense, moist, brown, gravels coarse and mainly sandstone, siltstone or shale; gravel up to 1-1/2 inch diameter

Note: Hg field readings are below detection unless otherwise noted.

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Boring Logs RT19-RT27

Source Area Removal and Investigation
Red Devil, Alaska

FIGURE 3

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	MP	01/01

LOG OF BORING RT28(FS047)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 532.25 Date Drilled 8-5-00
Northing (ft) 2835379.77 Easting (ft) 1759063.64

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS047	0		
SS	7	NO		1		SILTY SANDY GRAVEL (GM) loose, moist, brown, gravel up to 1 inch diameter, coarse, mainly sandstone/siltstone, silt binds rock fragments together
	7			2		
	6			3		

LOG OF BORING RT29(FS040)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.42 Date Drilled 8-5-00
Northing (ft) 2835374.73 Easting (ft) 1759079.93

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS040	0		
SS	13	NO		1		SILTY SANDY GRAVEL (GM) loose, moist, brown, angular gravel up to 1 inch diameter
	21			2		
	18			3		

LOG OF BORING RT30(FS046)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 532.78 Date Drilled 8-5-00
Northing (ft) 2835379.77 Easting (ft) 1759074.75

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS046	0		
SS	12	NO		1		GRAVELLY SANDY SILT (ML) very stiff, moist, brown, occasional iron oxide (orange)
	11			2		
	12			3		

LOG OF BORING RT31(FS045)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 532.99 Date Drilled 8-5-00
Northing (ft) 2835411.61 Easting (ft) 1759087.29

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS045	0		
SS	5	NO		1		SILTY SANDY GRAVEL (GM) medium dense, moist, brown, occasional orange iron oxide
	10			2		
	15			3		

LOG OF BORING RT32(FS044)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 533.51 Date Drilled 8-5-00
Northing (ft) 2835425.16 Easting (ft) 1759099.24

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS044	0		
SS	11	NO		1		GRAVELLY SILT (ML) medium dense, moist, brown with black (organic) fragments <1/2 inch diameter, occasional orange iron oxide
	16			2		
	13			3		

LOG OF BORING RT33(FS043)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 532.96 Date Drilled 8-5-00
Northing (ft) 2835441.46 Easting (ft) 1759112.13

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS043	0		
SS	7	NO		1		SILTY GRAVELLY SAND (SM) loose, moist, dark brown, gravel up to 3/4 inch occasional yellow (iron oxide or orpiment staining, small white crystals (appear salt-like) Hg = 4.3 ppm
	5			2		
	6			3		
SS	8	NO		4		very dense, moist, dark brown, gravel up to 1-1/2 inch diameter, appears to be slag or igneous origin refusal at 4.0 feet
	7					

LOG OF BORING RT34(FS042)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 532.97 Date Drilled 8-5-00
Northing (ft) 2835455.71 Easting (ft) 1759126.24

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS042	0		
SS	12	NO	RT34/1.5-3	1		SILTY SANDY GRAVEL (GM) medium dense, moist, brown, gravels are angular, blocky, siltstone; fragments of organic (peat) in silt fraction
	11			2		
	12			3		

LOG OF BORING RT35(FS022)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 532.97 Date Drilled 8-5-00
Northing (ft) 2835471.23 Easting (ft) 1759139.38

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS022 00RDV48SL	0		"high" Hg reading at surface
SS	7	NO		1		[no field log]
	13			2		
	11			3		
SS	9	NO		4		
	9					
	8					

LOG OF BORING RT36(FS061)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 533.42 Date Drilled 8-5-00
Northing (ft) 2835487.02 Easting (ft) 1759154.73

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS061	0		
SS	14	NO	RT36/1.5-3	1		[no field log]
	16			2		
	14			3		

LOG OF BORING RT37(FS060)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 533.10 Date Drilled 8-#-00
Northing (ft) 2835500.91 Easting (ft) 1759167.88

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS042	0		
SS	8	NO	RT37/1.5-3	1		[no field log]
	8			2		
	11			3		

LOG OF BORING RT38(FS013)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 533.10 Date Drilled 8-#-00
Northing (ft) 2835514.17 Easting (ft) 1759182.24

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS013	0		
SS	5	NO		1		SILTY GRAVEL (GM) medium dense, moist brown, gravel is generally medium to coarse with <2% cobbles (>3 inch diameter)
	8			2		
	11			3		

LOG OF BORING RT39(FS011)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 533.03 Date Drilled 8-#-00
Northing (ft) 2835529.71 Easting (ft) 1759197.88

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number	Depth (ft)	Samples	
			FS011	0		
SS	8	NO		1		[no field log]
	7			2		
	8			3		

Note: Hg field readings are below detection unless otherwise noted.

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Boring Logs RT28-RT39

Source Area Removal and Investigation
Red Devil, Alaska

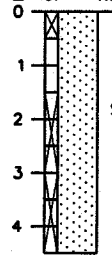
FIGURE 4

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		01/01

LOG OF BORING RT40(FS010)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.50 Date Drilled 8-5-00
Northing (ft) 2835519.86 Easting (ft) 1759217.77

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS010
SS	7	--	
	8		
	7		
SS	5	--	
	6		
	9		

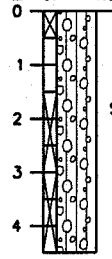


SAND WITH CLAY (SP)
fine sand, medium dense

LOG OF BORING RT41(FS012)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.20 Date Drilled 8-5-00
Northing (ft) 2835507.80 Easting (ft) 1759201.81

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS012
SS	7	NO	RT41/1.5-3
	9		
	13		
SS	5	NO	
	6		
	9		



SILTY SANDY GRAVEL (GM)
medium dense, moist, brown, gravels are subangular to subrounded and <3/4 inch diameter

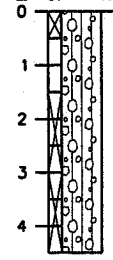
becomes gravelly, dark gray

becomes red, more fine sand, medium dense

LOG OF BORING RT42(FS014)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.50 Date Drilled 8-6-00
Northing (ft) 2835493.31 Easting (ft) 1759188.36

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS014
SS	17	NO	RT42/1.5-3
	17		
	12		
SS	7	NO	RT42/3-4.5
	7		
	6		

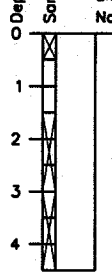


SILTY SANDY GRAVEL (GM)
medium dense, moist, brown, occasional orange iron oxide

LOG OF BORING RT43(FS021)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.58 Date Drilled 8-6-00
Northing (ft) 2835479.04 Easting (ft) 1759176.15

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS021 00RDV47SL
SS	9	NO	
	17		
	16		
SS	7	NO	RT43/3-4.5
	5		
	5		

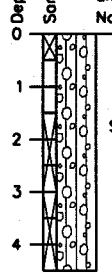


[less rocky than other samples in this area a few cobbles in fine-grained matrix]

LOG OF BORING RT44(FS020)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.14 Date Drilled 8-6-00
Northing (ft) 2835462.28 Easting (ft) 1759161.93

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS020
SS	10	NO	
	13		
	11		
SS	7	NO	
	7		
	16		

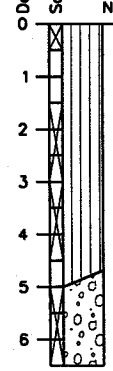


SILTY SANDY GRAVEL (GM)
medium dense, moist, brown

LOG OF BORING RT45(FS063)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.49 Date Drilled 8-6-00
Northing (ft) 2835444.51 Easting (ft) 1759169.39

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS063
SS	10	NO	RT45/1.5-3
	13		
	11		
SS	7	NO	RT45/3-4.5
	7		
	16		
SS	12	NO	RT45/5-6.5
	12		
	14		



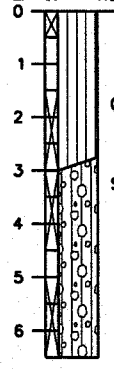
GRAVELLY SANDY SILT (ML)
medium dense, moist, brown, with occasional orange iron oxide, wood fragments

SILTY SANDY GRAVEL (GP)
medium dense, moist, brown, (weathered gray to brown shale)

LOG OF BORING RT46(FS019)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.63 Date Drilled 8-6-00
Northing (ft) 2835452.32 Easting (ft) 1759176.78

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS019
SS	10	NO	
	16		
	21		
SS	11	NO	RT46/3-4.5
	16		
	26		
SS	9	NO	
	13		
	16		



weathered shale at surface

GRAVELLY SANDY SILT (ML)
medium dense, moist, brown, with occasional orange iron oxide, wood fragments
becomes more sandy and more orange

SILTY SANDY GRAVEL (GM)
medium dense, moist, brown, with orange iron oxide, gravels are very fine sandstone/ siltstone and shale, subangular to angular

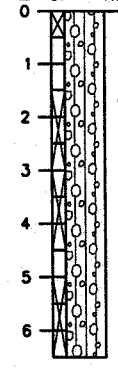
becomes less orange

brown with some orange (weathered shale)

LOG OF BORING RT47(FS018)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.43 Date Drilled 8-6-00
Northing (ft) 2835458.85 Easting (ft) 1759183.18

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS018
SS	13	NO	
	31		
	26		
SS	15	NO	
	9		
	9		
SS	9	NO	RT47/5-6.5
	9		
	10		



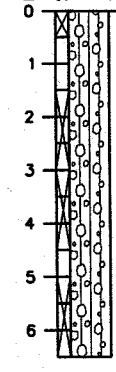
SILTY SANDY GRAVEL (GM)
very dense, moist, brown with occasional orange iron oxide on gravel fragments

hit rock during drilling - low recovery

LOG OF BORING RT48(FS017)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.36 Date Drilled 8-6-00
Northing (ft) 2835466.15 Easting (ft) 1759190.59

Sampling Method	Blows/ Foot	Visible Mercury	Sample Number
			FS017
SS	13	NO	RT48/1.5-3
	12		
	13		
SS	10	NO	
	13		
	16		
SS	10	NO	RT48/5-6.5
	10		
	14		



SILTY SANDY GRAVEL (GM)
medium dense, moist, brown, occasional orange (weathered shale)

becomes finer (less gravel, rock fragments) and more gray

becomes more gray

becomes more orange (iron oxide)

Note: Hg field readings are below detection unless otherwise noted.

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Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Boring Logs RT40-RT48

Source Area Removal and Investigation
Red Devil, Alaska

FIGURE 5

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	mp	01/01

LOG OF BORING RT49(FS016)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.22 Date Drilled 8-6-00
Northing (ft) 2835474.28 Easting (ft) 1759195.81

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS016
SS	10	NO	
	15		
	15		
SS	8	NO	RT49/3-4.5
	10		
	10		
SS	6	NO	RT49/5-6.5
	9		
	15		

"very rocky", dense, (weathered shale and siltstone)

SILTY SANDY GRAVEL (GM)
medium dense, moist, brown, occasional orange (weathered shale and siltstone)

LOG OF BORING RT50(FS001)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.96 Date Drilled 8-6-00
Northing (ft) 2835481.83 Easting (ft) 1759202.67

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS001 00RDV54SL
SS	11	NO	RT50/1.5-3
	22		
	18		
SS	17	NO	RT50/3-4.5
	10		
	18		
SS	11	NO	RT50/5-6.5
	15		
	15		

[based on field log]
"very rocky", dense

becomes medium dense

becomes more red due to iron oxide or realgar; less rocky, dense

LOG OF BORING RT51(FS070)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.77 Date Drilled 8-6-00
Northing (ft) 2835402.64 Easting (ft) 1759186.54

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS070
SS	10	NO	RT51/1.5-3
	15		
	15		
SS	8	NO	RT51/3-4.5
	10		
	10		
SS	6	NO	RT51/5-6.5
	9		
	15		

SANDY GRAVEL WITH SILT (GP)
very dense, moist, brown with iron oxide (or realgar) red-brown throughout, occasional yellow (iron oxide or orpiment) gravels are fine to medium groined sandstone

angular gravels are sandstone, less iron oxide

SILTY SANDY GRAVEL (GM)
medium dense, moist, brown, red iron oxide on some gravels, gravels are sandstone and some shale, more platey, less blocky than above samples

LOG OF BORING RT52(FS071)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.61 Date Drilled 8-6-00
Northing (ft) 2835394.99 Easting (ft) 1759180.29

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS071
SAMPLE WRONG OR SAMPLE # ???			
SS	17	NO	RT52/3-4.5
	32		
	84		
	90		
SS	17	NO	
	68		
	72		

SILTY SANDY GRAVEL (GM)
very dense, moist, brown, (weathered shale) poor recovery

refusal, very rocky

continue drilling, becomes rocky (cobble-sized)

SANDY GRAVEL WITH SILT (GP)
very dense, moist, brown, slightly more yellow, gravel /cobbles <3 inch diameter likely broken bedrock during drilling (sandstone) refusal at 6.25 feet

LOG OF BORING RT53(FS069)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.76 Date Drilled 8-6-00
Northing (ft) 2835410.47 Easting (ft) 1759193.10

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS069
SS	12	NO	RT53/1.5-3
	22		
	28		
SS	12	NO	
	32		
	38		
SS	11	NO	RT53/5-6.5
	21		
	26		

SILTY SANDY GRAVEL (GM)
dense, moist, brown and black with some orange iron oxide, (weathered shale)

LOG OF BORING RT54(FS068)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.24 Date Drilled 8-6-00
Northing (ft) 2835417.73 Easting (ft) 1759199.01

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS068
SS	9	NO	RT54/1.5-3
	29		
	33		
SS	21	NO	
	92		
SS	11	NO	RT54/5-6.5
	32		
	35		

SILTY SANDY GRAVEL (GM)
very dense, moist, brown and gray with occasional orange iron oxide on gravel surface, (weathered shale)

refusal, continue drilling

moderate orange iron oxide, (weathered shale)

LOG OF BORING RT55(FS067)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.36 Date Drilled 8-6-00
Northing (ft) 2835425.75 Easting (ft) 1759204.74

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS067
SS	13	NO	
	26		
	23		
SS	11	NO	
	19		
SS	12	NO	RT55/5-6.5
	24		
	44		

SILTY SANDY GRAVEL (GM)
dense, moist, brown with orange iron oxide on gravels, gravel up to 1 inch, very angular mainly shale with fragments of basalt (?) or very fine sandstone

becomes siltier

GRAVELLY SANDY SILT (ML)
very dense, moist, brown with occasional yellow and orange (weathered shale)

LOG OF BORING RT56(FS066)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.75 Date Drilled 8-6-00
Northing (ft) 2835433.83 Easting (ft) 1759211.50

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS066
SS	12	NO	
	54		
	71		
SS	12	NO	
	100		
SS	18	NO	
	63		

hydrocarbon odor
SILTY SANDY GRAVEL (GM)
very dense, moist, brown with orange iron oxide, gravels are angular, fine to very fine sandstone
becomes silty
hydrocarbon odor
GRAVELLY SANDY SILT (ML)
very dense, moist, brown with gray, (very weathered shale)

refusal, continue drilling

hydrocarbon odor, becomes rockier (shale)

LOG OF BORING RT57(FS065)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.28 Date Drilled 8-6-00
Northing (ft) 2835440.15 Easting (ft) 1759214.34

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS065
SS	7	NO	
	11		
	17		
SS	8	NO	
	23		
	31		
SS	8	NO	
	26		
	40		

SANDY GRAVELLY SILT (ML)
medium dense, moist, gray with brown (very weathered shale), gravels are angular to subrounded

shale, moist

Note: Hg field readings are below detection unless otherwise noted.

