Red Devil Mine
Historic Source Area Investigation
Red Devil, Alaska

Prepared for

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MACTEC Project 57064

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ABBREVIATIONS AND ACRONYMS

ADEC	Alaska Department of Environmental Conservation
bgs	below ground surface
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
EPA	U.S. Environmental Protection Agency
HgS	cinnabar
HLA/Wilder	Harding Lawson Associates/Wilder Construction Company Joint Venture
New Idria-AK	New Idria-Alaska Quicksilver Mining Company
MACTEC	MACTEC Engineering and Consulting
MeHg	methylmercury
mg/kg	milligrams per kilogram
µg/kg	micrograms per kilogram
NSTC	National Science and Technology Center
QC	quality control
RCRA	Resource Conservation and Recovery Act
RMC	risk management criteria
SOW	Statement of Work
SRA	Streamlined Risk Assessment
USGS	U.S. Geological Survey

1.0 INTRODUCTION

The Bureau of Land Management (BLM), Alaska State Office, retained MACTEC Engineering and Consulting, Inc. (MACTEC) to conduct a literature review to identify historic mine production areas (pre-1955) at the Red Devil Mine and investigate if mercury and arsenic associated with those mine activities are present.

The BLM assigned the Statement of Work (SOW) to MACTEC under Task Order NAD02HL13 to Contract NAC010004.

The field program for the investigation activities followed the SOW and current regulations and guidance documents listed in Section 6.0.

1.1 Site Description and Background

The Red Devil Mercury Mine is in a remote part of western Alaska, approximately 250 miles west of Anchorage (Figure 1). The mine is on the south bank of the Kuskokwim River, 8 miles downstream of Sleetmute, at the mouth of Red Devil Creek. The legal description is Township 19 North, Range 44 West, Southeast 1/4 of Section 6, Sleetmute D-4 Quadrangle, Seward Meridian.

The Red Devil Mine operated intermittently from 1933 until 1971. About 35,000 flasks of mercury (each flask is approximately 2 quarts) were produced during operations at the mine.

The original historic mine site (pre-1955) was situated on the west side of Red Devil Creek. The Pre-1955 Retort and Rotary Furnace sat above Red Devil Creek on a flattened bench approximately 250 feet wide (Cady et al., 1995). The terrain rises steeply west of the Rotary Furnace into heavily brushed rolling hills. Housing for the miners was to the northwest of the Pre-1955 Retort on a hillside overlooking the Kuskokwim River. Figure 2 shows these historic site features superimposed on a color aerial photograph from 1996.

After a fire destroyed most of the mine equipment and part of the housing complex in 1954, a modern retort was constructed on the east side of Red Devil Creek. Mining resumed in 1956 and continued intermittently until 1971 when declining mercury prices closed the mine.

Since 1989 the BLM, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), has completed several removal actions and cleanup activities at this site. The U.S. Environmental Protection Agency (EPA), Alaska Department of Environmental Conservation (ADEC), and certain Alaska Native corporations have also been involved during cleanup activities.

1.2 Statement of Work

The project SOW included the following tasks:

- Conduct a literature review of historic production areas at Red Devil Mine.
- Conduct personal interviews of local residents and individuals who may have participated in past mining operations at the site to further identify potential source areas.
- Investigate potential source areas that can be found in *The Central Kuskokwim Region Alaska*, Geological Survey Paper 268 (Cady et al., 1955). The specific source areas include the rotary furnace area, burnt ore disposal discharge point, retort, and stack from the rotary furnace.
- Identify the nature and extent of contamination (mercury and arsenic) present at these areas and other locations as the literature search may indicate.
- Identify the speciation of mercury present at these source areas.
- Correlate results with the draft streamlined risk assessment prepared for the site (BLM National Science and Technology Center [NSTC], 2001).
- Prepare an historic source area investigation report.

1.3 Historic Literature Review and Interviews

The historic literature review produced the following information on Red Devil Mine operations from 1933 through 1954. Figure 3 presents this information in a timeline, including information for what is considered the modern mine (post 1954) through 1982 when the mine was allowed to flood and operations were suspended.

- 1933: Hans Halverson discovered and staked Red Devil Mine (Roehm, 1939); Nick Mellick acquired half interest a few years later and additional claims were staked, Red Devil Nos. 1-4, Kusko Nos. 1 and 2, and Eurica Nos. 1, 2, and 3 (Wright and Rutledge, 1947)
- 1939: Retort from the Parks property moved and rebuilt at Red Devil (Roehm, 1939)
- Pre-1940 production was 11 flasks retorted from creek float and overburden using several Johnson McKay Tubes (Wright and Rutledge, 1947)
- 1940: Mine operated for 3 months, installed two "D" type retorts with 1-ton-per-day capacity; production was 158 flasks (Wright and Rutledge, 1947)
- 1941: U.S. Bureau of Mines performed extensive surface work and mapping (Cady et al., 1955); second adit and drift driven, deepened Red Devil main shaft (Wright and Rutledge, 1947)
- Fall of 1941: Harold Schmidt and L.J. Stampe of Fairbanks lease property (Wright and Rutledge, 1947)
- Late 1941: New Idria Mining Company of California subleased property and formed New Idria-Alaska Quicksilver Mining Company (New Idria-AK); brought in mining and furnace equipment including a 40-ton rotary kiln and condensing system (Wright and Rutledge, 1947)
- 1941: Production was 135 flasks (Wright and Rutledge, 1947)
- 1942: Another an adit was driven and 117 flasks produced (Wright and Rutledge, 1947)
- Winter 1942-1943: U.S. Bureau of Mines continued surface exploration program (Wright and Rutledge, 1947)
- 1943 to mid-1945: Red Devil Mine produced more than 2,000 flasks (Malone, 1962)
- 1943: Approximately 500 feet of drift and crosscuts worked; more furnace and retort equipment installed (including a reduction plant, a 50-ton fine ore bin, a 12-ton burned ore bin, a 36-inch by 40-foot rotary kiln, Sirocco dust collectors, fan condensers, and a redwood tank (Webber et al., 1947)
- March 1943: Reserve estimates that leases hold 11,360 tons of ore containing 45.3 pounds of mercury per ton plus 15,900 tons containing 36.7 pounds of mercury per ton (Bain, 1946)
- 1944: Ore that was mined in two previous years was treated; 1,096 flasks produced, 1,006 from the kiln and 90 from retorting (Meyer, 1983; Wright and Rutledge, 1947)
- February 1945: New Idria-AK contracted Kuskokwim Mining Company (Harold Schmidt, Glen Franklin, Earl Ellingen, and L.J. Stampe) to extend Red Devil shaft; later in 1945 Kuskokwim Mining Co. subleased the mine and reduction plant (Wright and Rutledge, 1947)
- 1945-46: Extensive exploration and development; mine operated for two 4-month seasons (Wright and Rutledge, 1947)
- 1945: Production was 962 flasks in 127 days of mining, but operations were suspended because of drop in market price (Webber et al., 1947)
- 1946: Robert Lyman held the lease on the property and produced 500 flasks (Jasper, 1963); mine shut down at end of 1946 season because of declining prices (Malone, 1962)
- 1947-1951: Work at the mine was limited to Annual Assessment requirements (Jasper, 1963)
- 1949: New Idria-AK sold all mining and furnace equipment to Robert Lyman (Malone, 1962)
- 1949-1951: Mine inactive (Malone, 1962)

- 1952-1956: Production totaled 15,486 flasks (Malone, 1962)
- 1952: Claims located and staked by Halverson and Mellick of Alaska Research Company (BLM); Decoursey Mountain Mining Company acquired lease (Jasper, 1963); loan from Defense Minerals Exploration Administration for additional exploration and production secured (MacKevett and Berg, 1963)
- 1953: Decoursey Mountain Mining Co. dewatered the mine and operations were restarted (Jasper, 1963)
- 1953-1954: Production was 1,084 flasks from 2,500 tons of ore in the Gould rotary kiln (Jasper, 1963)
- October 1954: Plant fire destroyed most of the mine site and mill equipment and some of the camp buildings; the controlling interest was sold to Brewis and White (a Canadian mining company) and renamed DeCoursey Brewis (Lund, 1969)
- 1955: DeCoursey Brewis rebuilt Red Devil Mine (Jasper, 1963)

Mercury production for the period from 1933 through 1954 was nearly 4,000 flasks; this represents approximately 11 percent of the total mine production of 35,000 flasks. A production summary (Meyer, 1983) by year is presented as a table in Figure 3.

During the literature review, possible source areas of concern were identified. These areas included the Rotary Furnace, the Rotary Furnace Stack, Rotary Furnace Burnt Ore Disposal Pile, and Pre-1955 Retort. A plan view drawing by Cady (Cady et al., 1955) that showed these features was superimposed onto a "modern mine" aerial photograph taken in 1996. The result is shown in Figure 2. This figure was used during development of the project planning documents and proved invaluable for the field crew, who were able to accurately orient themselves relative to modern site features still present (such as the concrete slab foundation of the former shop building).