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Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Boring Logs RT49-RT57

Source Area Removal and Investigation
Red Devil, Alaska

FIGURE 6

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		01/01

LOG OF BORING RT58(FS064)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.57 Date Drilled 8-7-00
Northing (ft) 2835449.64 Easting (ft) 1759221.33

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS064	0	
SS	8	NO		1	"rocky", wet
	13				
	40			2	SILTY SANDY GRAVEL (GM) dense, moist weathered shale fragments
SS	10	NO		3	
	15				
	17			4	
SS	17	NO	RT58/5-6.5	5	(weathered shale)
	92				
	62			6	

LOG OF BORING RT59(FS004)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.57 Date Drilled 8-7-00
Northing (ft) 2835465.42 Easting (ft) 1759226.55

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS004	0	
SS	7	NO		1	
	17				
	25			2	SILTY GRAVEL (GM) dense, moist, brown rock stuck in catcher, low recovery
SS	10	NO		3	
	15				
	20			4	SILTY SANDY GRAVEL (GM) dense, moist, brown and gray, weathered shale with very fine grained sandstone or siltstone
					less fines at 4.5 feet

LOG OF BORING RT60(FS005)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.22 Date Drilled 8-7-00
Northing (ft) 2835480.30 Easting (ft) 1759235.44

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS005	0	
SS	14	NO	RT60/1.5-3	1	
	31				
	32			2	SILTY SANDY GRAVEL (GM) dense, moist, brown with light gray and occasional orange iron oxide on gravels, (weathered very fine sandstone and siltstone)
SS	15	NO	RT60/3-4.5	3	
	42				
	37			4	becomes rockier

LOG OF BORING RT61(FS009)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.51 Date Drilled 8-7-00
Northing (ft) 2835488.95 Easting (ft) 1759239.83

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS009	0	
SS	7	NO		1	SILTY SANDY GRAVEL (GM) dense, moist
	13				
	20			2	(weathered shale)
				3	

LOG OF BORING RT62(FS003)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.16 Date Drilled 8-7-00
Northing (ft) 2835471.75 Easting (ft) 1759219.04

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS003	0	
SS	7	NO	00RDV36SL	1	SILTY SANDY GRAVEL (GM) dense, gravels are shale fragments (weathered shale)
	16				
	14			2	becomes more red
SS	8	NO	RT62/3-4.5	3	SANDY GRAVEL WITH SILT (GP) medium dense, brown with red throughout, gravels are siltstone/very fine sandstone (weathered siltstone/shale and sandstone)
	11				
	17			4	

LOG OF BORING RT63(FS002)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.07 Date Drilled 8-7-00
Northing (ft) 2835475.23 Easting (ft) 1759219.55

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS002	0	
SS	4	NO	RT63/1.5-3	1	FILL/SANDY SILTY GRAVEL (GM) medium dense, moist, brown, gravels are subrounded up to 1 inch diameter
	6				
	12			2	
SS	18	NO	RT63/3-4.5	3	becomes dense
	13				becomes more red/orange
	26			4	

LOG OF BORING RT64(FS006)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.02 Date Drilled 8-7-00
Northing (ft) 2835487.78 Easting (ft) 1759226.91

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS006	0	
SS	7	NO	RT64/1.5-3	1	
	14				weathered shale, clayey
	16			2	small amount of unknown white material-fabric ?
SS	14	NO	RT64/3-4.5	3	
	20				becomes more dense, rockier
	20			4	

LOG OF BORING RT65(FS008)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.36 Date Drilled 8-7-00
Northing (ft) 2835503.60 Easting (ft) 1759235.50

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS008	0	
SS	9	NO		1	[no field log]
	24				
	20			2	very dense material
				3	

LOG OF BORING RT66(FS007)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.13 Date Drilled 8-7-00
Northing (ft) 2835493.91 Easting (ft) 1759218.28

Sampling Method	Blows/6" Foot	Visible Mercury	Sample Number	Depth (ft)	Samples
			FS007	0	
SS	13	NO	RT66/1.5-3	1	
	23				GRAVELLY SANDY SILT (ML) dense, moist, brown with orange iron oxide on angular gravel, gravel is siltstone and very fine sandstone
	20			2	
SS	13	NO	RT66/3-4.5	3	becomes softer, more iron oxide (red) coloration
	23				gravels subangular up to 1 inch diameter
	20			4	less clay

Note: Hg field readings are below detection unless otherwise noted.

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Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Boring Logs RT58-RT66

Source Area Removal and Investigation
Red Devil, Alaska

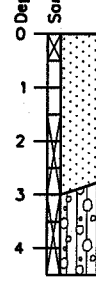
FIGURE **7**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		01/01

LOG OF BORING RT67(FS074)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 537.23 Date Drilled 8-7-00
Northing (ft) 2835335.56 Easting (ft) 1759104.52

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS074
SS	10	NO	RT67/1.5-3
	20		
	30		
SS	17	NO	RT67/3-4.5
	17		
	23		



GRAVELLY SAND (SP)
dense, moist, brown with red and orange iron oxide, gravel is fine to medium grained sandstone, angular to 1 inch diameter

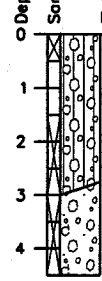
becomes softer

SILTY SANDY GRAVEL (GM)
dense, moist, brown and black, gravel is angular shale up to 3/4 inch (weathered shale)

LOG OF BORING RT68(FS073)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.32 Date Drilled 8-7-00
Northing (ft) 2835338.71 Easting (ft) 1759095.41

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS073 00RDV52SL
SS	10	NO	
	10		
	15		
SS	7	NO	RT68/3-4.5
	17		
	22		



SILTY SANDY GRAVEL (GM)
medium dense, moist, brown with orange and red iron oxide on gravels, gravel is shale, angular up to 1/2 inch diameter (weathered shale)

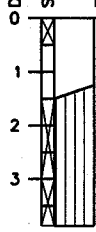
SANDY GRAVEL WITH SILT (GP)
dense, moist, brown, gravel is angular sandstone or siltstone to 1/2 inch diameter (weathered shale/siltstone and sandstone)

becomes more rocky

LOG OF BORING RT69(FS072)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 536.06 Date Drilled 8-7-00
Northing (ft) 2835350.63 Easting (ft) 1759096.76

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS072 00RDV50SL
SS	7	--	
	15		
	72		
SS	17	--	
	60		



FILL

SANDY GRAVELLY SILT (ML)
very dense, moist, brown and black, gravels are shale, angular from 1/4 to 1/2 inch diameter

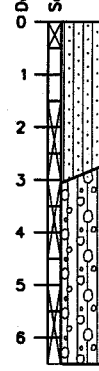
subrounded gravels

refusal at 3.75 fett

LOG OF BORING RT70(FS062)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.60 Date Drilled 8-7-00
Northing (ft) 2835357.40 Easting (ft) 1759103.06

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS062 00RDV49SL
SS	3	YES	RT70/1.5-3
	8		
	17		
SS	9	NO	RT70/3-4.5
	23		
	40		
SS	13	NO	RT70/5-6.5
	27		
	43		



FILL/ SILTY GRAVELLY SAND (SM)
medium dense, moist, brown and black, wood fragments, subrounded gravels includes weathered gray shale
visible mercury from 2 feet to 2 feet 9 inches

SILTY SANDY GRAVEL (GM)
very dense, moist, brown and gray, gravels are shale, angular (weathered shale)

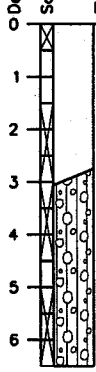
becomes siltier

brown with orange iron oxide on gravels

LOG OF BORING RT71(FS033)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.93 Date Drilled 8-7-00
Northing (ft) 2835362.17 Easting (ft) 1759097.34

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS033
SS	27	YES	00RDV58SL
	54		
	55		
SS	18	NO	RT71/3-4.5
	44		
	41		
SS	14	NO	
	28		
	30		



SAND AND FILL ROCK OR TAILINGS
subrounded, visible mercury

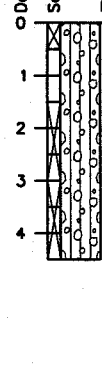
SILTY SANDY GRAVEL (GM)
very dense, moist, brown with orange (iron oxide) on gravels, angular shale (weathered shale)

greater silt fraction

LOG OF BORING RT72(FS034)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.23 Date Drilled 8-7-00
Northing (ft) 2835347.73 Easting (ft) 1759082.29

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS034
SS	7	NO	
	21		
	30		
SS	11	NO	RT72/3-4.5
	13		
	14		



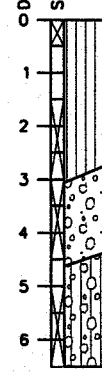
SILTY SANDY GRAVEL (GM)
very dense, moist, brown, gravel is siltstone and fine sandstone
1/2 inch light gray silty sand, medium to fine grained

medium dense, moist, brown, gravel is angular siltstone or shale and sandstone up to 3/4 inch diameter (weathered siltstone and very fine sandstone)

LOG OF BORING RT73(FS032)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 535.23 Date Drilled 8-7-00
Northing (ft) 2835368.86 Easting (ft) 1759100.82

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS032 00RDV51SL
SS	6	NO	
	5		
	25		
SS	8	NO	RT73/3-4.5
	55		
	50		
SS	18	NO	
	25		
	22		



FILL

GRAVELLY SILT (ML)
dense, moist, brown with black and gray with occasional orange iron oxide

becomes more dense, harder drilling

SANDY GRAVEL WITH SILT (GP)
very dense, moist, brown, gravel is subangular to angular very fine sandstone and siltstone

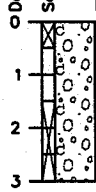
becomes siltier

SILTY SANDY GRAVEL (GM)
dense, moist, brown with black, gravels are shale (weathered shale)

LOG OF BORING RT74(FS075)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 534.75 Date Drilled 8-7-00
Northing (ft) 2835333.67 Easting (ft) 1759068.41

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS075
SS	13	NO	00RDV56SL
	11		
	23		

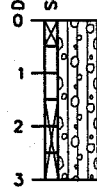


FILL/SANDY GRAVEL (GP)
dense, moist, gray, gravel appears to be slag or igneous origin up to 2 inch diameter
6 to 18 inches is green and gray

LOG OF BORING RT75(FS076)

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 532.13 Date Drilled 8-7-00
Northing (ft) 2835346.07 Easting (ft) 1759053.92

Sampling Method	Blows/6 Inch	Visible Mercury	Sample Number
			FS076
SS	18	NO	RT75/1.5-3
	23		
	29		



SILTY SANDY GRAVEL (GM)
very dense, moist, brown, gravels are angular to subangular siltstone/very fine sandstone and shale
(weathered siltstone/sandstone)

Note: Hg field readings are below detection unless otherwise noted.

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Harding Lawson Associates/
Wilder Construction Company
Joint Venture

HLA WILDER

Boring Logs
RT67-RT75

Source Area Removal and Investigation
Red Devil, Alaska

FIGURE
8

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		01/01

LOG OF BORING GT01

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 531.24 Date Drilled 8-10-00
Northing (ft) 2835202.50 Easting (ft) 1758945.52

Sampling Method	Blows/6" Foot	Visible Mercury	Depth (ft)	Samples	Description
SS	10	NO	0		
	11		1		**SILTY SANDY GRAVEL (GM)** medium dense, moist, gray with iron oxide (orange), gravels are angular, cobbles up to 2 inch diameter, clumps break apart as weathered shale
	12		2		
			3		
SS	10	NO	4		becomes brown and siltier
	13		5		
	15		6		
			7		
			8		
SS	9	NO	9		becomes more orange
	13		10		becomes sandier, gravels are sandstone still > 12% fines
	14		11		becomes more orange
			12		
			13		
SS	9	NO	14		greater shale fragments and less moist
	29		15		very dense, moist, brown and gray with orange (iron oxide), shales are dark gray (weathered shale)
	41		16		
			17		
			18		
SS	26	NO	19		becomes less moist
	28		20		**SANDY GRAVELLY SILT (ML)** hard, moist, brown with orange iron oxide
	76		21		
			22		
			23		
SS	19	NO	24		**SILTY SANDY GRAVEL (GM)** very dense, moist, brown with orange (iron oxide) (weathered shale/sandstone)
	37				refusal at 24.5
	84				

LOG OF BORING GT02

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 531.90 Date Drilled 8-10-00
Northing (ft) 2835213.98 Easting (ft) 1758978.96