Collecting additional information from those familiar with historic mine operations was also attempted through mailings in the community of Red Devil and personnel interviews. A mailing to Red Devil community members was completed by distributing a cover letter and questionnaire about historic mine operations. An initial mailing was conducted in September 2003 and another in February 2004. No responses were received.

Art Smith in the BLM's Kingman, Arizona field office was contacted by telephone, but did not return messages. During September 2003 work in Red Devil, the Vanderpools and Mr. Walmarth (longtime members of the community) were interviewed. Neither were familiar with historic mine operations or knew contact information for miners who worked at the mine during historic operations.

2.0 FIELD ACTIVITIES

Field activities associated with this SOW were conducted from September 19 through September 29, 2003. Tasks included identifying and sampling soil at the former locations of the Rotary Furnace, Rotary Furnace Stack, Rotary Furnace Burnt Ore Disposal Pile, and Pre-1955 Retort Building.

The objective was to identify possible mercury and arsenic associated with pre-1955 mining activities. MACTEC staff and personnel from Winsor Construction, Inc., conducted the field activities.

2.1 Mobilization and Demobilization

The project was mobilized and demobilized in conjunction with the BLM's aboveground storage tanks and ore hopper demolition project.

Equipment and supplies were mobilized to and demobilized from Red Devil by chartered aircraft (Hercules L-382 and a CASA 212). Personnel traveled to and from the site by Peninsula Airways, Inc., and Hageland Aviation Services, Inc.

2.2 Field Procedures

Soil Sampling

Soil sampling was conducted in accordance with the *Work Plan/Sampling and Analysis Plan, Red Devil Mine Historic Source Area Investigation, Red*

Devil, Alaska (MACTEC, 2003d), the program-level quality assurance plan, and ADEC guidance.

Soil samples for laboratory analysis were collected and placed directly into laboratory-provided containers using decontaminated stainless steel spoons or trowels. The sample containers were completely filled with soil for arsenic and mercury analysis by EPA Method 6020 and EPA Method 7471A, respectively. These samples were then placed in a cooler and kept at approximately 4 degrees Celsius until delivered to Analytica Alaska in Anchorage.

Samples for mercury speciation were collected and placed into 125-milliliter glass jars with Teflon lids supplied by Frontier Geosciences, Inc. Each jar was filled approximately 60 percent full of soil and then frozen until processing.

Decontamination Procedures

Decontamination procedures for soil sampling equipment consisted of an Alconox wash followed by deionized water rinses. The equipment was then air-dried before use.

2.3 Source Investigation

Areas included in the historic investigation included the following.

- Rotary Furnace
- Rotary Furnace Stack
- Rotary Furnace Burnt Ore Disposal Pile
- Pre-1955 Retort

These areas are shown in Figure 2. Field activities for each area are described below. Figure 4 presents the sample locations and results. Trench and sample locations were based on visual observations of historic foundations and debris. Appendix A presents photographs taken during investigation activities.

2.3.1 Rotary Furnace

Two trenches and three test pits were completed at the Rotary Furnace (Figure 2). An L-shaped concrete slab associated with a shop building demolished in 2000 covered a portion of footprint of the former Rotary Furnace. The slab was supported and surrounded by mine tailings used as fill material. The depth of the fill material was not known, so the backhoe was used to trench alongside the concrete slab to expose the original ground surface of the pre-1955 mine site. Figure 4 shows the excavations and sample locations.

The first trench (referred to as the long trench in Figure 4) was excavated along the long side of the slab and measured approximately 95 feet by 4 feet and as much as 4 feet deep. While this trench was being excavated, piping, upright pilings (possibly building footings), plank flooring with char marks from fire, miscellaneous burnt woody debris, and unburned dimensional lumber were encountered between 1 and 2 feet below ground surface (bgs) along the entire length of the trench. Photographs in Appendix A show the trench and debris.

Tailings and fill material extended from the ground surface down to the building debris. Silty sands and some fractured bedrock were beneath the building debris.

Five soil samples and two mercury speciation samples were collected from the long trench. Samples were recovered at the interface between the tailings/fill material and the dimensional lumber debris.

The second trench (referred to as the short trench in Figure 4) was excavated approximately 22 feet southeast of the long trench. This trench measured 32 feet by 4 feet and as much as 4 feet deep. Another vertical piling and charred dimensional lumber were exposed during excavation activities. Tailings extended from the ground surface to approximately 1.5 feet bgs. Dark gray silty sand with minor gravel extended to the bottom of the trench. Four soil samples (including one duplicate sample) and one mercury speciation sample were collected from the interface below the tailings and above the charred lumber at the locations shown in Figure 4.

Pit 1 was excavated between the two trenches along the approximate edge of the building footprint. Horizontal wood planking (possible flooring) was noted, and rounded logs (similar to log cabin

construction) were exposed along the eastern sidewall of the excavation. The wood showed charring from fire. One soil sample was collected from this pit; no mercury speciation samples were collected at this location.

Pit 2 was excavated near the northern edge of the modern concrete slab. Dimensional lumber, metal strapping, and charred planking were exposed. Tailings extended from the ground surface to approximately 1.2 feet bgs. Dark gray gravelly sands extended to the bottom of the excavation. One soil sample was collected from this pit; no speciation samples were collected at this location.

Pit 3 was excavated near the L of the modern concrete slab. No dimensional lumber or pilings were exposed. Tailings extended from the ground surface to approximately 2 feet bgs. Dark gray gravelly sand extended to the bottom of the excavation. One soil sample was collected from this pit; no mercury speciation samples were collected at this location.

2.3.2 Rotary Furnace Stack

The Rotary Furnace Stack was situated uphill, west-northwest of the Rotary Furnace Building (Figure 2). The backhoe was used to complete minor brushing at the likely stack location. No building debris or foundation material associated with the stack was observed. However, an area that had been previously identified on the aerial photograph as an abandoned sluice was noted. The sample area was cleared and one soil sample and one mercury speciation sample were collected. Soil was dark gray gravelly sand. No tailings or fill materials were noted in this area.

2.3.3 Rotary Furnace Burnt Ore Disposal Pile

The Rotary Furnace Burnt Ore Disposal Pile was situated across the mine access road and downhill toward Red Devil Creek approximately 175 feet east of the former Rotary Furnace (Figure 2). A small bench was noted above the creek in the approximate location marked on the aerial photograph. This site was not accessible by the backhoe, so the area was cleared with shovels and a pickax. No burnt ore was identified; however, the material exposed for sampling contained more gravel than sand and was not like the tailings or fill material noted on the bench above. One soil sample and one mercury speciation sample were collected at this location.

2.3.4 Pre-1955 Retort

The Pre-1955 Retort is shown in Figure 2. Sample locations relative to the approximate location of the building footprint are presented in Figure 4. This site was heavily vegetated with alder and grasses. Building debris, several vertical pilings (possibly building footers or supports), a raised wooden platform, dimensional lumber, and firebrick were identified in an area of approximately 60 feet by 30 feet. One large stump and a piling, both with hardware, mark the southern boundary of the site.

During clearing activities, individual firebricks were exposed between the stump and pole. Several vertical pilings (exposed approximately 10 inches above the organic mat) extend west. A wood platform was noted but not completely exposed during sampling activities. Dimensional lumber and pole sections were scattered throughout the site. In the middle of the Pre-1955 Retort site, an 18-inch by 18-inch section of firebrick was found. A power pole with wire and insulators was identified along the northern boundary.

Approximately 75 feet east of the Pre-1955 Retort was an area where burned rock/ore was stockpiled. This pile consisted of large gravel- and cobble-sized material with minor amounts of sand. When the rocks were split or broken, a burnt rind was noted around the edges.

After the site was photographed, the backhoe cleared the Pre-1955 Retort area so that soil samples could be collected from below the organic mat of leaves, grass, and roots. The soil was dark gray gravelly sand.

Ten soil samples (including one duplicate sample) and four mercury speciation samples (including one duplicate sample) were submitted for analysis from the Pre-1955 Retort area. One soil sample and one mercury speciation sample were collected from the adjacent stockpile. Figure 4 presents sample locations with the analytical results.

3.0 LABORATORY RESULTS

Sample numbers, locations, depths, and chemical analyses are summarized in Table 1 and in the sample record log in Appendix B. Figure 4 presents the data results and sample locations for the two former building locations.

3.1 Analytical Program

The project laboratory for mercury analysis by EPA Method 7471A and arsenic analyses by EPA Method 6020 was Analytica Alaska Inc. Samples for mercury analysis were transferred to Analytica Environmental Laboratories in Thornton, Colorado. Samples for arsenic analysis were transferred to Analytica in Juneau, Alaska. Because of laboratory capacity limitations, these samples were subsequently sent for subcontract analysis to BC Research Inc. in Vancouver, British Columbia. Sample preparation and chemical analyses were performed using methods described in *Test Methods for Evaluating Solid Waste, USEPA SW-846, Third Edition, Revision 4, December 1996* (EPA, 1996), and *Standard Methods for Laboratory Determination of Water (moisture) Content of Soil, Rock and Soil Aggregate Mixtures, ASTM D 2216-80* (EPA, 1980).

Soil samples collected for mercury speciation analysis were submitted to Frontier Geosciences, Inc., Seattle, Washington.

Laboratory-supplied sample containers were completely filled with soil for arsenic and mercury analysis by EPA Method 6020 and EPA Method 7471A, respectively. Samples for mercury speciation were placed into 125-milliliter glass jars with Teflon lids. Because of the remoteness of the site and the extraction techniques used for the analysis, jars were filled approximately 60 percent full of soil and frozen until processing.

3.2 Data Quality Assessment

MACTEC assessed data quality for all project and quality control (QC) samples collected during the investigation. The results of the data quality assessment and checklists are in Appendix B. On the basis of MACTEC's data quality assessment, the data are considered acceptable.

3.3 Analytical Results

The analytical data are summarized in Table 1, with results for samples collected from the Rotary Furnace and Pre-1955 Retort presented in Figure 4. The analytical laboratory reports are in Appendix B.

3.3.1 Rotary Furnace

Eleven project samples and one QC sample were collected and analyzed for mercury and arsenic by EPA methods. Mercury speciation was performed on three samples. Analytical results are presented below.

EPA Methods

- Arsenic (6020): 38 to 2,000 milligrams per kilogram (mg/kg)
- Mercury (7471A): 2.5 to 140 mg/kg

The majority of the mercury samples (9 of 11 samples) ranged from 2.5 to 7.6 mg/kg; the remaining two samples were at 23.0 and 140 mg/kg.

Mercury Speciation

- Total Mercury Speciation: 1.6 to 38.6 mg/kg
- Hg(II) Speciation (F1+F2): 37.5 to 137.7 micrograms per kilogram (µg/kg)
- Methylmercury (MeHg) Speciation (CH_3Hg): 0.186 to 0.563 µg/kg

3.3.2 Rotary Furnace Stack

One project sample was collected and analyzed for mercury, arsenic, and mercury speciation from this site. The results are as follows:

EPA Methods

- Arsenic (6020): 118 mg/kg
- Mercury (7471A): 3.4 mg/kg

Mercury Speciation

- Total Mercury Speciation: 8.39 mg/kg
- Hg(II) Speciation: 106.5 µg/kg
- MeHg Speciation: 0.050 µg/kg

3.3.3 Rotary Furnace Burnt Ore Disposal Pile

One project sample was collected and analyzed for mercury, arsenic, and mercury speciation from this site.

EPA Methods

- Arsenic (6020): 980 mg/kg
- Mercury (7471A): 160 mg/kg

Mercury Speciation

- Total Mercury Speciation: 355.58 mg/kg
- Hg(II) Mercury Speciation: 5,182 µg/kg
- MeHg Speciation: 0.807 µg/kg

3.3.4 Pre-1955 Retort

At the Pre-1955 Retort, nine project samples and one QC sample were collected and analyzed for mercury and arsenic by EPA methods. Three project samples and one QC sample were submitted for mercury speciation. At the adjacent burnt ore stockpile, one project sample was collected and analyzed for mercury, arsenic, and mercury speciation.

Pre-1955 Retort

EPA Methods

- Arsenic (6020): 89 to 1,250 mg/kg
- Mercury (7471A): 2.9 to 32.0 mg/kg

Mercury Speciation

- Total Mercury Speciation: 9.51 to 30.76 mg/kg
- Hg(II) Speciation: 99.9 to 373 µg/kg
- MeHg Speciation: 0.357 to 1.688 µg/kg

Retort Stockpile

EPA Methods

- Arsenic (6020): 1,390 mg/kg
- Mercury (7471A): 940 mg/kg

Mercury Speciation

- Total Mercury Speciation: 1,349.72 mg/kg
- Hg(II) Speciation: 40.7 µg/kg
- MeHg Speciation: 0.445µg/kg

4.0 DISCUSSION

4.1 Mine Operations and Mercury Speciation Data

Mercury speciation analysis quantifies the different chemical forms of mercury in the soil. This speciation data can then be used to (1) link different mining operations with a specific mercury species and concentration (Bailey et al., 2002) and (2) to predict or quantify the solubility and potential bioavailability of mercury at a site.

During the 1990s several investigations were performed by the U.S. Geological Survey (USGS) to evaluate environmental hazards from abandoned mercury mines in southwestern Alaska (Bailey et al., 2002). The USGS studies have shown that mercury speciation information (total Hg, percent Hg[II], and percent MeHg) can be used to distinguish between tailings, retort areas, mined areas, and background locations. The whisker plots shown in Figures 5 and 6 present the USGS data along with MACTEC's 2003 sample data plotted together for comparison.

Comparison of the Total Hg data from the USGS and the 2003 samples by location is presented below.

Total Mercury Speciation data – USGS actual concentrations (mean) in mg/kg:

- Tailings 12.4 to 1,587 (970)
- Retort 0.05 to 120 (8.5)
- Mined Area 6.0 to 1,200 (210)
- Background 0.03 to 1.1 (0.4)

Total Mercury Speciation data for 2003 in mg/kg:
- Rotary Furnace 1.6 to 38.5
- Rotary Furnace Stack 8.3
- Rotary Furnace Burnt Ore Disposal Pile 355.8
- Pre-1955 Retort 9.5 to 30.7
- Retort Building Burn Pile 1,349.7

The comparison for Hg(II) data from the USGS and 2003 samples is presented below.

Hg(II) Mercury Speciation data for USGS actual concentrations (mean) in µg/kg:
- Tailings 1.5 to 4.5 (2.8)
- Retort 0.12 to 0.40 (0.26)
- Mined Area 2.5 to 16 (9.2)
- Background 0.01 to 1.2 (0.05)

Hg(II) Mercury Speciation data for 2003 in µg/kg:
- Rotary Furnace ranged from 188.5 to 389.5
- Rotary Furnace Stack 273.5
- Rotary Furnace Burnt Ore Disposal Pile 6,654
- Pre-1955 Retort from 329.0 to 497.9
- Retort Building Stockpile 78.1

When comparing Hg(II) data, median Hg(II) concentrations from the USGS studies, and the 2003 data, the results from the Rotary Furnace (samples 03RDV16SL, 03RDV17SL, 03RDV23SL), Rotary Furnace Stack (sample 03RDV12SL), and Rotary Furnace Burnt Ore Pile (sample 03RDV26SL) show that the materials sampled most likely represent tailings. At the Retort (samples 03RDV02SL, 03RDV08SL, and 03RDV10SL) and the Retort Stockpile (03RDV13SL), sample results were most consistent with tailings material. Figure 5 presents these data.

The comparison for MeHg data from the USGS and 2003 samples is presented below.

MeHg Speciation data for USGS concentrations (mean) in µg/kg:
- Tailings 0.08 to 0.71 (0.4)
- Retort 0.69 to 8.2 (3.3)
- Mined Area 0.29 to 7.2 (2.2)
- Background 0.04 to 1.4 (0.8)

MeHg Speciation data for 2003 in µg/kg:
- Rotary Furnace ranged from 0.186 to 0.563
- Rotary Furnace Stack 0.050
- Rotary Furnace Burnt Ore Disposal Pile 0.807
- Pre-1955 Retort from 0.357 to 1.688
- Retort Building Burn Pile 0.445

For comparison of MeHg between the USGS median concentrations and 2003 samples, see the whisker plots in Figure 6. Sample results from the Rotary Furnace, the Rotary Furnace Stack, and the Rotary Furnace Burnt Ore Disposal Pile show the percentage MeHg available from 2003 samples is similar to concentrations at mined areas. At the Pre-1955 Retort and the Retort Stockpile, sample results are also consistent with MeHg percent concentrations from a mined area.

Of note in the above comparison is that for both mercury species, Hg(II) and MeHg, all 2003 results are well below the median concentration reported from background samples by the USGS (Bailey et al., 2002).

4.2 Potential Bioavailability of Mercury

Mercury speciation data were also used to quantify or predict the solubility and potential bioavailability of mercury associated with mining practices before 1955.

The mineral cinnabar (HgS) and elemental mercury (Hg^0) are the most common forms of mercury found naturally. Cinnabar, an extremely stable mineral complex, is essentially non-leachable and not readily absorbed by humans, wildlife, or vegetation. Elemental mercury, or liquid mercury, is also very stable and not readily absorbed by ingestion. Both have low solubility, are very stable, and are not easily converted to the more toxic forms of mercury such as Hg(II) and MeHg.

Hg(II) is a reactive mercury species that can be converted into methylmercury. Methylmercury is considered a more toxic form of mercury because it might accumulate in biological tissues (bioaccumulation) and increase in concentration as it progresses up the food chain (biomagnification).