Sampling Method	Blows/6" Foot	Visible Mercury	Depth (ft)	Samples	Description
SS	8	NO	0		
	15		1		**TAILINGS – SILTY GRAVELLY SAND (SM)** dense, moist, black
	16		2		
			3		becomes more gravelly at 1 foot 8 inches
			4		
SS	6	NO	5		loose, moist, black with orange fragments (iron oxide or realgar), becomes more gravelly (GM) at 5.5 feet; at 6.0 feet is peat/silt (OL–OH)
	5		6		
	4		7		
			8		
			9		
SS	3	NO	10		becomes greater in silt or clay
	4		11		**SANDY GRAVELLY SILT (ML)** medium dense, moist, gray with orange (iron oxide), gravels and coarse sands are angular (shale)
	13		12		
			13		
SS	5	NO	14		becomes siltier, less gravel, less moisture
	8		15		**SANDY SILT (ML)** medium dense, moist, brown and orange, very compact, denser than above sample
	21		16		
			17		
			18		
SS	21	NO	19		slightly more gravel
	100/3"		20		**SANDY GRAVELLY SILT (ML)** very dense, moist, brown with orange iron oxide (weathered shale)
			21		refusal, continue drilling
			22		
			23		hard drilling
SS	100/6"	NO	24		**SILTY SANDY GRAVEL (GM)** very dense, moist, gray with occasional orange iron oxide (weathered shale)

LOG OF BORING GT03

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 531.84 Date Drilled 8-10-00
Northing (ft) 2835239.10 Easting (ft) 1759003.01

Sampling Method	Blows/6" Foot	Visible Mercury	Depth (ft)	Samples	Description
SS	7	NO	0		
	13		1		**TAILINGS – SILTY SANDY GRAVEL (GM)** medium dense, moist, gray with occasional orange iron oxide, gravels are angular shale
	13		2		
			3		
SS	6	NO	4		
	5		5		becomes more silty/clay
	2		6		**SANDY GRAVELLY SILT (ML)** loose, moist, brown and gray with occasional orange, black rootlets throughout, organic silt/clay
			7		
			8		
SS	3	NO	9		
	4		10		becomes sandier (very fine sand)
	5		11		
			12		
			13		
SS	8	NO	14		becomes orange
	8		15		▽ groundwater level during drilling
	16		16		**SILTY SANDY GRAVEL (GM)** medium dense, wet, orange and brown, gravels are angular shale in matrix of silt

LOG OF BORING GT04

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 531.24 Date Drilled 8-10-00
Northing (ft) 2835275.34 Easting (ft) 1759009.93

Sampling Method	Blows/6" Foot	Visible Mercury	Depth (ft)	Samples	Description
SS	3	NO	0		
	5		1		**FILL – SILTY SANDY GRAVEL (GM)** loose, moist, gray, occasional orange and red spots (~2 to 3 mm diameter), gravels are angular shale
	5		2		
			3		
SS	3	NO	4		becomes brown with increased clay **GRAVELLY SILT OR CLAY (CL)** very stiff, moist, brown, with occasional orange iron oxide, gravel is angular shale
	9		5		
	10		6		
			7		
			8		
SS	10	NO	9		**SILTY GRAVEL (GM)** medium dense, moist, brown with occasional orange iron oxide, gravel up to 2 inch diameter, fine grained sandstone
	13		10		**SANDY CLAY/SILT (CL)**
	12		11		
			12		
			13		
SS	7	NO	14		**GRAVELLY SAND WITH SILT(SP)** medium dense, wet, gray with brown/orange sand is very fine grained
	8		15		possible saturation, wet
	8		16		
			17		weathered bedrock of sandstone weathering "rinds" are around gravels of fine sand or possible basalt
			18		
SS	5	NO	19		▽ groundwater level during drilling
	8		20		**SANDY SILTY GRAVEL (GM)** medium dense, wet, brown with orange iron oxide throughout (weathered shale)
	10				

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Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Boring Logs GT01-GT04

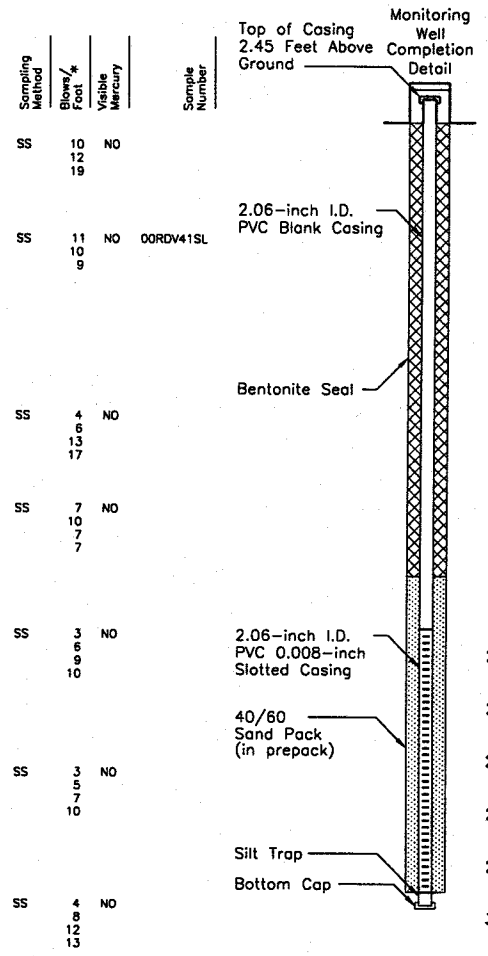
Source Area Removal and Investigation
Red Devil, Alaska

FIGURE **9**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		01/01

LOG OF BORING B01/MW01

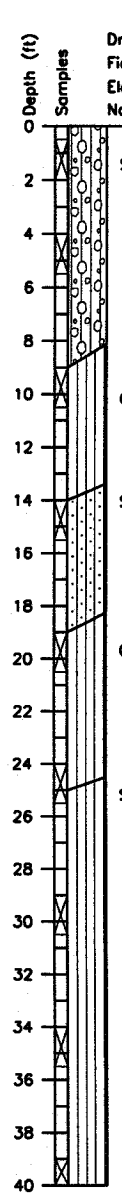
Drilling Co. Hughes Drilling **Driller** Gary Wilson/Pat Smith
Field Engineer K. Vincent **Drill Rig** HSA CME 45
Elevation 515.34 **Date Drilled** 8-1/2-00
Northing (ft) 2835457.86 **Easting (ft)** 1758933.83



Depth (ft)	Sampling Method	Blows/6"	Visible Mercury	Sample Number	Description
0	SS	10 12 19	NO		**TAILINGS** **SANDY GRAVEL (GP)** dense, moist, black, coarse sand to fine gravel
2					
4	SS	11 10 9	NO	00RDV41SL	medium dense, gravels are angular, trace coarse gravel, wood (2 inches) at top of drive
6					wood debris at 6.0 to 8.5 feet
8					
10	SS	4 6 13 17	NO		at 9.0 feet rocks in shoe, rock fragments to 2 inch diameter and wood (50/50)
12					redrill medium dense, moist, dark gray, minor silt (<5%), occasional trace organics (20%)
14	SS	7 10 7 7	NO		
16					wire at 15.5 feet becomes wetter at 16.0 feet increasing rocks
18					▽ groundwater level during drilling (17.8 feet bg)
20	SS	3 6 9 10	NO		**SANDY SILT (ML)** medium dense, moist, dark gray, fine sand, trace organics (<2%) at 20.5 feet color is mottled gray
22					
24	SS	3 5 7 10	NO		**SILT (ML)** very stiff, moist, dark gray, fine sand <5%, occasional organics (wood)
26					free water/saturated at 26.0 feet
28	SS	4 8 12 13	NO		**GRAVEL (GP)** medium dense, wet, gray (lighter than previous sample), rock fragments to 2 inch diameter, occasional orange or red mottling
30					

LOG OF BORING B02

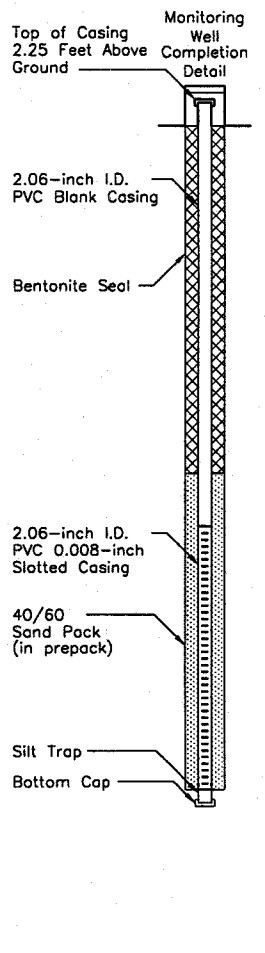
Drilling Co. Hughes Drilling **Driller** Gary Wilson/Pat Smith
Field Engineer K. Vincent **Drill Rig** HSA CME 45
Elevation 531.25 **Date Drilled** 8-7/8-00
Northing (ft) 2835480.66 **Easting (ft)** 1759141.16



Depth (ft)	Sampling Method	Blows/6"	Visible Mercury	Sample Number	Description
0	SS	7 12 10	NO		**SILTY SANDY GRAVEL (GM)** medium dense, moist brown, gravel is angular very fine sandstone, orange iron oxide on gravels (up to 1-1/2 inch diameter)
2					
4	SS	7 10 8	NO		becomes more clayey
6					
8					
10	SS	5 7 7	NO		becomes more clayey **GRAVELLY SANDY SILT (ML)** medium stiff, moist, brown with black and orange (iron oxide), possible clay
12					
14	SS	6 9 11	NO	00RDV42SL	**SILTY GRAVELLY SAND (SM)** medium dense, moist, brown with occasional orange iron oxide, gravels are subangular very fine sandstone or siltstone (up to 1/2 inch diameter)
16					
18	SS	6 9 11	NO		gravels become coarser **GRAVELLY SANDY SILT (ML)** medium dense, moist, brown and black, occasional orange iron oxide, gravels are angular siltstone or very fine sandstone, gravels up to 1 inch diameter
20					
22	SS	6 7 11	NO		**SANDY GRAVELLY SILT (ML)** very stiff, moist, brown and gray with orange iron oxide, very clayey at 24 feet 10 inches to 25 feet 6 inches, increased iron oxide
24					
26	SS	7 19 42	NO		becomes harder highly weathered shale, gray with orange iron oxide on fragments becomes rockier, wet
28					
30	SS	18 100	NO		becomes much drier, hard drilling sand < 1/4 inch with cobbles (4 inches) refusal / redrill and continue
32					
34					
36	SS	18 102	NO		
38					
40					refusal on shale bedrock

LOG OF BORING B03/MW03

Drilling Co. Hughes Drilling **Driller** Gary Wilson/Pat Smith
Field Engineer K. Vincent **Drill Rig** HSA CME 45
Elevation 488.67 **Date Drilled** 8-8/9-00
Northing (ft) 2835808.54 **Easting (ft)** 1759209.38



Depth (ft)	Sampling Method	Blows/6"	Visible Mercury	Sample Number	Description
0	SS	8 27 30	NO		**TAILINGS – (clay and fine sand)** **SILTY SANDY GRAVEL (GM)** very dense, moist, gray and brown, minor orange iron oxide piece of metal stuck in sampler
2					
4	SS	8 7 8	NO	00RDV43SL 83/0.5-2	becomes less silty, becomes softer medium dense, moist, gravels are 1/4 inch to 1 inch diameter, subangular with 1 cobble (gray shale gravels)
6					
8	SS	6 6 8	NO		iron oxide increases, occasional red orange gravels are smaller (< 1/2 inch)
10					
12					at 11.5 to 13.5 feet drilling through wood
14					
16					
18	SS	7 10 11	NO		▽ groundwater level during drilling (19.0 feet bg)
20	SS	9 9 11	NO		**SANDY GRAVEL WITH SILT (GP)** medium dense, wet, possible clay
22					
24	SS	4 5 11	NO		**SANDY SILT (ML)** very stiff, wet, brown and gray with orange iron oxide
26	SS	8 8 10	NO		

Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Boring Logs
B01/MW01, B02 & B03/MW03

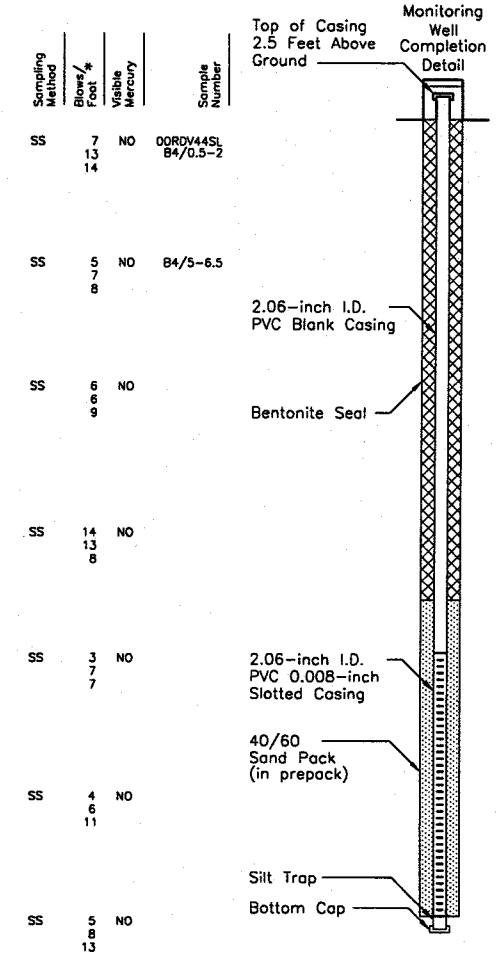
Source Area Removal and Investigation
Red Devil, Alaska

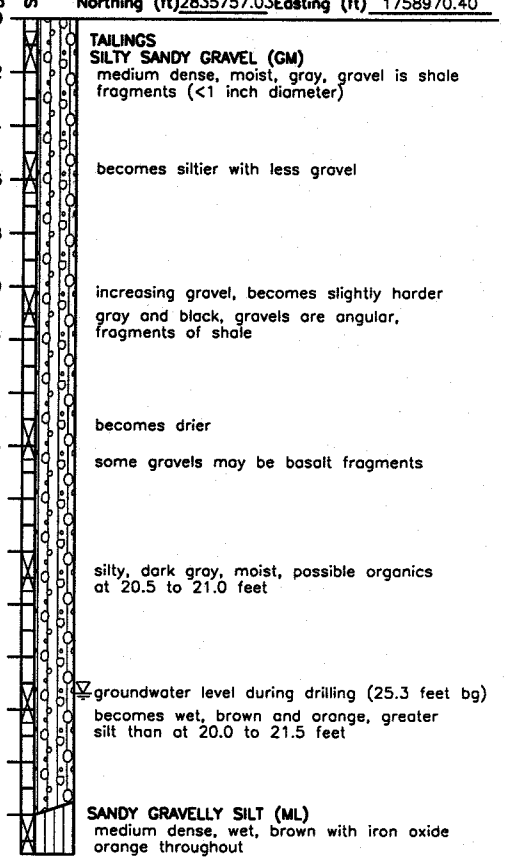
FIGURE **10**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192		01/01

LOG OF BORING B04/MW04

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 500.02 Date Drilled 8-9-00
Northing (ft) 2835757.03 Easting (ft) 1758970.40





TAILINGS
SILTY SANDY GRAVEL (GM)
medium dense, moist, gray, gravel is shale fragments (<1 inch diameter)

becomes siltier with less gravel

increasing gravel, becomes slightly harder gray and black, gravels are angular, fragments of shale

becomes drier

some gravels may be basalt fragments

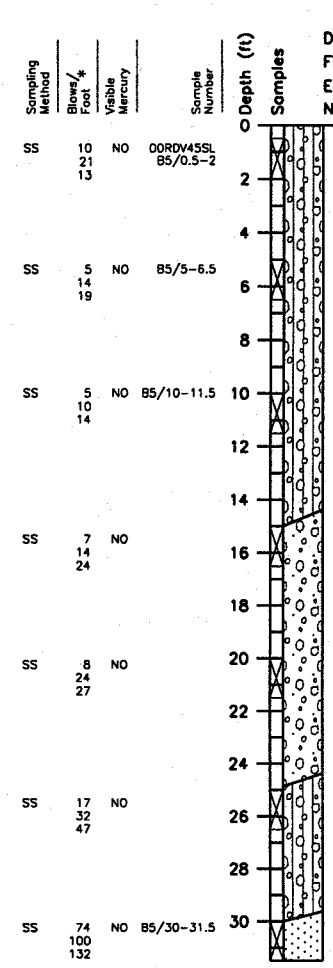
silty, dark gray, moist, possible organics at 20.5 to 21.0 feet

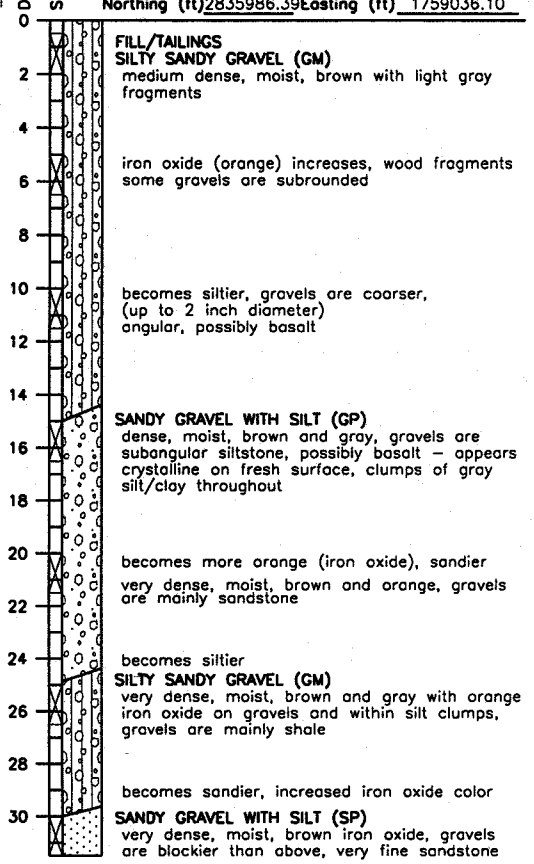
groundwater level during drilling (25.3 feet bg)
becomes wet, brown and orange, greater silt than at 20.0 to 21.5 feet

SANDY GRAVELLY SILT (ML)
medium dense, wet, brown with iron oxide orange throughout

LOG OF BORING B05

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 500.26 Date Drilled 8-9-00
Northing (ft) 2835986.39 Easting (ft) 1759036.10





FILL/TAILINGS
SILTY SANDY GRAVEL (GM)
medium dense, moist, brown with light gray fragments

iron oxide (orange) increases, wood fragments some gravels are subrounded

becomes siltier, gravels are coarser, (up to 2 inch diameter) angular, possibly basalt

SANDY GRAVEL WITH SILT (GP)
dense, moist, brown and gray, gravels are subangular siltstone, possibly basalt - appears crystalline on fresh surface, clumps of gray silt/clay throughout

becomes more orange (iron oxide), sandier

very dense, moist, brown and orange, gravels are mainly sandstone

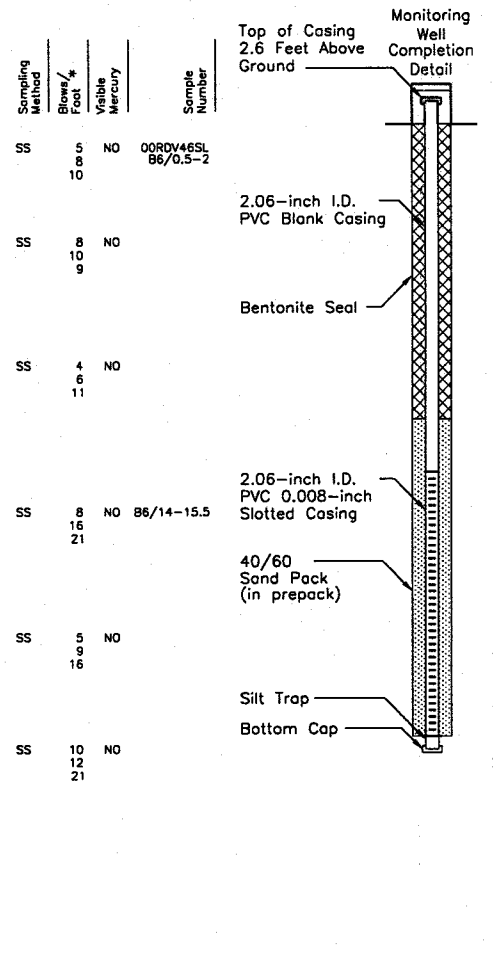
becomes siltier
SILTY SANDY GRAVEL (GM)
very dense, moist, brown and gray with orange iron oxide on gravels and within silt clumps, gravels are mainly shale

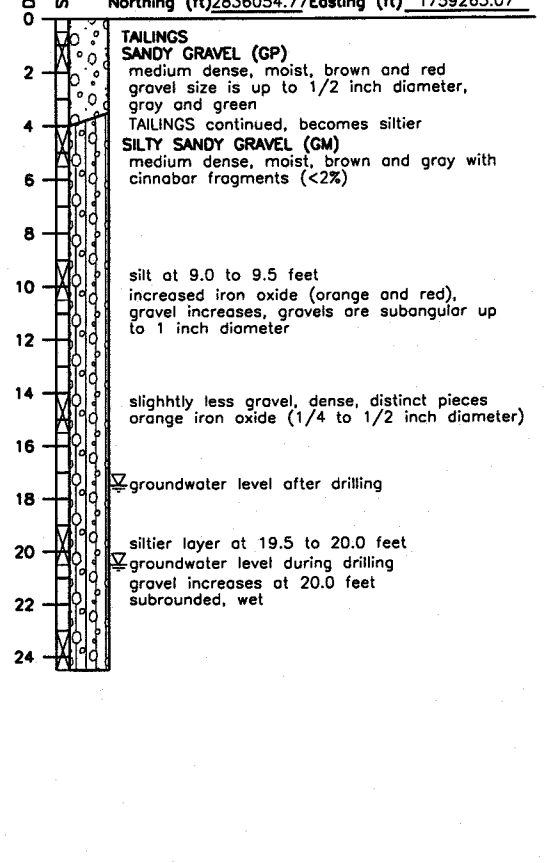
becomes sandier, increased iron oxide color
SANDY GRAVEL WITH SILT (SP)
very dense, moist, brown iron oxide, gravels are blockier than above, very fine sandstone

refusal

LOG OF BORING B06/MW06

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 475.29 Date Drilled 8-10-00
Northing (ft) 2836054.77 Easting (ft) 1759263.07





TAILINGS
SANDY GRAVEL (GP)
medium dense, moist, brown and red gravel size is up to 1/2 inch diameter, gray and green
TAILINGS continued, becomes siltier
SILTY SANDY GRAVEL (GM)
medium dense, moist, brown and gray with cinnabar fragments (<2%)

silt at 9.0 to 9.5 feet
increased iron oxide (orange and red), gravel increases, gravels are subangular up to 1 inch diameter

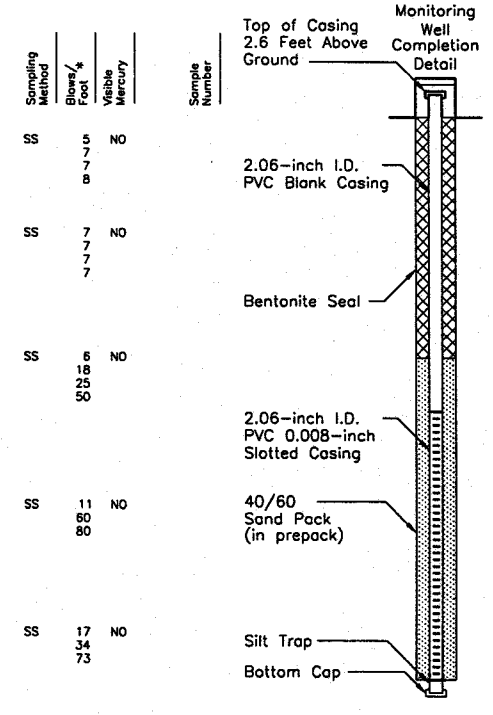
slighhtly less gravel, dense, distinct pieces orange iron oxide (1/4 to 1/2 inch diameter)

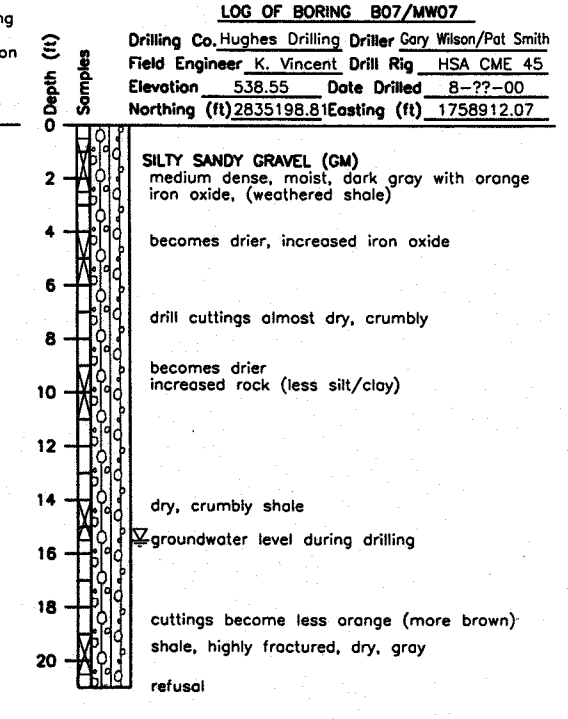
groundwater level after drilling

siltier layer at 19.5 to 20.0 feet
groundwater level during drilling
gravel increases at 20.0 feet subrounded, wet

LOG OF BORING B07/MW07

Drilling Co. Hughes Drilling Driller Gary Wilson/Pat Smith
Field Engineer K. Vincent Drill Rig HSA CME 45
Elevation 538.55 Date Drilled 8-??-00
Northing (ft) 2835198.81 Easting (ft) 1758912.07





SILTY SANDY GRAVEL (GM)
medium dense, moist, dark gray with orange iron oxide, (weathered shale)

becomes drier, increased iron oxide

drill cuttings almost dry, crumbly

becomes drier
increased rock (less silt/clay)

dry, crumbly shale

groundwater level during drilling

cuttings become less orange (more brown)

shale, highly fractured, dry, gray

refusal

Harding Lawson Associates/ Wilder Construction Company
Joint Venture

Boring Logs/Monitoring Wells B04/MW04, B05, B06/MW06 & B07/MW07

Source Area Removal and Investigation
Red Devil, Alaska

FIGURE **11**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	51192	MJ	01/01

APPENDIX G

APPENDIX G

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FORMS

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name REID Devil Mine
Job Number 47411
Recorded by C. Marshall / K. Vincent (Signature)

Well No. B-1 / MW-1
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date 8/14/00 Time 1450
Sampled by CRM / KV (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC):
Water Level Depth (WL in feet BTOC):
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION:

(33.87 - 21.72) X 2 ^{2} X ____ X 0.0408 = ____ gallons
TD (feet) WL (feet) D (inches) # Vols Calculated Purge Volume

PURGE TIME

____ Start ____ Stop ____ Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

____ gallons

FIELD PARAMETER MEASUREMENT

One point parameter

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☒ °C ☐ °F	Other turb./DO
	~~7.18~~	0.304	3.9	483/3.14
	6.07			

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor):
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other Filtered on site

WELL SAMPLING

SAMPLING METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series:

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
RDV01WA	1x1L	Mercury, Arsenic	HNO3	CTE	Time = 1450
		Lead, Antimony			
RDV02WA					Time 1500
FWL =	24.81'	- Dewatered -	however	well does	recharge

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.
RDV01WA	RDV02WA

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name REB Bezul Mine
Job Number 47411
Recorded by C. Marshall / K. Vincent (Signature)

Well No. B-3 / MW-3
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date 8/14/00 Time 1525
Sampled by CRM / KV (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC):
Water Level Depth (WL in feet BTOC):
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION:

(28.87' - 22.28') X ____ ^{2} X ____ X 0.0408 = ____ gallons
TD (feet) WL (feet) D (inches) # Vols Calculated Purge Volume

PURGE TIME

Start Stop Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

____ gallons

FIELD PARAMETER MEASUREMENT

* One point parameters after sample has obtained

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☒ °C ☐ °F	Other turb DO
	693	.291	4.9	999/8.02

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor):
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other

WELL SAMPLING

SAMPLING METHOD

☐ Same As Above
☐ Bailer - Type:
☐ Grab - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series:

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
RDV03WA	1x1L	Hg, Pb, Antimony Arsenic	HNO_3	CTE	time 1530
FWL = 28.51'					
Water Remains after Approx +/- 1 gallon.					