Reviewing 2003 speciation data, the F4 fraction (Hg^0), the F5 fraction (HgS), and the F6 fraction (Hg bound in the mineral lattice) account for most

of the mercury present in each sample, from 88.3 percent to 100 percent depending on the sample.

For identifying Hg(II), the F1 fraction plus the F2 fraction are most indicative. These two fractions account for between 0.0 and 2.3 percent of any single sample.

The F3 fraction is mercury that has the potential to be methylated (could be converted to MeHg). This form of mercury is organically bound in the soil humus. This fraction ranges from 0 to 5.7 percent of any single soil sample.

Speciation analysis was also performed to identify the actual percentage of MeHg for each sample. These percentages range from 0.00002 to 0.0115 percent.

These results are presented by location below.

Rotary Furnace
- HgS, Hg^0, and Hg (mineral lattice): 88.3 to 99.3 percent
- Hg(II): 0.3 to 2.3 percent
- Potential to methylate: 0.4 to 9.3 percent
- MeHg: 0.0013 to 0.0115 percent

Rotary Furnace Stack
- HgS, Hg^0, and Hg (mineral lattice): 96.7 percent
- Hg(II): 1.2 percent
- Potential to methylate Hg: 2.0 percent
- MeHg: 0.0006 percent

Rotary Furnace Burnt Ore Disposal Pile
- HgS, Hg^0, and Hg (mineral lattice): 98.1 percent
- Hg(II): 1.4 percent
- Potential to methylate Hg: 0.4 percent
- MeHg: 0.0002 percent

Pre-1955 Retort
- HgS, Hg^0, and Hg (mineral lattice): 93.2 to 98.3 percent
- Hg(II): 1.0 to 2.2 percent
- Potential to methylate Hg: 0.5 to 5.7 percent
- MeHg: 0.0038 to 0.0101 percent

Retort Stockpile
- HgS, Hg^0, and Hg (mineral lattice): >99.999 percent
- Hg(II): 0.0 percent
- Potential to methylate Hg: 0.0 percent
- MeHg: 0.00003 percent

4.3 Risk Comparison

The SOW includes a task to correlate results from a previous risk study performed at Red Devil Mine with the 2003 data.

In 2001, the BLM drafted a Streamlined Risk Assessment (SRA) for Red Devil Mine (BLM NSTC, 2001). As part of the SRA, acceptable multi-media risk management criteria (RMCs) were calculated for the contaminants of concern (COCs) as they relate to human use, wildlife, and habitat. Mercury and arsenic were the principal COCs. The RMCs were developed using available toxicity data and standard EPA exposure assumptions for human health and toxicity values and wildlife intake assumptions from current ecotoxicology literature.

The receptor for the human health assessment was identified as a camper onsite for 14 days. The RMCs for soil were calculated as 40 mg/kg for mercury and 20 mg/kg for arsenic. For wildlife the median RMCs were calculated as 8 mg/kg for mercury and 274 mg/kg for arsenic. The mercury value used assumes all of the mercury detected in a sample is bioavailable, not just a small percentage (typically less than 1 percent of mercury in a sample is MeHg). According to the SRA author, at the time the draft SRA was issued, bioaccessibility and mercury speciation was being conducted at the University of Colorado and the RMCs presented in the SRA may be modified by use of a bioaccessibility factor by dividing the RMC by the percent bioaccessible (BLM NSTC, 1999).

Comparing human health soil RMCs for mercury (50 mg/kg) with 2003 mercury sample results (EPA Method 7471A), only three samples exceed this criterion:

- 03RDV14SL (140 mg/kg) Rotary Furnace
- 03RDV26SL (160 mg/kg) Rotary Furnace Burnt Ore Disposal Pile

- 03RDV13SL (940 mg/kg) Retort Stockpile

Comparing human health soil RMCs for arsenic (20 mg/kg) with 2003 sample results, all samples exceeded the screening criteria.

Comparing the wildlife median RMCs for mercury (8 mg/kg) with mercury levels in 2003:

- 03RDV14SL (140 mg/kg) Rotary Furnace
- 03RDV19SL (23.0 mg/kg) Rotary Furnace
- 03RDV26SL (160 mg/kg) Rotary Furnace Burnt Ore Disposal Pile
- 03RDV04SL (14.0 mg/kg) Pre-1955 Retort
- 03RDV08SL (23.0 mg/kg) Pre-1955 Retort
- 03RDV10SL (32.0 mg/kg) Pre-1955 Retort
- 03RDV13SL (940 mg/kg) Retort Stockpile

Comparing the wildlife median RMC for arsenic (274 mg/kg) with arsenic levels in 2003:

- 03RDV14SL (674 mg/kg) Rotary Furnace
- 03RDV19SL (2,000 mg/kg) Rotary Furnace
- 03RDV20SL (645 mg/kg) Rotary Furnace
- 03RDV21SL (983 mg/kg) Rotary Furnace
- 03RDV23SL (359 mg/kg) Rotary Furnace
- 03RDV26SL (980 mg/kg) Rotary Furnace Burnt Ore Disposal Pile
- 03RDV01SL (732 mg/kg) Pre-1955 Retort
- 03RDV02SL (425 mg/kg) Pre-1955 Retort
- 03RDV03SL (496 mg/kg) Pre-1955 Retort
- 03RDV04SL (1,250 mg/kg) Pre-1955 Retort
- 03RDV05SL (628 mg/kg) Pre-1955 Retort
- 03RDV13SL (1,390 mg/kg) Retort Stockpile

5.0 SUMMARY

The following is a summary for each area of concern. Concentrations of mercury and arsenic from each area are compared to the draft SRA RMCs. The draft SRA RMCs were established using total metals concentrations. Results from bioaccessiblity and mercury speciation being conducted to support the SRA are expected to show that only a small percent of arsenic and mercury in soil and tailings is bioavailable (BLM NSTC, 2001).

5.1 Rotary Furnace

- Evidence found during the site investigation suggests the location of the former rotary furnace was identified.
- Mercury speciation results show a majority (88.3 to 99.3 percent) of the mercury is present HgS, Hg^0, and Hg.
- Comparing the Hg(II) speciation data collected in 2003 with speciation data collected by the USGS at Red Devil and other mercury mines in the region indicates the material "fingerprint" sampled is similar to areas identified by the USGS as being areas of tailings; however, comparison of MeHg speciation data collected in 2003 with speciation data collected by the USGS indicates the material sampled is similar to areas identified by the USGS as being mined areas.
- Comparison of the 2003 data with the draft SRA (BLM NSTC, 2001) indicates RMC exceedences for wildlife and human health are present.

5.2 Rotary Furnace Stack

- Evidence found during the site investigation suggests the location of the former rotary furnace stack was identified.
- Mercury speciation results show a majority (96.7 percent) of the mercury is present as HgS, Hg^0, and Hg.
- Comparing the Hg(II) speciation data collected in 2003 with speciation data collected by the USGS at Red Devil and other mercury mines in the region indicates the material "fingerprint" sampled is similar to areas identified by the USGS as being areas of tailings. Comparison of MeHg speciation data collected in 2003 with speciation data collected by the USGS indicates the material sampled is similar to areas identified by the USGS as being retort or mined areas.
- Comparison of the 2003 data with the draft SRA (BLM NSTC, 2001) indicates that no RMC exceedences for wildlife and human health are present.

5.3 Rotary Furnace Burnt Ore Disposal Pile

- Evidence found during the site investigation suggests the location of the former rotary furnace burnt ore disposal pile was identified.
- Mercury speciation results show a majority (98.1 percent) of the mercury is present as HgS, Hg^0, and Hg.
- Comparing the Hg(II) speciation data collected in 2003 with speciation data collected by the USGS at Red Devil and other mercury mines in the region indicates the material "fingerprint" sampled is similar to areas identified by the USGS as being areas of tailings. Comparison of MeHg speciation data collected in 2003 with speciation data collected by the USGS indicates the material sampled is similar to areas identified by the USGS as being mined or tailings areas.
- Comparison of the 2003 data with the draft streamlined risk assessment (BLM NSTC, 2001) indicates RMC exceedences for wildlife and human health are present.

5.4 Pre-1955 Retort

- Evidence found during the site investigation suggests the location of the pre-1995 retort was identified.
- Mercury speciation results show a majority (93.2 to 98.3 percent) of the mercury is present as HgS, Hg^0, and Hg.
- Comparing the Hg(II) speciation data collected in 2003 with speciation data collected by the USGS at Red Devil and other mercury mines in the region indicates the material "fingerprint" sampled is similar to areas identified by the USGS as being areas of tailings; however, comparison of MeHg speciation data collected in 2003 with speciation data collected by the USGS indicates the material sampled is similar to areas identified by the USGS as being retort areas.
- Comparison of the 2003 data with the draft streamlined risk assessment (BLM NSTC, 2001) indicates RMC exceedences for wildlife and human health are present.

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Table 1. Soil Analytical Results

	Sample Number	03RDV01SL	03RDV02SL	03RDV03SL	03RDV04SL	03RDV05SL	03RDV06SL	03RDV07SL	03RDV08SL	03RDV09SL
	Date Collected	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003
	Location	Pre-1955 Retort Building	Pre-1955 Retort Building	Pre-1955 Retort Building	Pre-1955 Retort Building	Pre-1955 Retort Building	Pre-1955 Retort Building	Pre-1955 Retort Building	Pre-1955 Retort Building	Pre-1955 Retort Building
	Depth (feet bgs)	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
	Sample Type	PR	PR	PR	PR	PR	PR	PR	PR	QC (duplicate of 03RDV08SL)
Analyte	**Analytical Method**	**Units**								
Mercury	EPA 7471A	mg/kg	7.6	4.5	2.9	14	4.8	6.0	5.2	23	29
Arsenic	EPA 6020	mg/kg	732	425	496	1,250	628	89	132	258	218
Mercury Speciation											
F1(Hg II)		µg/kg	--	305	--	--	--	--	--	221	--
F2(HgII)		µg/kg	--	43.9	--	--	--	--	--	152	--
F3 (Hg in humics)		µg/kg	--	149	--	--	--	--	--	104	--
F4 (elemental Hg)		µg/kg	--	2,430	--	--	--	--	--	2,796	--
F5 (cinnabar)		µg/kg	--	27,542	--	--	--	--	--	13,370	--
F6 (Hg in mineral lattice)		µg/kg	--	292	--	--	--	--	--	140	--
sum		µg/kg	--	30,762	--	--	--	--	--	16,783	--
MeHg		µg/kg	--	1.566	--	--	--	--	--	1.688	--
Hg^0		$\mu g/m^3$	--	<4.5	--	--	--	--	--	<4.5	--

--	Not analyzed
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
Hg	Mercury
MeHg	Methylmercury
mg/kg	Milligrams per kilogram
PR	Project sample
QC	Quality control
µg/kg	Micrograms per kilogram
$\mu g/m^3$	Micrograms per cubic meter

Table 1. Soil Analytical Results

	Sample Number	03RDV10SL	03RDV11SL	03RDV12SL	03RDV13SL	03RDV14SL	03RDV15SL	03RDV16SL	03RDV17SL	03RDV18SL
	Date Collected	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003	9/21/2003
	Location	Pre-1955 Retort Building	Pre-1955 Retort Building	Rotary Furnace Stack	Pre-1955 Retort Burnt Ore Pile	Rotary Furnace	Rotary Furnace	Rotary Furnace	Rotary Furnace	Rotary Furnace
	Depth (feet bgs)	Surface	Surface	Surface	Surface	1.5	2.3	2.3	1.3	1.0
	Sample Type	PR	QC	PR	PR	PR	PR	PR	PR	PR
Analyte	**Analytical Method**	**Units**								
Mercury	EPA 7471A	mg/kg	32	NA	3.4	940	140	5.3	3.4	7.6	5.7
Arsenic	EPA 6020	mg/kg	175	NA	118	1,390	674	121	95	194	38
Mercury Speciation											
F1(Hg II)		µg/kg	206	86	87	40.3	--	--	34.6	110	--
F2(HgII)		µg/kg	21.0	13.9	19.5	0.4	--	--	2.9	26.5	--
F3 (Hg in humics)		µg/kg	1,102	374	167	37.4	--	--	151	253	--
F4 (elemental Hg)		µg/kg	3,800	2,311	1,299	7,272	--	--	397	3,024	--
F5 (cinnabar)		µg/kg	14,185	6,589	6,654	1,340,246	--	--	939	14,650	--
F6 (Hg in mineral lattice)		µg/kg	98	135	164	2,120	--	--	94	728	--
sum		µg/kg	19,412	9,509	8,390	1,349,716	--	--	1,619	18,792	--
MeHg		µg/kg	0.913	0.357	0.050	0.445	--	--	0.186	0.563	--
Hg^0		$\mu g/m^3$	<4.5	<4.5	17.3	<4.5	--	--	<4.5	<4.5	--

--	Not analyzed
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
Hg	Mercury
MeHg	Methylmercury
mg/kg	Milligrams per kilogram
PR	Project sample
QC	Quality control
µg/kg	Micrograms per kilogram
$\mu g/m^3$	Micrograms per cubic meter

Table 1. Soil Analytical Results

	Sample Number	03RDV19SL	03RDV20SL	03RDV21SL	03RDV22SL	03RDV23SL	03RDV24SL	03RDV25SL	03RDV26SL
	Date Collected	9/21/2003	9/21/2003	9/22/2003	9/22/2003	9/22/2003	9/22/2003	9/22/2003	9/22/2003
	Location	Rotary Furnace	Rotary Furnace	Rotary Furnace	Rotary Furnace	Rotary Furnace	Rotary Furnace	Rotary Furnace	Burn Pile, Furnace
	Depth (feet bgs)	2.3	2.3	2.0	1.7	2.0	1.7	Surface	Surface
	Sample Type	PR	PR	PR	PR	PR	uplicate of 03RDV	PR	PR
Analyte	**Analytical Method**	**Units**							
Mercury	EPA 7471A	mg/kg	23	2.9	2.5	3.4	2.9	6.2	2.9	160
Arsenic	EPA 6020	mg/kg	2,000	645	983	232	359	253	230	980
Mercury Speciation										
F1(Hg II)		µg/kg	--	--	--	--	128	--	--	1,217
F2(HgII)		µg/kg	--	--	--	--	9.7	--	--	3,965
F3 (Hg in humics)		µg/kg	--	--	--	--	158	--	--	1,463
F4 (elemental Hg)		µg/kg	--	--	--	--	2,800	--	--	14,344
F5 (cinnabar)		µg/kg	--	--	--	--	34,660	--	--	333,775
F6 (Hg in mineral lattice)		µg/kg	--	--	--	--	812	--	--	816
sum		µg/kg	--	--	--	--	38,567	--	--	355,580
MeHg		µg/kg	--	--	--	--	0.518	--	--	0.807
Hg^0		$\mu g/m^3$	--	--	--	--	6.2	--	--	<4.5

--	Not analyzed
bgs	Below ground surface
EPA	U.S. Environmental Protection Agency
Hg	Mercury
MeHg	Methylmercury
mg/kg	Milligrams per kilogram
PR	Project sample
QC	Quality control
µg/kg	Micrograms per kilogram
$\mu g/m^3$	Micrograms per cubic meter