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name: RED DEVIL MINE
Job Number: 47411
Recorded by: C. Marshall / K. Vincent (Signature)

Well No.: B-4 / MW-4
Well Type: ☒ Monitor ☐ Extraction ☐ Other ____
Well Material: ☒ PVC ☐ St. Steel ☐ Other ____
Date: 8/14/00 Time: 1555
Sampled by: CM / KV (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other ____
Total Depth of Casing (TD in feet BTOC): ____
Water Level Depth (WL in feet BTOC): ____
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other ____

PURGE METHOD

☐ Bailer - Type: ____
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.: ____
☐ Other - Type: ____

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other ____
Depth in feet (BTOC): ____ Screen Interval in Feet (BTOC) from ____ to ____

PURGE VOLUME CALCULATION:

(33.95 - 27.77) X ____ ^{2} X ____ X 0.0408 = ____ gallons
TD (feet) WL (feet) D (inches) # Vols Calculated Purge Volume

PURGE TIME

____ Start ____ Stop ____ Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

____ gallons

FIELD PARAMETER MEASUREMENT

* One point parameter obtained

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other ~~Turb/DO~~
	6.36	1.19	4.0	999/7.00

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other ____
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor): ____
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other Filtered on site

WELL SAMPLING

SAMPLING METHOD

☐ Bailer - Type: ____
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.: ____
☐ Same As Above
☐ Grab - Type: ____
☐ Other - Type: ____

SAMPLING DISTRIBUTION

Sample Series: ____

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
RDV04WA	1 x 1L	HNO_3 →		CT & FL	T= 1600
		Mercury / Arsenic			
		Lead / Antimony			
FWL=	33.00'	Well Dewatered			

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name RED DEVIL MINE
Job Number 47411
Recorded by C. Marshall / K. Vincent (Signature)

Well No. B-6 / MW-6
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date 8/14/00 Time 1610
Sampled by CRM / KV. (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC):
Water Level Depth (WL in feet BTOC):
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☒ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION:

(27.12 (TD feet) - 19.98 (WL feet)) X ____ (D inches)^2 X ____ (# Vols) X 0.0408 = ____ gallons (Calculated Purge Volume)

PURGE TIME

____ Start ____ Stop ____ Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

____ gallons

FIELD PARAMETER MEASUREMENT

* One point parameter obtained

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☒ °C ☐ °F	Other Turb./DO
	7.22	.408	4.4	144 / 7.74

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other ____
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor):
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other

WELL SAMPLING

SAMPLING METHOD

☐ Same As Above
☐ Bailer - Type:
☐ Grab - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series:

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
RDW05WA	1 x 1L	Hg, Pb, Antimony, Arsenic	HNO_3	CTE	time: 1645
FWL =	26.73				
Dewatered after	approx 1 gal				

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

Harding Lawson Associates
Engineering and
Environmental Services

GROUND-WATER SAMPLING FORM

Job Name RED DEVIL MINE
Job Number 47411
Recorded by C. Marshall / K. Vincent (Signature)

Well No. B-7 / MW-7
Well Type: ☒ Monitor ☐ Extraction ☐ Other
Well Material: ☒ PVC ☐ St. Steel ☐ Other
Date 8/14/00 Time 1630
Sampled by CM / KV (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches):
☒ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other
Total Depth of Casing (TD in feet BTOC): 24.65
Water Level Depth (WL in feet BTOC):
Number of Well Volumes to be purged (# Vols)
☐ 3 ☐ 4 ☐ 5 ☐ 10 ☐ Other

PURGE METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Other - Type:

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other
Depth in feet (BTOC): Screen Interval in Feet (BTOC) from to

PURGE VOLUME CALCULATION:

(24.65 - 22.48) X ____ ^{2} X ____ X 0.0408 = ____ gallons
TD (feet) WL (feet) D (inches) # Vols Calculated Purge Volume

PURGE TIME

____ Start ____ Stop ____ Elapsed

PURGE RATE

Initial ____ gpm Final ____ gpm

ACTUAL PURGE VOLUME

____ gallons

FIELD PARAMETER MEASUREMENT

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other

Minutes Since Pumping Began	pH	Cond. (µmhos/cm)	T ☐ °C ☐ °F	Other
Meter Nos.				

Observations During Purging (Well Condition, Turbidity, Color, Odor):
Discharge Water Disposal: ☐ Sanitary Sewer ☐ Storm Sewer ☒ Other filtered on site

WELL SAMPLING

SAMPLING METHOD

☐ Bailer - Type:
☐ Submersible ☐ Centrifugal ☐ Bladder; Pump No.:
☐ Same As Above
☐ Grab - Type:
☐ Other - Type:

SAMPLING DISTRIBUTION

Sample Series:

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
RDV06WA	1x1L	Hg, Pb, Antimony, Arsenic	HNO_3	CTE	time 1705
FWL =	24.51'				
		Note: Dewatered Approx ½ gallon purged			
		Sample very turbid, no - parameters, no weather			

QUALITY CONTROL SAMPLES

Duplicate Samples

Original Sample No.	Duplicate Sample No.

Blank Samples

Type	Sample No.

Other Samples

Type	Sample No.

APPENDIX H

XRF FIELD SCREENING REPORT AND RESULTS

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
NATIONAL SCIENCE AND TECHNOLOGY CENTER
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, COLORADO 800225-0047

In Reply Refer to:
1703 (ST-133)

December13, 2000

Memorandum

To: Mike Alcorn, Anchorage District Office

From: Karl Ford, Ph.D., Toxicologist

Re: X-ray Fluorescence Analytical Results, Red Devil Mine

During the period August 1-4, 2000, approximately 400 soil samples were analyzed for total metals using a Niton 702 portable x-ray fluorescence spectrometer (XRF) using the procedures of EPA Method 6200 as published in Test Methods for Evaluating Solid Waste (SW-846). Although mercury was the element of principal interest, arsenic, lead, iron and zinc were also reported. The data quality objective of this work was to provide quantitative (data quality level III) mercury data for determining horizontal and vertical extent of contamination at the site.

This method calls for the use of blank samples, check samples, precision samples (one sample run 7 times daily) and laboratory confirmation samples at a minimum of 1:20 (5%). For this project 20% of the samples were split and analyzed by a laboratory. The check sample was sample 2710, a certified sample prepared by the National Institute of Standards (NIST). The certified result is 32.6 mg/kg, and the average detectable XRF result was 31.6 mg/kg. This sample was analyzed 15 times during the work, and the blank sample was analyzed seven times. The blank sample results were nondetect for all analytes except for iron. The mercury precision results were conducted for samples FS022, FS041, FS053, FS073. The results, expressed as % relative standard deviation were: 3.2, 6.2, 11.0, and 2.6. Since Method 6200 indicates RSD should not exceed 20%, the precision results were excellent.

Field samples were analyzed in the field or at BLM in Denver, Colorado in ziplock bags at field moisture and are reported as wet weight. Samples split for laboratory confirmation were air-dried and sieved through a 10 mesh sieve to provide thorough mixing. Confirmation samples were sent CTE Environmental Services in Anchorage, Alaska for analysis. Ten of the sample splits were also analyzed for arsenic and mercury by ACZ Laboratory in Steamboat Springs, Colorado. The ACZ results tended to confirm the CTE results. According to Method 6200, XRF and laboratory data should be analyzed via linear regression and the correlation coefficient r^2

should be 0.7 or greater for the XRF results to be screening level data.

Mercury

The Niton Operation Manual indicates that the calibration is linear within the 0-10,000 ppm range and that high concentrations may not be quantitative. In evaluating the XRF:Lab dataset, there appear to be three data groups: 1) samples which were less than the level of detection (<LOD) for the XRF (approximately 25 ppm), 2) samples within the quantitation range of 25-10,000 ppm and 3) the >10,000 ppm samples. These results are shown in Table 1.

1) <LOD data. 36 samples were in this data set. The published detection limit for the instrument in a sand matrix with 60 second measurement time is 25 ppm. The mean laboratory result is 18.5 ppm and the 95% confidence interval of the mean is 5.3 ppm, so the confidence interval for the mean is 13.2-23.8 ppm. Therefore from these data, we can be 95% confident the XRF <LOD results are less than 24 ppm when analyzed by a laboratory. This finding is bolstered by the comparison of the XRF results to the certified standard results for NIST standard 2710 cited above, showing good comparison in the low (but detectable) range.

2) Quantitation range data. The regression analyses for the samples within the quantitation range are also shown in Table 1. The regression indicates a r^2 of 0.71 and a slope of 5.04. The data show an unusually low (5-fold) bias for the XRF results. The XRF data in this range are consistent enough ($r^2 = 0.71$) that these data can be used if modified using the following simple equation:

$$Lab = 5*XRF$$

Using a y-intercept did not enhance the statistics for the equation of the line. One outlier, FS073, was within the quantitative range but the Lab:XRF result was nearly six times higher than the average for the dataset and was not used in the regression.

3) >10,000 ppm data. Laboratory results for the three data points in this range average about 14 times the XRF results, indicating non-linearity in the calibration curve. These data should not be used quantitatively.

Arsenic

The results of the linear regression showed an r^2 of 0.95 (Table 2). The slope of the line is 0.67 and the y-intercept is 4.6, indicating a high bias for the XRF results. The XRF results may be corrected to the laboratory results according to the following equation:

$$lab=0.67*xrf+4.6$$

While the slope of the line is much lower than 1.0, the r^2 is very good, indicating good consistency but only fair accuracy for the XRF results. Since the r^2 is so high, the XRF data can be confidently used quantitatively by modifying the XRF data according to the above equation is a spreadsheet.

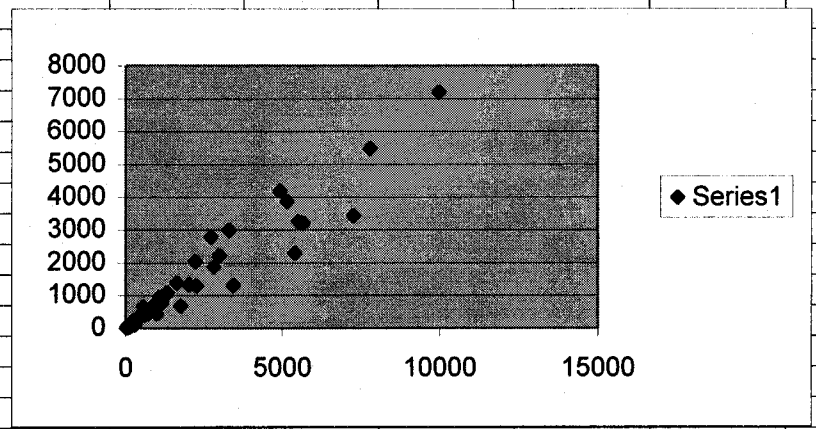
Summary:

The <LOD XRF mercury data met the data quality objective and can be used quantitatively to determine compliance with a cleanup action level in the range of 25 ppm with 95% confidence. For screening sample results in the quantitation range (25-10,000 ppm) the XRF result should be multiplied times 5 to approximate the laboratory result. The XRF arsenic data also met data quality objectives and are quantitative if multiplied times 0.67 to approximate laboratory results.

	A	B	C	D	E	F	G	H	I
1	Table 1. Red Devil Mine XRF Results Analyzed 8/00 (ppm)								
2									
3	**Sample**	**XRF Hg**	**Hg CTE**	**CTE/XRF**			**XRF Hg**	**Hg CTE**	
4	B3/0.5-2	97.8	671	6.9		RT34/1.5-3	<LOD	17	
5	B4/0.5-2	70.8	376	5.3		RT37/1.5-3	<LOD	32	
6	B5/0.5-2	105.6	467	4.4		RT43/3-4.5	<LOD	70	
7	B5/10-11	20.9	119	5.7		RT45/1.5-3	<LOD	7	
8	B5/5-6.5	52.3	214	4.1		RT45/3-4.5	<LOD	3	
9	B6/0.5-2	46.5	183	3.9		B5/30-31.5	<LOD	4	
10	B6/14-15.5	9.5	31	3.3		RT45/5-6.5	<LOD	58	
11	FS010	66.7	443	6.6		RT46/3-4.5	<LOD	24	
12	FS011	145.9	1300	8.9		RT47/5-6.5	<LOD	2	
13	FS012	215	414	1.9		RT48/1.5-3	<LOD	13	
14	FS013	157.9	1300	8.2		RT48/5-6.5	<LOD	5	
15	FS014	116.7	1910	16.4		RT49/3-4.5	<LOD	7	
16	FS015	191.3	594	3.1		RT49/5-6.5	<LOD	4	
17	FS016	50.2	530	10.6		RT50/1.5-3	<LOD	57	
18	FS018	17.5	160	9.1		RT50/3-4.5	<LOD	12	
19	FS019	53	189	3.6		RT51/1.5-3	<LOD	11	
20	FS020	28.3	111	3.9		RT51/3-4.5	<LOD	14	
21	FS022	724.8	494	0.7		RT51/5-6.5	<LOD	12	
22	FS072	1080	7360	6.8		RT53/1.5-3	<LOD	10	
23	FS076	242.6	1250	5.2		RT53/5-6.5	<LOD	4	
24	FS079	458.8	2410	5.3		RT54/1.5-3	<LOD	20	
25	FS081	195.6	1200	6.1		RT54/5-6.6	<LOD	6	
26	RT36/1.5-3	6.3	26	4.1		RT55/5-6.5	<LOD	9	
27	RT41/1.5-3	9.1	70	7.7		RT58/5-6.5	<LOD	7	
28	RT42/3-4.5	6.9	62	9.0		RT60/1.5-3	<LOD	26	
29	RT50/5-6.5	6.1	43	7.0		RT60/3-4.5	<LOD	12	
30	RT62/3-4.5	13.9	102	7.3		RT63/3-4.5	<LOD	21	
31	RT73/3-4.5	14.2	89	6.3		RT64/1.5-3	<LOD	10	
32	RT67/3-4.5	9.2	40	4.3		RT64/3-4.5	<LOD	10	
33	RT68/3-4.5	12.1	78	6.5		RT66/1.5-3	<LOD	38	
34	RT70/5-6.5	13	43	3.3		RT66/3-4.5	<LOD	29	
35	RT63/1.5-3	30.8	237	7.7		RT67/1.5-3	<LOD	19	
36	RT52/3-4.5	7.8	96	12.3		RT70/3-4.5	<LOD	31	
37	Unnamed	7.2	45	6.2		RT71/3-4.5	<LOD	34	
38						RT72/3-4.5	<LOD	14	
39						RT75/1.5-3	<LOD	15	
40						Mean		18.5	