Prepared/Date: S. Finnegan 9/2/05
Checked/Date: J. Ditsworth 9/2/05

FIGURES

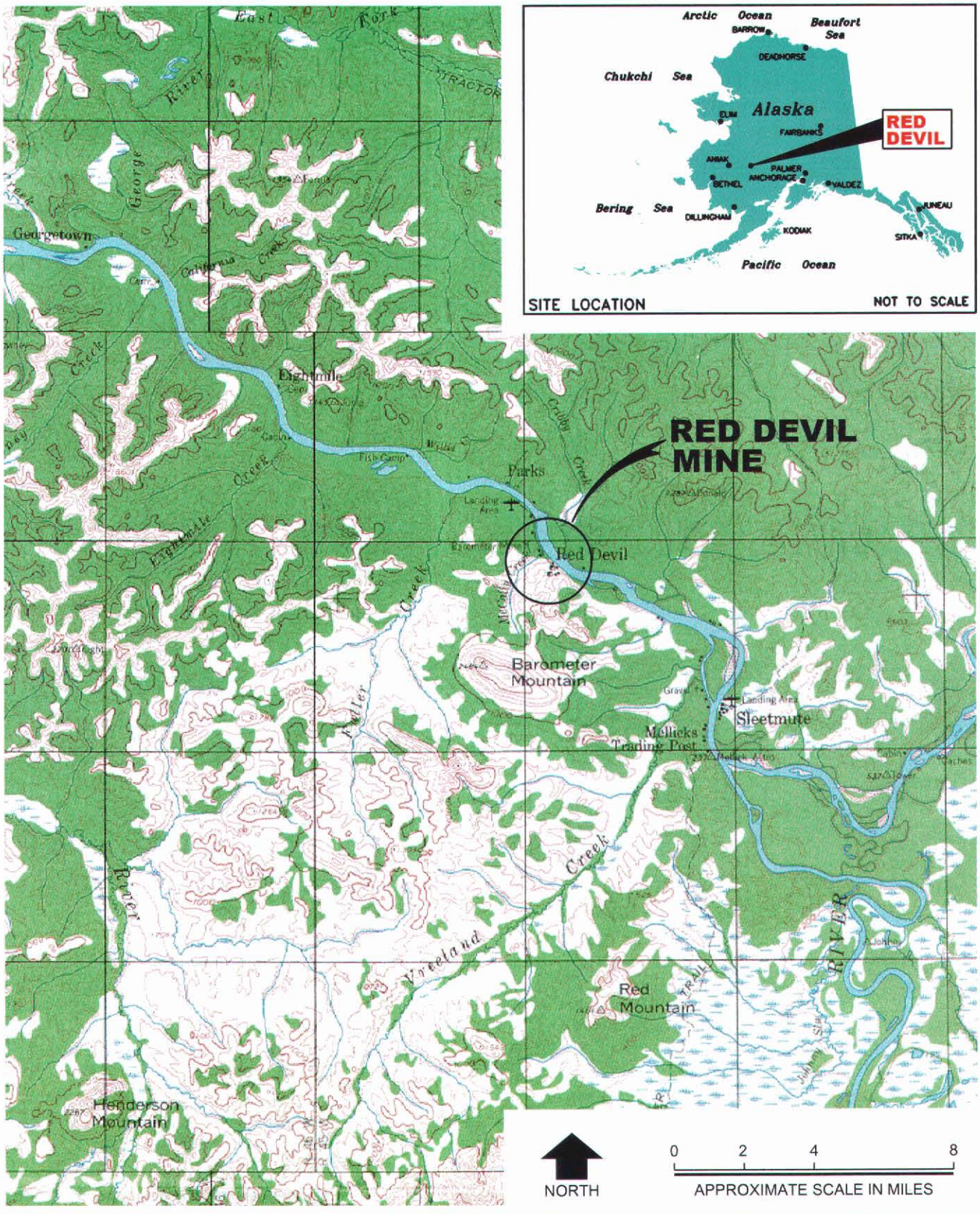

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FIGURE

Site Location and Vicinity Maps

1

MACTEC
Engineering and Consulting, Inc.

Red Devil Mine, Historic Source Area Investigation
Red Devil, Alaska

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	57064	JBD	6/2004

NORTH

TRAIL FROM
RED DEVIL

LEGEND

HISTORIC AREA OF INTEREST - CADY, 1955

HISTORIC AREA OF INTEREST - CADY AND WALLACE, 1941-1942

NOTES

1) STRUCTURES SHOWN IN PHOTOGRAPHY REMOVED IN 2002.
2) REPRINTED WITH PERMISSION OF AEROMAP U.S., PHOTOGRAPHY DATE 6-14-96, ROLL 96-29C, EXP 1-3, RED DEVIL PROJECT.

PRE-1955
RETORT

ROTARY FURNACE
BURNT ORE
DISPOSAL PILE

ROTARY
FURNACE

ROTARY
FURNACE
STACK

0 25 50 100
APPROXIMATE SCALE IN FEET

MACTEC
Engineering and Consulting

Site Plan and Historic Areas of Interest
Red Devil Mine, Historic Source Area Investigation
Red Devil, Alaska

FIGURE
2

DRAWN	APPROVED	PROJECT NUMBER	DATE	FILE NAME
jp	DLD	57064	6/2004	57064c1.cdr

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(6) Jasper, M.W. 1963. *Resumé of 1963 field investigations and mining activity in the Third and Fourth Section Judicial Districts*. Alaska Territorial Department of Mines IR, pp. 14-16.

(7) Lund, M.J. 1969. Red Devil Mercury Mine Reactivated. *Alaska Industry*, ed. by R. G. Knox. Alaska Industry Publication, Vol. 1, No. 8, August, pp 24, 25 70.

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(12) Sainsbury, C.L., and E.M. MacKevett, Jr. 1965. *Quicksilver deposits of Southwestern Alaska.* U.S. Geological Survey Bulletin 1187, 89 pp.

(13) BLM. 1983. *History analysis report*. Mining claim recordings/surveys/patents/contests, unpublished computer abstract report from BLM state office, May 31.

(14) Webber, B.S., S.C. Bjorklund, F.A. Rutledge, B.I. Thomas, and W.S. Wright. 1947. *Mercury deposits of Southwestern Alaska.* Bureau of Mines RI 4065, 57 pp.

(15) Wright, W.S., and F.A. Rutledge. 1947. *Red Devil mercury-antimony mine, Sleetmute.* Bureau of Mines Supplemental Report, 31 pp.

Production Summary (10)

Year	Flasks of Mercury
1933-1940	11
1940	158
1941	135
1942	117
1943-1944	1,096
1945	962
1946	491
1953-1954	1,084
1956-1960	19,800
1961	3,200 (approximate)
1962-1963	4,800
1969-1971	3,146 (approximate)
Total	**35,000**

1930

- 1933 Hans Halverson discovered and staked Red Devil Mine (11); Nick Mellick acquires half interest a few years later and additional claims are staked, Red Devil Nos. 1-4, Kusko Nos. 1 and 2, and Eurica Nos. 1, 2, and 3 (15)
- 1939 Retort from the Parks property moved and rebuilt at Red Devil Mine Site (11)
- pre-1940 production was 11 flasks retorted from creek float and overburden using several Johnson McKay Tubes (15)
- 1940 Installed 2 "D" type retorts (1 ton per day capacity); 3 months production 158 flasks (15)
- 1941 U.S. Bureau of Mines performed extensive surface work and mapping (4), second adit and drift driven, deepened Red Devil main shaft (15)
- Fall of 1941 Harold Schmidt and LJ Stampe of Fairbanks lease property (15)
- Late 1941 New Idria Mining Company of California subleased property and formed New Idria-Alaska Quicksilver Mining Company (New Idria-AK) - Mining and furnace equipment installed including a 40 ton rotary kiln and condensing system (15).

1940

- 1941 Production was 135 flasks (15)
- 1942 Another adit was driven; production was 117 flasks (15)
- Winter 1942-1943 U.S. Bureau of Mines continued surface exploration program (15)
- 1943-mid 1945 Mine produced more than 2,000 flasks (9)
- 1943 Approximately 500 feet of drift and crosscuts were worked; more furnace and retort equipment was installed (including a reduction plant, a 50-ton fine ore bin, a 12-ton burned ore bin, a 36-inch by 40-foot rotary kiln, Sirocco dust collectors, fan condensers, and a redwood tank (14)
- 1943 Reserve estimates 7 leases had 11,360 tons of ore containing 45.3 pounds of mercury per ton plus 15,900 tons containing 36.7 lbs of mercury per ton (3)
- 1944 Ore mined in 1943 and 1944 was treated; production was 1,096 flasks (10, 15)
- 1945 February New Idria-AK contracted Kuskokwim Mining Company (Harold Schmidt, Glen Franklin, Earl Ellingen, and L J Stampe) to extend Red Devil shaft; later in the year Kuskokwim Mining Company subleased the mine and reduction plant (15)
- 1945-46 extensive exploration and development; mine operated for two 4-month seasons (15)
- 1945 Produced 962 flasks in 127 days of mining but operations were suspended because of dropping market price (14)

1950

- 1946 Robert Lyman held the lease on the property and produced 491 flasks (6) mine shut down at end of 1946 season because of declining prices (9)
- 1947-1951 Work at the mine was limited to Annual Assessment requirements (6)
- 1949 New Idria-AK sold all mining and furnacing equipment to Robert Lyman (9)
- 1949-1951 Mine inactive (9)
- 1952-1956 Production was 15,486 flasks (9)
- 1952 Claims located and staked by Halverson and Mellick of Alaska Research Company (BLM); Decoursey Mountain Mining Company acquired lease (6); loan from Defense Minerals Exploration Administration for additional exploration and production (8)
- 1953 Decoursey Mountain Mining Company dewatered the mine and operations were restarted (6)
- 1953-1954 Production was 1,084 flasks from 2,500 tons of ore in the Gould rotary kiln (6)
- 1954 October Plant fire destroyed most of the mine site and mill equipment and some of the camp buildings; controlling interest was sold to Brewis and White (a Canadian mining company) and renamed DeCoursey Brewis (7)

1960

- 1955 DeCoursey Brewis rebuilds Red Devil Mine (6)
- 1956-1963 produced 27,800 flasks (9)
- 1956 Claims staked by Hans Halverson (BLM)
- 1956 DeCoursey Brewis resumes production and operations (10)
- 1956 Herreshoff furnace installed (10)
- 1957 Dolly shaft sunk (8); mine was producing more than 5,000 flasks (10, 12)
- 1958 Condenser tubes replaced and a dryer added increasing capacity 50% (9)
- 1959 DeCoursey Mountain Mining changed its name to Alaska Mines and Minerals, Inc. (8) and DeCoursey Brewis name changed to Consolidated Brewis (7)
- 1959 Klebs Cyclone and agitator installed to treat condenser mud (9)
- 1961 Mine is nine unpatented claims Kusko 1-5 held by Alaska Mines and Minerals Inc (AK Mines); Red Devil Nos. 1-4 owned by Halverson and Mellick and leased to the mining company (9)