	A	B	C	D	E	F	G	H	I
41						Std Deviation		16.3	
42						95% Confidence		5.3	
43						90% Confidence		4.5	
44	lab=5*xrf					Not Used in Regression (>10,000) or outlier			
45	SUMMARY OUTPUT					**FS021**	**3680**	**73300**	19.9184783
46						**FS032**	**3360**	**24500**	7.29166667
47						**FS073**	**788**	**11000**	13.9593909
48	*Regression Statistics*					**B4/5-6.5**	**81**	**2280**	28.1481481
49	Multiple R	0.840837195							
50	R Square	0.707007189							
51	Adjusted R Square	0.676704159							
52	Standard Error	712.8933492							
53	Observations	34							
54									
55	ANOVA								
56		*df*	*SS*	*MS*	*F*	*Significance F*			
57	Regression	1	40469695.02	40469695.02	79.63074986	3.40553E-10			
58	Residual	33	16771158.6	508216.9274					
59	Total	34	57240853.62						
60									
61		*Coefficients*	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	
62	Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
63	X Variable 1	5.041643717	0.482157372	10.45642774	5.23286E-12	4.060686391	6.022601043	4.060686391	

	A	B	C	D	E	F	G	H	I	J	K	L
1	Table 2. Red Devil Mine XRF Arsenic Results Analyzed 8/00 (ppm)											
2												
3	**Sample**	**XRF As**	**Lab**	**Predicted**								
4	B3/0.5-2	3299	2980	2215								
5	B4/0.5-2	2989	2210	2007								
6	B4/5-6.5	2720	2790	1827								
7	B5/0.5-2	5667	3200	3802								
8	B5/10-11	1140	747	768								
9	B5/30-31.5	135	113	95								
10	B5/5-6.5	2219	2040	1491								
11	B6/0.5-2	2810	1870	1887								
12	FS010	984	443	664								
13	FS011	2259	1300	1518								
14	FS012	1749	679	1176								
15	FS013	3427	1300	2301								
16	FS014	2010	1330	1351								
17	FS015	5520	3240	3703								
18	FS016	914	726	617								
19	FS017	1080	949	728								
20	FS018	437	313	297								
21	FS019	617	402	418								
22	FS020	896	555	605								
23	FS021	9997	7190	6702								
24	FS022	5398	2290	3621			Outliers	XRF	Lab			
25	FS072	7795	5480	5227			FS032	15693	3110			
26	FS073	7264	3420	4871			RT70/1.5-3	16397	10700			
27	FS079	5149	3860	3454								
28	FS081	4928	4180	3306								
29	RT34/1.5-3	191	138	133								
30	RT36/1.5-3	97	43	70								
31	RT37/1.5-3	68	34	50								
32	RT41/1.5-3	190	156	132								
33	RT42/1.5-3	268	184	184								
34	RT42/3-4.5	82	58	59								
35	RT43/3-4.5	55	43	41								
36	RT45/1.5-3	534	453	362								
37	RT45/3-4.5	95	95	68								
38	RT45/5-6.5	132	80	93								
39	RT46/3-4.5	157	59	109								



	A	B	C	D	E	F	G	H	I	J	K	L
40	RT47/5-6.5	53	22	40								
41	RT48/1.5-3	51	20	39								
42	RT48/5-6.5	43	22	34								
43	RT49/3-4.5	123	29	87								
44	RT50/1.5-3	76	54	56								
45	RT50/3-4.5	58	44	43								
46	RT50/5-6.5	63	50	47								
47	RT51/1.5-3	259	207	178								
48	RT51/3-4.5	132	83	93								
49	RT51/5-6.5	271	142	186								
50	RT52/3-4.5	141	71	99								
51	RT53/1.5-3	137	51	96								
52	RT53/5-6.5	85	21	61								
53	RT54/1.5-3	125	41	88								
54	RT54/5-6.6	144	62	101								
55	RT55/5-6.5	149	60	105								
56	RT60/1.5-3	287	95	197								
57	RT60/3-4.5	68	49	50								
58	RT62/3-4.5	159	62	111								
59	RT63/1.5-3	566	663	384								
60	RT63/3-4.5	71	63	52								
61	RT64/1.5-3	58	33	43								
62	RT64/3-4.5	26	19	22								
63	RT66/1.5-3	274	232	188								
64	RT66/3-4.5	305	148	209								
65	RT67/1.5-3	171	106	119								
66	RT67/3-4.5	145	57	102								
67	RT68/3-4.5	231	209	159								
68	RT70/3-4.5	1630	1370	1096								
69	RT70/5-6.5	1260	997	849								
70	RT71/3-4.5	921	727	621								
71	RT72/3-4.5	1320	1080	889								
72	RT73/3-4.5	386	328	263								
73	RT75/1.5-3	709	444	480								
74	Unnamed	127	76	90								
75	FS076	11398	8350	7641								
76												
77												
78												

	A	B	C	D	E	F	G	H	I	J	K	L
79												
80												
81	SUMMARY OUTPUT											
82	lab=.67*xrf+4.6											
83	*Regression Statistics*											
84	Multiple R	0.9747065										
85	R Square	0.9500528										
86	Adjusted R	0.9493393										
87	Standard Err	372.88825										
88	Observation	72										
89												
90	ANOVA											
91		*df*	*SS*	*MS*	*F*	*ignificance F*						
92	Regression	1	185136614	1.85E+08	1331.481	2.73E-47						
93	Residual	70	9733195.5	139045.7								
94	Total	71	194869809									
95												
96		*Coefficients*	*tandard Err*	*t Stat*	*P-value*	*ower 95%*	*pper 95%*	*ower 95.0*	*pper 95.0%*			
97	Intercept	4.5656001	51.531642	0.088598	0.929654	-98.21093	107.3421	-98.21093	107.3421			
98	X Variable 1	0.6714988	0.0184025	36.48946	2.73E-47	0.634796	0.708201	0.634796	0.708201			

	A	B	C	D	E	F	G	H
1	Table 1. Red Devil Mine XRF Results Analyzed 8/00 (ppm)							
2								
3	**Sample**	**XLNo**	**Pb**	**As**	**Hg**	**Zn**	**Fe**	**Mn**
4								
5	2710	254	5478	675	40	6976	38886	10694
6	2710	390	5498	614	28.5	6906	38298	10797
7	2710	402	5658	657	27	7104	39578	10995
8	2710	447	5507	662	20.3	7027	39987	10694
9	2710	493	5450	792	22.1	6995	39885	10400
10	2710	8/2/00 4:24	5347	756	45	6918	39475	10099
11	2710	8/2/00 4:25	5568	661	<LOD	6835	38298	11494
12	2710	8/2/00 4:26	5549	684	36	7098	38784	10797
13	2710	8/2/00 4:26	4947	636	27	6358	36275	9037
14	2710	8/2/00 4:28	3619	481	<LOD	4867	27494	7398
15	2710	8/2/00 4:28	5379	812	38	6925	39578	9965
16	2710	8/2/00 4:29	5530	546	33	6906	39091	10694
17	2710	8/2/00 4:31	5338	676	25	6810	37478	10694
18	2710	8/1/00 8:57	5520	634	26	6970	39296	10400
19	2710	8/3/00 1:55	5568	565	<LOD	6906	38682	10496
20	2710	8/4/00 2:00	4858	763	<LOD	5987	33690	9395
21	2710	8/4/00 2:01	4928	634	39	6208	34893	8915
22	2710	8/4/00 7:13	4998	660	22	6320	34278	8595
23	2710	8/5/00 1:03	5008	566	<LOD	6189	33485	8717
24	2710	8/5/00 4:02	5018	615	25	6349	34176	9254
25	B1/0.5-1.5	8/2/00 4:51	<LOD	567	<LOD	<LOD	22195	<LOD
26	B1/11-13	8/2/00 4:53	47	1120	<LOD	<LOD	19891	1310
27	B1/14-16	8/2/00 4:54	<LOD	2680	29	78	21798	997
28	B1/19-21	8/2/00 4:55	<LOD	51	<LOD	51	10899	<LOD
29	B1/24-25	8/2/00 4:55	<LOD	<LOD	<LOD	<LOD	14694	<LOD
30	B1/29-31	8/2/00 4:56	<LOD	56	<LOD	92	24294	<LOD
31	B1/4-6	8/2/00 4:52	44	670	27	69	21594	<LOD
32	B2/0.5-2	256	<LOD	267	<LOD	<LOD	28979	1840
33	B2/14-15.5	370	100	530	41.1	63	21491	1120
34	B2/19-20.5	403	18	482	8.4	107	34176	1030
35	B2/24-25	259	29	259	<LOD	98	23898	1180
36	B2/29-30.5	260	50	42	<LOD	123	43290	<LOD
37	B2/34-35.5	261	<LOD	51	<LOD	114	35584	1190
38	B2/39-40	262	43	59	<LOD	125	58470	<LOD
39	B2/4-5.5	257	48	49	<LOD	63	14298	780
40	B2/9-10.5	277	53	118	<LOD	134	25690	1330
41	B3/0.5-2	409	38	3299	97.8	118	35482	1210
42	B3/10-11.5	285	39	2200	83	81	21594	<LOD
43	B3/16.5-18	263	<LOD	76	<LOD	107	39475	<LOD
44	B3/20-21.5	258	30	<LOD	<LOD	70	16000	<LOD
45	B3/25-26.5	364	46	115	<LOD	103	30592	<LOD
46	B3/5-6.5	387	<LOD	2000	73.5	100	18790	<LOD
47	B4/0.5-2	461	<LOD	2989	70.8	129	34995	923
48	B4/10-11.5	266	43	598	12.1	124	24397	1290
49	B4/15-16.5	267	37	424	20.3	120	28083	1190
50	B4/20-21.5	268	25	33	<LOD	59	10899	<LOD
51	B4/25-26.5	269	<LOD	287	<LOD	105	30797	<LOD
52	B4/30-31.5	294	<LOD	198	<LOD	83	31590	<LOD
53	B4/5-6.5	406	<LOD	2720	80.7	108	33587	<LOD
54	B5/0.5-2	413	<LOD	5667	105.6	147	37683	851

	A	B	C	D	E	F	G	H
55	B5/10-11	424	37	1140	20.9	123	42394	3978
56	B5/15-16.5	272	38	328	<LOD	106	38784	1829
57	B5/20-21.5	273	33	237	<LOD	84	36378	<LOD
58	B5/25-26.5	274	<LOD	219	<LOD	117	28595	<LOD
59	B5/30-31	442	<LOD	195	<LOD	93	49894	1300
60	B5/30-31.5	275	<LOD	135	<LOD	78	30080	<LOD
61	B5/31.5	276	<LOD	102	<LOD	<LOD	27597	1250
62	B5/5-6.5	407	31	2219	52.3	106	32691	759
63	B6/0.5-2	410	<LOD	2810	46.5	91	31488	874
64	B6/14-15.5	416	<LOD	143	9.5	87	54784	<LOD
65	B6/19-21.5	282	31	<LOD	<LOD	115	15296	811
66	B6/23-24.5	283	<LOD	39	<LOD	110	24090	<LOD
67	B6/4-5.5	279	<LOD	225	<LOD	91	21990	<LOD
68	B6/9-10.5	280	<LOD	142	<LOD	109	48896	<LOD
69	B7/0.5-1	8/2/00 12:00	<LOD	20	<LOD	116	25894	<LOD
70	B7/14-15.5	8/2/00 12:03	<LOD	34	<LOD	116	41677	2029
71	B7/19-20.5	8/2/00 12:04	<LOD	19	<LOD	124	32486	<LOD
72	B7/4-6	8/2/00 12:01	<LOD	44	<LOD	166	62771	3000
73	B7/9-11	8/2/00 12:02	<LOD	31	<LOD	127	29389	1930
74	BLK	255	<LOD	<LOD	<LOD	<LOD	609	185
75	BLK	391	<LOD	<LOD	<LOD	<LOD	645	<LOD
76	BLK	401	<LOD	<LOD	<LOD	<LOD	846	<LOD
77	BLK	415	21	<LOD	<LOD	<LOD	1130	339
78	BLK	485	27	<LOD	<LOD	<LOD	1500	391
79	BLK	8/1/00 8:59	<LOD	<LOD	<LOD	<LOD	652	233
80	BLK	8/2/00 4:32	<LOD	<LOD	<LOD	<LOD	725	<LOD
81	BLK	8/3/00 1:56	<LOD	<LOD	<LOD	<LOD	632	262
82	BLK	8/4/00 2:02	<LOD	<LOD	<LOD	<LOD	652	<LOD
83	BLK	8/4/00 7:15	<LOD	<LOD	<LOD	<LOD	589	258
84	BLK	8/5/00 1:08	<LOD	<LOD	<LOD	<LOD	519	285
85	BLK	8/5/00 4:01	<LOD	<LOD	<LOD	<LOD	675	<LOD
86	BRICK	8/3/00 9:21	184	3987	2549	231	17894	1000
87	FS01	8/4/00 10:03	934	5478	2099	518	32691	1340
88	FS010	483	40	984	66.7	109	31078	1110
89	FS010	8/3/00 7:45	66	827	54	109	21888	826
90	FS011	482	143	2259	145.9	117	36787	1000
91	FS012	488	284	1749	215	<LOD	30694	<LOD
92	FS013	481	41	3427	157.9	132	38195	1170
93	FS014	487	43	2010	116.7	104	31283	1230
94	FS015	491	99	5520	191.3	207	46285	<LOD
95	FS016	478	<LOD	914	50.2	90	24000	836
96	FS017	8/1/00 9:37	262	1080	186	67	16794	<LOD
97	FS018	486	<LOD	437	17.5	53	17293	700
98	FS019	479	46	617	53	117	25088	837
99	FS02	8/4/00 10:04	144	886	140	83	15296	877
100	FS020	490	41	896	28.3	124	37786	1360
101	FS021	484	329	9997	3680	255	89600	2480
102	FS022	393	<LOD	5398	724.8	160	26675	1480
103	FS022	394	<LOD	5379	660.8	140	24589	1530
104	FS022	395	<LOD	5360	719.2	<LOD	25088	1400
105	FS022	396	<LOD	5408	712.8	<LOD	26598	1709
106	FS022	397	<LOD	5309	708.4	154	24794	<LOD
107	FS022	398	<LOD	5379	729.2	150	26099	<LOD
108	FS022	399	<LOD	5478	718.8	<LOD	26598	<LOD
109	FS023	8/3/00 4:31	3578	2619	130	105	20800	<LOD

	A	B	C	D	E	F	G	H
110	FS024	8/3/00 4:30	294	6090	822	141	19494	1270
111	FS025	8/3/00 7:36	400	5648	346	479	21594	994
112	FS026	8/3/00 8:11	89	5347	166	297	24896	1550
113	FS027	8/3/00 8:50	75	6989	580	1350	46797	1350
114	FS028	8/3/00 9:46	<LOD	8378	608	1989	24691	<LOD
115	FS029	8/4/00 1:58	70	5347	731	2059	79462	<LOD
116	FS03	8/4/00 10:05	148	1310	97	79	15488	<LOD
117	FS030	8/4/00 2:31	<LOD	4298	362	604	49587	<LOD
118	FS031	8/4/00 3:46	66	3789	509	689	35379	<LOD
119	FS032	471	<LOD	15693	3360	1899	32179	1370
120	FS033	8/5/00 1:16	186	1779	909	305	31590	<LOD
121	FS034	8/5/00 1:22	<LOD	5648	185	97	24794	<LOD
122	FS035	8/3/00 4:36	407	3229	219	116	16294	858
123	FS036	8/3/00 7:51	355	3747	257	130	20992	<LOD
124	FS037	8/3/00 9:31	228	2600	169	159	24397	<LOD
125	FS038	8/4/00 2:05	158	1730	120	147	21299	<LOD
126	FS039	8/4/00 4:24	49	3968	223	150	20698	1050
127	FS04	8/4/00 10:06	241	1789	203	<LOD	18995	<LOD
128	FS040	8/5/00 1:51	<LOD	5069	110	<LOD	21389	<LOD
129	FS041	8/5/00 1:55	<LOD	3160	152	101	19994	1010
130	FS041	8/5/00 2:08	48	3229	181	132	20595	1140
131	FS041	8/5/00 2:09	<LOD	3229	173	<LOD	21594	<LOD
132	FS041	8/5/00 2:09	<LOD	3139	187	125	19891	1000
133	FS041	8/5/00 2:10	<LOD	3250	183	100	20698	<LOD
134	FS041	8/5/00 2:11	<LOD	3240	181	106	20890	1270
135	FS041	8/5/00 2:11	<LOD	3370	176	140	21990	<LOD
136	FS041	8/5/00 2:12	<LOD	3299	174	107	20992	1260
137	FS042	8/4/00 2:36	556	3059	208	221	22694	<LOD
138	FS043	8/4/00 2:41	34	357	13	106	14797	1160
139	FS044	8/4/00 2:50	<LOD	3808	78	118	18099	950
140	FS045	8/4/00 3:07	65	1810	139	159	21888	1200
141	FS046	8/4/00 3:19	<LOD	3040	313	146	17894	1080
142	FS047	8/4/00 3:14	<LOD	1160	78	237	36378	1380
143	FS048	8/4/00 7:58	73	886	616	126	18598	<LOD
144	FS049	8/4/00 8:00	<LOD	25690	1530	429	31283	1650
145	FS05	8/4/00 10:07	36	397	21	100	20698	<LOD
146	FS050	8/4/00 8:18	<LOD	6637	258	2720	56781	<LOD
147	FS051	8/4/00 8:22	<LOD	3978	390	78	14989	<LOD
148	FS052	8/4/00 8:30	<LOD	100	<LOD	119	22989	<LOD
149	FS053	8/4/00 8:33	37	676	90	106	12397	<LOD
150	FS053	8/4/00 8:33	<LOD	795	98	186	24499	<LOD
151	FS053	8/4/00 8:34	60	756	104	185	25690	<LOD
152	FS053	8/4/00 8:35	<LOD	603	84	<LOD	21594	<LOD
153	FS053	8/4/00 8:35	62	830	97	142	24589	<LOD
154	FS053	8/4/00 8:36	<LOD	821	118	145	23898	<LOD
155	FS053	8/4/00 8:37	50	808	103	162	23590	<LOD
156	FS053	8/4/00 8:38	46	878	116	115	24896	1090
157	FS053	8/4/00 8:38	<LOD	921	110	170	23194	1290
158	FS054	8/4/00 8:16	121	2810	370	95	16000	728
159	FS055	8/4/00 7:52	164	1380	156	193	23693	<LOD
160	FS056	8/4/00 7:28	<LOD	5619	250	136	34688	<LOD
161	FS057	8/5/00 1:07	83	1590	149	120	22490	<LOD
162	FS058	8/4/00 8:39	98	3747	470	161	21197	<LOD
163	FS059	8/4/00 8:43	33	765	21	95	18688	<LOD
164	FS06	8/4/00 10:08	52	1909	69	104	19891	<LOD

	A	B	C	D	E	F	G	H
165	FS060	8/5/00 2:35	276	2819	315	115	26675	1280
166	FS061	8/5/00 2:43	249	2720	98	120	21094	903
167	FS062	8/5/00 3:07	<LOD	3250	2589	397	24294	<LOD
168	FS063	333	352	2299	409	121	23296	1070
169	FS07	8/4/00 10:10	71	1020	57	<LOD	17088	<LOD
170	FS070	332	89	3558	270	244	29594	1360
171	FS071	304	52	1580	167.3	235	22400	1590
172	FS072	411	<LOD	7795	1080	156	40294	942
173	FS073	462	<LOD	7264	788	189	37478	<LOD
174	FS073	463	<LOD	7366	762.4	188	37299	1090
175	FS073	464	59	7347	782	184	37581	1520
176	FS073	465	<LOD	7526	819.2	141	37376	<LOD
177	FS073	466	<LOD	7507	789.6	191	37888	<LOD
178	FS073	467	<LOD	7290	810.4	160	37786	1180
179	FS073	468	65	7277	771.2	149	38195	<LOD
180	FS074	350	<LOD	5379	814.8	178	20800	<LOD
181	FS075	352	<LOD	5440	222.6	124	27187	<LOD
182	FS076	427	<LOD	11398	242.6	128	39296	<LOD
183	FS077	344	45	683	41.5	115	21299	1290
184	FS078	342	355	5658	225	150	29082	<LOD
185	FS079	476	1050	5149	458.8	263	41779	1360
186	FS08	8/4/00 10:11	88	464	49	102	24397	<LOD
187	FS080	346	45	3738	82.6	113	28186	919
188	FS081	470	309	4928	195.6	142	38298	1260
189	FS082	299	215	1580	106.1	149	23194	1140
190	FS09	8/4/00 10:12	33	321	26	61	13299	565
191	RT1/1.5-3	8/3/00 4:32	48	232	<LOD	126	28083	<LOD
192	RT1/3-4.5	8/3/00 4:33	61	109	<LOD	67	34995	2210
193	RT1/5-6.5	8/3/00 4:34	41	106	<LOD	144	25395	1500
194	RT10/1.5-3	8/4/00 1:57	<LOD	4198	104	3667	19891	1890
195	RT10/3-3.5	8/4/00 1:56	<LOD	432	<LOD	<LOD	19290	<LOD
196	RT11/1.5-3	8/4/00 2:13	58	191	<LOD	116	22899	1080
197	RT12/1.5-3	8/4/00 2:44	<LOD	4490	232	212	32794	<LOD
198	RT12/3-4.5	8/4/00 2:59	<LOD	911	38	148	24294	1220
199	RT12/5-6.5	8/4/00 3:12	<LOD	1220	65	261	28083	<LOD
200	RT13/1.5-3	8/4/00 3:52	<LOD	46182	2610	5210	23693	1730
201	RT13/3-4.5	8/4/00 4:05	<LOD	3850	38	209	75366	2360
202	RT14/3-4.5	8/4/00 4:35	37	370	16	94	22592	1070
203	RT14/5-6.5	8/4/00 4:25	<LOD	839	30	76	21990	1410
204	RT15/1.5-3	8/4/00 7:29	<LOD	162	17	108	13389	1130
205	RT15/3-4.5	8/4/00 7:39	40	145	<LOD	90	40192	<LOD
206	RT16/1.5-3	8/4/00 8:04	<LOD	<LOD	<LOD	212	23194	<LOD
207	RT18/1.5-3	8/4/00 8:47	<LOD	2349	179	247	23693	<LOD
208	RT18/3-4.5	8/4/00 8:57	<LOD	645	18	252	25997	1200
209	RT18/5-6.5	8/4/00 9:09	<LOD	392	<LOD	201	26099	1180
210	RT19/1.5-3	8/4/00 9:30	<LOD	8250	360	331	56986	2589
211	RT19/3-4.5	8/4/00 9:47	<LOD	1280	<LOD	111	35200	1909
212	RT2/1.5-3	8/3/00 4:37	29	356	<LOD	83	20800	1140
213	RT2/3-4.5	8/3/00 4:39	<LOD	52	<LOD	<LOD	15488	1050
214	RT2/5-6.5	8/3/00 4:40	<LOD	66	<LOD	72	13197	1340
215	RT20/1.5-3	8/4/00 10:09	<LOD	5530	91	148	28877	<LOD
216	RT20/3-4.5	8/4/00 10:24	<LOD	2440	43	161	29798	<LOD
217	RT21/1.5-3	8/5/00 1:05	<LOD	129	<LOD	104	43981	3210

	A	B	C	D	E	F	G	H
218	RT22/1.5-3	8/5/00 1:22	41	69	<LOD	74	23795	<LOD
219	RT23/1.5-3	8/5/00 1:40	<LOD	285	<LOD	87	26982	1090
220	RT24/1.5-3	8/5/00 1:58	<LOD	1920	25	163	25997	991
221	RT24/3-4	8/5/00 2:14	<LOD	1480	<LOD	190	22298	<LOD
222	RT25/1.5-3	8/5/00 2:34	<LOD	2699	31	169	39578	<LOD
223	RT25/3-4.5	8/5/00 2:54	<LOD	1490	33	170	24896	<LOD
224	RT25/5-6.5	8/5/00 3:06	50	529	<LOD	161	27392	1100
225	RT26/1.5-3	8/5/00 3:26	<LOD	2170	62	179	42291	1789
226	RT26/3-4.5	8/5/00 3:36	35	585	20	137	15693	935
227	RT26/5-6.5	8/5/00 3:46	34	950	24	167	19392	1380
228	RT27/1.5-3	8/5/00 4:13	41	555	<LOD	110	29184	1300
229	RT28/1.5-3	8/5/00 4:27	<LOD	492	<LOD	105	37299	3090
230	RT29/1.5-3	8/5/00 4:45	31	371	<LOD	117	21594	<LOD
231	RT3/1.5-3	8/3/00 4:44	78	1410	77	90	19891	<LOD
232	RT3/3-4.5	8/3/00 4:43	<LOD	4787	474	<LOD	26291	1180
233	RT30/1.5-3	8/5/00 7:07	<LOD	456	<LOD	110	18688	<LOD
234	RT31/1.5-3	8/5/00 7:40	32	155	<LOD	76	21094	974
235	RT32/1.5-3	8/5/00 7:23	29	150	<LOD	86	22694	<LOD
236	RT33/1.5-3	8/5/00 7:52	<LOD	3109	43	114	21696	925
237	RT34/1.5-3	429	29	191	<LOD	113	34483	1230
238	RT35/1.5-3	321	53	71	<LOD	130	34099	1600
239	RT35/3-4.5	296	<LOD	85	<LOD	81	39680	<LOD
240	RT36/1.5-3	419	22	97	6.3	99	39296	1659
241	RT37/1.5-3	408	25	68	<LOD	101	38579	1190
242	RT38/1.5-3	323	<LOD	326	91.9	<LOD	28595	<LOD
243	RT39/1.5-3	330	<LOD	52	<LOD	<LOD	18893	<LOD
244	RT4/1-3.5	8/3/00 7:40	47	1190	<LOD	146	33997	<LOD
245	RT40/1.5-3	317	<LOD	50	<LOD	82	19789	1030
246	RT40/3-4.5	314	38	42	<LOD	87	21389	<LOD
247	RT41/1.5-3	405	21	190	9.1	99	28288	976
248	RT41/3-4.5	322	<LOD	35	<LOD	61	14899	680
249	RT42/1.5-3	475	25	268	<LOD	88	30182	1070
250	RT42/3-4.5	417	24	82	6.9	77	32794	1410
251	RT43/1.5-3	328	39	57	<LOD	152	21491	1819
252	RT43/3-4.5	404	30	55	<LOD	97	35379	1550
253	RT44/1.5-3	300	28	88	<LOD	93	25088	877
254	RT44/3-4.5	287	30	103	<LOD	65	21299	1020
255	RT45/1.5-3	422	35	534	<LOD	137	36378	1949
256	RT45/3-4.5	450	23	95	<LOD	105	37376	936
257	RT45/5-6.5	454	38	132	<LOD	103	38784	849
258	RT46/1.5-3	316	47	535	<LOD	81	36378	2259
259	RT46/3-4.5	469	29	157	<LOD	121	49792	1899
260	RT46/5-6.5	329	50	132	<LOD	110	59853	4269
261	RT47/1.5-3	326	47	822	20.3	82	26675	<LOD
262	RT47/3-4.5	432	<LOD	44	<LOD	108	33997	1250
263	RT47/5-6.5	452	28	53	<LOD	79	42291	1200
264	RT48/1.5-3	434	35	51	<LOD	144	45798	1080
265	RT48/3-4.5	325	35	367	<LOD	138	37094	1330
266	RT48/5-6.5	456	<LOD	43	<LOD	119	48282	1920
267	RT49/1.5-3	336	62	62	<LOD	131	47386	2280
268	RT49/3-4.5	451	<LOD	123	<LOD	137	50893	1280
269	RT49/5-6.5	477	34	35	<LOD	152	48589	3269
270	RT5/1.5-3	8/3/00 7:59	34	728	<LOD	81	21990	870
271	RT50/1.5-3	448	<LOD	76	<LOD	83	56371	1510
272	RT50/3-4.5	440	24	58	<LOD	139	38400	<LOD