1970

- 1961 Production 3,200 flasks (9)
- 1963 September 1 property shut down, all equipment removed and workings allowed to flood; September 19 water at 300-foot level, shaft was sealed and all portals closed; October Don Holloway and Mariano Juancorena obtained 1-year lease. Jack Neubauer joined them and hired miners. Drove 100-foot adit in Red Devil Gulch and stockpiled 40 tons of high grade ore (6)
- 1964 Known ore bodies exhausted; further exploration financed by Office of Mineral Exploration; failed to identify economic/minable ore; so production limited to small lease holders (7)
- 1964-1969 Mine inactive (7)
- 1966 Price of mercury rises and company seeks financing to start operations; they own over 50 claims and have worked only 4 (7)
- 1968 Plans for a flotation plant for $300,000 with Matanuska Valley Bank. Nissho-Iwai Company Limited and Nomura Mining Company Limited agreed to add $225,000 for opening mine and exploration with cinnabar concentrate to be shipped to Japan (7)
- 1969 AK Mines defined additional economic ores and started open pit mining, mine has retort plant with 40 tons per day capacity, two light plants, several fuel storage tanks, machine shops, offices, dormitories, apartments, and a flotation plant that can process 100 tons of ore per day (7)

1980

- 1970 Red Devil Mine is the largest mercury producer in Alaska with a crew of 34 (1)
- 1971 Mine shut down because of market price drop (1)
- 1981 Mine is closed and allowed to flood (2)
- 1982 Approximately 35,000 flasks of mercury produced from 1940-1972 (5)

HISTORIC

MODERN

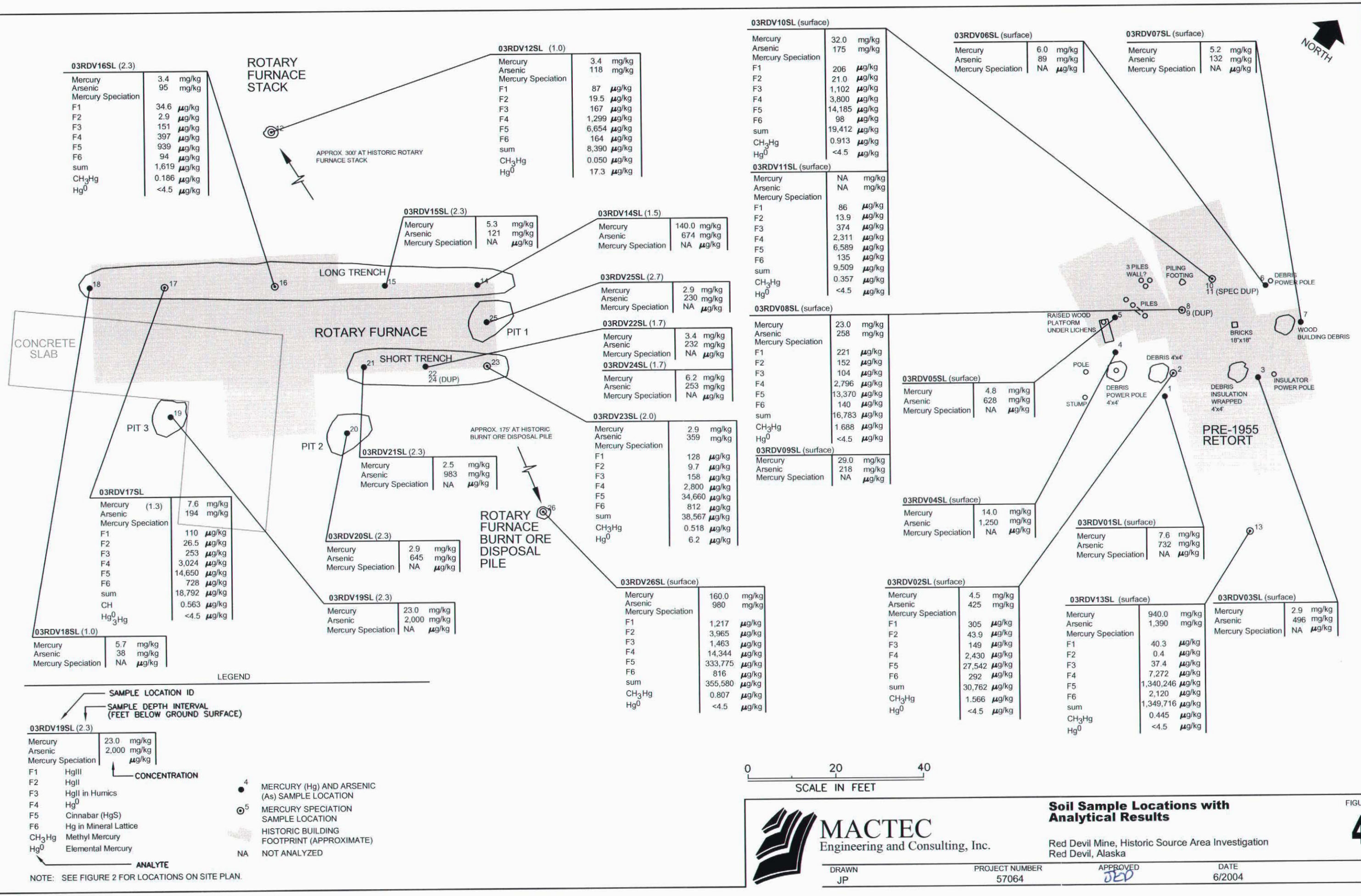
MACTEC
Engineering and Consulting, Inc.

Timeline

Red Devil Mine, Historic Source Area Investigation
Red Devil, Alaska

FIGURE **3**

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
JP	57064	SED	5/2004	57064c2x.cdr



03RDV16SL (2.3)

Mercury	3.4	mg/kg
Arsenic	95	mg/kg
Mercury Speciation		
F1	34.6	µg/kg
F2	2.9	µg/kg
F3	151	µg/kg
F4	397	µg/kg
F5	939	µg/kg
F6	94	µg/kg
sum	1,619	µg/kg
CH_3Hg	0.186	µg/kg
Hg^0	<4.5	µg/kg

03RDV12SL (1.0)

Mercury	3.4	mg/kg
Arsenic	118	mg/kg
Mercury Speciation		
F1	87	µg/kg
F2	19.5	µg/kg
F3	167	µg/kg
F4	1,299	µg/kg
F5	6,654	µg/kg
F6	164	µg/kg
sum	8,390	µg/kg
CH_3Hg	0.050	µg/kg
Hg^0	17.3	µg/kg

03RDV15SL (2.3)

Mercury	5.3	mg/kg
Arsenic	121	mg/kg
Mercury Speciation	NA	µg/kg

03RDV14SL (1.5)

Mercury	140.0	mg/kg
Arsenic	674	mg/kg
Mercury Speciation	NA	µg/kg

03RDV25SL (2.7)

Mercury	2.9	mg/kg
Arsenic	230	mg/kg
Mercury Speciation	NA	µg/kg

03RDV22SL (1.7)

Mercury	3.4	mg/kg
Arsenic	232	mg/kg
Mercury Speciation	NA	µg/kg

03RDV24SL (1.7)

Mercury	6.2	mg/kg
Arsenic	253	mg/kg
Mercury Speciation	NA	µg/kg

03RDV23SL (2.0)

Mercury	2.9	mg/kg
Arsenic	359	mg/kg
Mercury Speciation		
F1	128	µg/kg
F2	9.7	µg/kg
F3	158	µg/kg
F4	2,800	µg/kg
F5	34,660	µg/kg
F6	812	µg/kg
sum	38,567	µg/kg
CH_3Hg	0.518	µg/kg
Hg^0	6.2	µg/kg

03RDV21SL (2.3)

Mercury	2.5	mg/kg
Arsenic	983	mg/kg
Mercury Speciation	NA	µg/kg

03RDV20SL (2.3)

Mercury	2.9	mg/kg
Arsenic	645	mg/kg
Mercury Speciation	NA	µg/kg

03RDV19SL (2.3)

Mercury	23.0	mg/kg
Arsenic	2,000	mg/kg
Mercury Speciation	NA	µg/kg

03RDV17SL

Mercury (1.3)	7.6	mg/kg
Arsenic	194	mg/kg
Mercury Speciation		
F1	110	µg/kg
F2	26.5	µg/kg
F3	253	µg/kg
F4	3,024	µg/kg
F5	14,650	µg/kg
F6	728	µg/kg
sum	18,792	µg/kg
CH	0.563	µg/kg
Hg^0_3Hg	<4.5	µg/kg

03RDV18SL (1.0)

Mercury	5.7	mg/kg
Arsenic	38	mg/kg
Mercury Speciation	NA	µg/kg

03RDV26SL (surface)

Mercury	160.0	mg/kg
Arsenic	980	mg/kg
Mercury Speciation		
F1	1,217	µg/kg
F2	3,965	µg/kg
F3	1,463	µg/kg
F4	14,344	µg/kg
F5	333,775	µg/kg
F6	816	µg/kg
sum	355,580	µg/kg
CH_3Hg	0.807	µg/kg
Hg^0	<4.5	µg/kg