	A	B	C	D	E	F	G	H
273	RT50/5-6.5	428	<LOD	63	6.1	91	36582	2610
274	RT51/1.5-3	441	<LOD	259	<LOD	76	66867	9549
275	RT51/3-4.5	445	<LOD	132	<LOD	73	32077	2440
276	RT51/5-6.5	435	26	271	<LOD	148	41600	2379
277	RT52/1.5-3	306	39	80	<LOD	115	24000	<LOD
278	RT52/3-4.5	449	<LOD	141	7.8	114	35098	1659
279	RT52/5-6.5	303	<LOD	110	<LOD	128	29389	1210
280	RT53/1.5-3	455	28	137	<LOD	233	60467	<LOD
281	RT53/3-4.5	308	<LOD	96	<LOD	111	35379	2440
282	RT53/5-6.5	443	47	85	<LOD	188	60365	1190
283	RT54/1.5-3	473	29	125	<LOD	161	91392	2429
284	RT54/3-4.5	312	23	95	<LOD	85	39091	918
285	RT54/5-6.6	453	<LOD	144	<LOD	88	47181	<LOD
286	RT55/1.5-3	359	39	135	<LOD	99	40192	1960
287	RT55/3-4.5	372	33	83	<LOD	100	31181	1800
288	RT55/5-6.5	425	41	149	<LOD	131	48589	1200
289	RT56/1.5-3	292	<LOD	112	<LOD	<LOD	52198	<LOD
290	RT56/3-4.5	293	<LOD	175	<LOD	75	23091	1020
291	RT56/5-6.5	349	36	70	<LOD	146	31078	<LOD
292	RT57/1.5-3	290	35	430	37.7	113	24691	<LOD
293	RT57/3-4.5	361	33	43	<LOD	46	11795	679
294	RT57/5-6.5	286	34	65	<LOD	178	24192	965
295	RT58/1.5-3	382	36	<LOD	<LOD	84	39475	<LOD
296	RT58/3-4.5	347	33	53	<LOD	84	26394	1580
297	RT58/5-6.5	459	26	<LOD	<LOD	163	66867	1150
298	RT59/1.5-3	345	45	649	26	174	23194	<LOD
299	RT59/3-4.5	381	34	124	<LOD	81	27494	2130
300	RT6/1.5-3	8/3/00 8:20	<LOD	11898	711	1170	18291	1440
301	RT6/3-4.5	8/3/00 8:35	<LOD	4259	158	1939	24000	1060
302	RT6/5-6	8/3/00 8:29	<LOD	10298	486	950	18099	<LOD
303	RT6/6-6.5	8/3/00 8:36	32	819	<LOD	748	32077	1130
304	RT60/1.5-3	458	<LOD	287	<LOD	95	43392	1909
305	RT60/3-4.5	474	21	68	<LOD	95	42086	1100
306	RT61/1.5-3	379	<LOD	88	<LOD	112	35277	1869
307	RT62/1.5-3	371	58	43	<LOD	99	19494	<LOD
308	RT62/3-4.5	412	26	159	13.9	102	61389	5008
309	RT63/0.5-2	421	<LOD	814	47.4	78	35277	1500
310	RT63/1.5-3	365	40	566	30.8	<LOD	26598	1460
311	RT63/3-4.5	444	<LOD	71	<LOD	74	39091	2789
312	RT64/1.5-3	431	20	58	<LOD	112	34381	<LOD
313	RT64/3-4.5	457	22	26	<LOD	75	35891	907
314	RT65/1.5-3	385	56	<LOD	<LOD	<LOD	18598	1260
315	RT66/1.5-3	426	<LOD	274	<LOD	88	36992	1140
316	RT66/3-4.5	438	<LOD	305	<LOD	127	41293	933
317	RT67/1.5-3	433	20	171	<LOD	106	45696	<LOD
318	RT67/3-4.5	437	<LOD	145	9.2	113	47488	<LOD
319	RT68/1.5-3	289	<LOD	359	50.4	150	28390	1260
320	RT68/3-4.5	446	<LOD	231	12.1	111	44493	887
321	RT69/1.5-3	367	<LOD	585	<LOD	105	21696	<LOD
322	RT69/3-4.5	358	<LOD	2610	409.2	108	24794	1250
323	RT7/1.5-3	8/3/00 8:57	48	924	32	1290	20890	1310
324	RT7/3-4.5	8/3/00 9:06	<LOD	2520	176	854	27085	934
325	RT7/5-6.5	8/3/00 9:15	52	241	<LOD	491	33997	1540
326	RT70/1.5-3	414	<LOD	16397	1400	411	26099	1160
327	RT70/3-4.5	420	33	1630	<LOD	182	46797	795

	A	B	C	D	E	F	G	H
328	RT70/5-6.5	436	<LOD	1260	13	186	46490	1010
329	RT71/1.5-3	351	110	4598	1489.6	723	34483	<LOD
330	RT71/3-4.5	430	44	921	<LOD	214	51379	1240
331	RT71/5-6.5	353	40	657	13.7	95	18995	1070
332	RT72/1.5-3	360	<LOD	3069	51.5	121	21990	859
333	RT72/3-4.5	439	33	1320	<LOD	124	44493	2299
334	RT73/1.5-3	378	<LOD	3149	230	319	21594	977
335	RT73/3-4.5	472	<LOD	386	14.2	144	28493	1040
336	RT73/5-6.5	348	37	733	14.2	190	22592	<LOD
337	RT74/1.5-3	354	<LOD	113971	282	557	19098	3629
338	RT75/1.5-3	460	<LOD	709	<LOD	142	52787	2410
339	RT8/1.5-3	8/3/00 9:34	40	175	10	117	20698	<LOD
340	RT9/1.5-3	8/3/00 9:52	40	867	17	1280	18496	<LOD
341	Unnamed	492	<LOD	127	7.2	105	37299	1260

APPENDIX I

FIXATION TREATABILITY STUDY RESULTS

MT^2 ™ Cost Effective Metals Treatment Technologies

MT^2 RED DEVIL MINE TREATABILITY REPORT

Prepared for Harding Lawson

1.0 INTRODUCTION

The purpose of this report is to present the findings of a laboratory treatability study conducted by Metals Treatment Technologies, LLC (MT^2) which was designed to develop a formulation that stabilizes TCLP leachable mercury and arsenic in the Red Devil mine soil samples.

2.0 SAMPLES RECEIVED

MT^2 received three samples of contaminated soil and one brick from the Red Devil project. These samples were received on November 27, 2000.

3.0 SAMPLE CHARACTERIZATION

The physical descriptions of the four samples received are as follows:

MT^2 Sample No.	Client ID	Weight kg	Natural pH	Sample Description
10-1	FTS-1	1.4	8.3	Black, damp, rocky soil
10-2	FTS-2	1.0	6.21	Same
10-3	FTS-3	0.5	8.9	Same
10-4	FTS-4	3.66	4.4	Yellowish brick

The three soil samples are heterogeneous and were mixed by hand-blending in a plastic bag. After blending the larger rocks were picked out and were not analyzed in the pre-treatment or TCLP stabilization testing. The brick was reduced in sized by placing the brick in a plastic bag and hitting the bag with a hammer. The brick fragments and fines were screened through a 3/8 inch Tyler screen with the minus 3/8 inch fraction being utilized for baseline and TCLP sampling.

Pre-treatment TCLP extractions were conducted for mercury and arsenic and the results are presented in the following table. TCLP Leach Solution # 1 was used for all tests.

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RED DEVIL MINE
PRE-TREATMENT TCLP RESULTS

Laboratory	Sample	Client ID	Hg mg/l	As mg/l
MT² Test 2-9-1	10-1	FTS 1	0.44	10
MT² Test 2-9-2	10-2	FTS 2	0.02	20
MT² Test 2-9-3	10-3	FTS 3	<0.01	6
MT² Test 2-9-4	10-4	FTS 4	<0.01	6

The pre-treatment TCLP data shows that all of the samples failed the RCRA TCLP for arsenic (<5 mg/l TCLP arsenic). Only sample (10-1) failed the TCLP test for mercury (<0.20 mg/l TCLP mercury). The brick sample (10-4) and the other two soil samples (10-2 and 10-3) had little or no TCLP mercury.

4.0 TREATMENT PROCEDURES

The Red Devil soil samples were treated with various concentrations of Ecobond™ AS, T, HP, HG and H.

The lab procedure was to blend 80 grams of Red Devil soil sample with the Ecobond additive(s). Varying amounts of water were added and the stabilizations were all completed using the following procedure:

1. Weigh 80 grams of soil in a plastic bag.
2. Weigh a prescribed quantity of the reagent.
3. Transfer the additive(s) to the bag.
4. Mix and allow to cure overnight and then run an TCLP test by EPA Method SW-846.

A total of 13 arsenic and mercury stabilization formulations were tested on the Red Devil soil samples and the results are presented in Table 1. All formulations passed the TCLP acid test so TCLP Leach Solution #1 was used in all TCLP tests.

5.0 TREATMENT DISCUSSIONS

Sample 10 - 1

This sample contained TCLP leachable mercury and arsenic. One of the Ecobond™ formula combinations, Test 2-29-5, was able to stabilize both the mercury and the arsenic to below the RCRA criteria. The TCLP arsenic was brought to below the detection limit of < 1 ppm arsenic and the TCLP mercury was lowered to 0.18 mg/l mercury. Even though the test was successful the mercury results indicate that additional formula optimization work is necessary.

Samples 10 - 2 and 3

Pre-treatment TCLP testing of Samples 10 - 2 and 3 only failed for arsenic. TCLP mercury was either not present or below RCRA action levels. The addition of EcoBond™ AS in 1.5% and 2.5% concentrations lowered the TCLP arsenic to well below RCRA action levels. Further optimization may prove that even lower concentrations EcoBond™ AS may be effective.

6.0 CONCLUSIONS

The MT^2 treatability study shows that the Red Devil soil sample containing TCLP mercury and arsenic above RCRA action levels (Sample 10 – 1) can be stabilized for mercury and arsenic with:

- Formulation # 1: EcoBond™ AS (2.5%) and EcoBond™ HG (2.0%)

The MT^2 treatability study shows that the soil samples containing elevated levels of TCLP arsenic (Samples 10 - 2 and 3) can be stabilized with:

- Formulation # 2: EcoBond™ AS (1.5%)

No stabilization tests were completed on the brick sample (10 - 4) because it passed the TCLP for mercury and just failed the TCLP test for arsenic. It is assumed that a 1.5% EcoBond™ AS additive would stabilize the crushed brick material for arsenic.

The post stabilization pH of Sample 10 - 1 was 3.1. For Samples 10 - 2 and 3 the post stabilization pH was between 3.2 and 4.4.

The Red Devil mine soil samples can be successfully treated with either a combination of EcoBond™ AS and HG if TCLP mercury is present or EcoBond™ AS if only TCLP arsenic is present. Some additional optimization of the mercury contaminated waste is recommended. However, due to the large number of tests conducted to date, little additional Red Devil mine soil is available for further testing.

Dated this 25th day of January, 2001

Dr. Mark Peters, Ph.D.

TABLE 1
Red Devil Laboratory Stabilization Study

MT2 LAB DATA																	
No.	Test No (Notebook page)	Test Description	Feed ID		Stabilization Reagents							TCLP Leach Data					TCLP Pass/ Fail TCLP
			Client ID	MT2 Sample Number	Ecobond AS %	Ecobond T %	Ecobond HP %	Ecobond HG %	Ecobond H %	Water %	pH After Curing	Leach Solution No.	Filtrate pH	Filtrate Color	Filtrate Hg ppm	Filtrate As ppm	
1	2-29-1	Stabilization	FTS-1	10--1	2.5					5	3.3	1	4.68	Colorless	0.43	<1	Fail
2	2-29-2	Stabilization	FTS-1	10--1	2.5	2				5	3.26	1	4.7	Colorless	0.34	4	Fail
3	2-29-3	Stabilization	FTS-1	10--1			1			5	5.34	1	4.78	Colorless	0.36	9	Fail
4	2--29-4	Stabilization	FTS-1	10--1				2		3	6.1	1	4.79	Colorless	0.18	10	Fail
5	2-29-5	Stabilization	FTS-1	10--1	2.5			2		3	3.09	1	4.76	Colorless	0.18	<1	Pass
6	2-32-1	Stabilization	FTS-1	10--1	2.5		1			3	2.96	1	4.82	Colorless	0.64	1	Fail
7	2-32-2	Stabilization	FTS-1	10--1	1.5			3		0	3.4	1	4.92	Colorless	0.22	<1	Fail
8	2-32--3	Stabilization	FTS-1	10--1	2.5	3				3	3.47	1	4.93	Colorless	0.32	13	Fail
9	2--32-4	Stabilization	FTS-1	10--1	1.5				0.8	3	3.63	1	4.94	Colorless	0.43	3	Fail
10	2-32-5	Stabilization	FTS-2	10--2	2.5					1.5	3.23	1	4.94	Colorless		1	Pass
11	2-32-6	Stabilization	FTS-2	10--2	1.5					1.5	4.39	1	5.02	Colorless		<1	Pass
12	2-32-7	Stabilization	FTS-3	10--3	2.5					1.5	3.29	1	4.96	Colorless		<1	Pass
13	2-32-8	Stabilization	FTS-3	10--3	1.5					1.5	4.37	1	5.01	Colorless		1	Pass
14	2--9-1	No stabilization-TCLP	FTS-1	10--1							8.3	1	4.9	Colorless	0.44	10	Fail
15	2--9-2	No stabilization-TCLP	FTS-2	10--2							6.2	1	5	Colorless	0.02	20	Fail
16	2--9-3	No stabilization-TCLP	FTS-3	10--3							8.9	1	5.03	Colorless	<0.01	6	Fail
17	2--9-4	No stabilization-TCLP	FTS-4	10--4							4.5	1	4.89	Colorless	<0.01	6	Fail
		Criteria-RCRA TCLP													0.2	5	

Mark Peters, MT2,LLC

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