03RDV10SL (surface)

Mercury	32.0	mg/kg
Arsenic	175	mg/kg
Mercury Speciation		
F1	206	µg/kg
F2	21.0	µg/kg
F3	1,102	µg/kg
F4	3,800	µg/kg
F5	14,185	µg/kg
F6	98	µg/kg
sum	19,412	µg/kg
CH_3Hg	0.913	µg/kg
Hg^0	<4.5	µg/kg

03RDV11SL (surface)

Mercury	NA	mg/kg
Arsenic	NA	mg/kg
Mercury Speciation		
F1	86	µg/kg
F2	13.9	µg/kg
F3	374	µg/kg
F4	2,311	µg/kg
F5	6,589	µg/kg
F6	135	µg/kg
sum	9,509	µg/kg
CH_3Hg	0.357	µg/kg
Hg^0	<4.5	µg/kg

03RDV08SL (surface)

Mercury	23.0	mg/kg
Arsenic	258	mg/kg
Mercury Speciation		
F1	221	µg/kg
F2	152	µg/kg
F3	104	µg/kg
F4	2,796	µg/kg
F5	13,370	µg/kg
F6	140	µg/kg
sum	16,783	µg/kg
CH_3Hg	1.688	µg/kg
Hg^0	<4.5	µg/kg

03RDV09SL (surface)

Mercury	29.0	mg/kg
Arsenic	218	mg/kg
Mercury Speciation	NA	µg/kg

03RDV06SL (surface)

Mercury	6.0	mg/kg
Arsenic	89	mg/kg
Mercury Speciation	NA	µg/kg

03RDV07SL (surface)

Mercury	5.2	mg/kg
Arsenic	132	mg/kg
Mercury Speciation	NA	µg/kg

03RDV05SL (surface)

Mercury	4.8	mg/kg
Arsenic	628	mg/kg
Mercury Speciation	NA	µg/kg

03RDV04SL (surface)

Mercury	14.0	mg/kg
Arsenic	1,250	mg/kg
Mercury Speciation	NA	µg/kg

03RDV01SL (surface)

Mercury	7.6	mg/kg
Arsenic	732	mg/kg
Mercury Speciation	NA	µg/kg

03RDV02SL (surface)

Mercury	4.5	mg/kg
Arsenic	425	mg/kg
Mercury Speciation		
F1	305	µg/kg
F2	43.9	µg/kg
F3	149	µg/kg
F4	2,430	µg/kg
F5	27,542	µg/kg
F6	292	µg/kg
sum	30,762	µg/kg
CH_3Hg	1.566	µg/kg
Hg^0	<4.5	µg/kg

03RDV13SL (surface)

Mercury	940.0	mg/kg
Arsenic	1,390	mg/kg
Mercury Speciation		
F1	40.3	µg/kg
F2	0.4	µg/kg
F3	37.4	µg/kg
F4	7,272	µg/kg
F5	1,340,246	µg/kg
F6	2,120	µg/kg
sum	1,349,716	µg/kg
CH_3Hg	0.445	µg/kg
Hg^0	<4.5	µg/kg

03RDV03SL (surface)

Mercury	2.9	mg/kg
Arsenic	496	mg/kg
Mercury Speciation	NA	µg/kg

LEGEND

SAMPLE LOCATION ID
SAMPLE DEPTH INTERVAL (FEET BELOW GROUND SURFACE)

03RDV19SL (2.3)

Mercury	23.0	mg/kg
Arsenic	2,000	mg/kg
Mercury Speciation		µg/kg

CONCENTRATION

F1	HgIII
F2	HgII
F3	HgII in Humics
F4	Hg^0
F5	Cinnabar (HgS)
F6	Hg in Mineral Lattice
CH_3Hg	Methyl Mercury
Hg^0	Elemental Mercury

ANALYTE

MERCURY (Hg) AND ARSENIC (As) SAMPLE LOCATION

MERCURY SPECIATION SAMPLE LOCATION

HISTORIC BUILDING FOOTPRINT (APPROXIMATE)

NA NOT ANALYZED

NOTE: SEE FIGURE 2 FOR LOCATIONS ON SITE PLAN.

File: 57064s1.dwg
Path: P:\CAD\57064_red devil\source area invest\
Date_Time: 06/23/04 08:09:10

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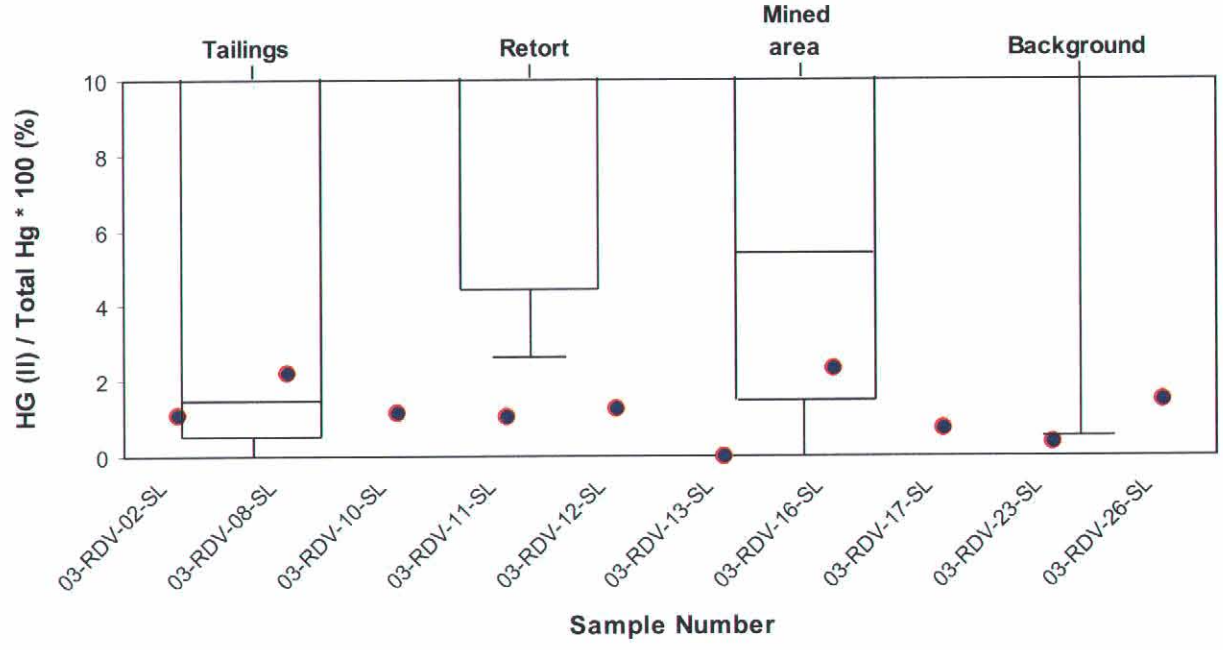
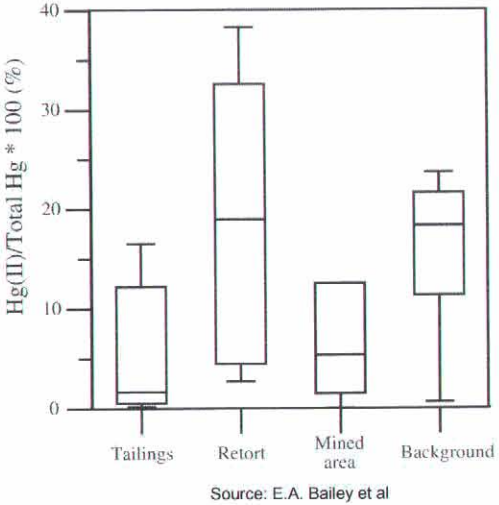
Soil Sample Locations with Analytical Results

Red Devil Mine, Historic Source Area Investigation
Red Devil, Alaska

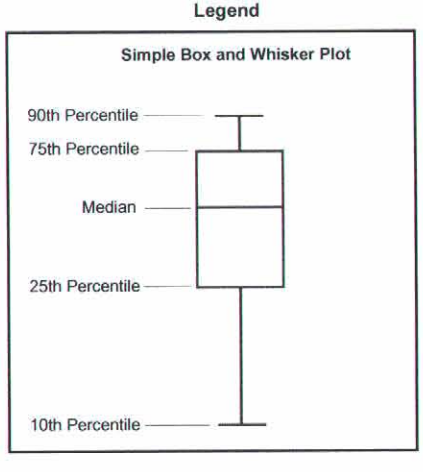
FIGURE **4**

DRAWN	PROJECT NUMBER	APPROVED	DATE
JP	57064	JED	6/2004





Source: E.A. Bailey et al



Sample Result for 03-RDV-02-SL (typical)

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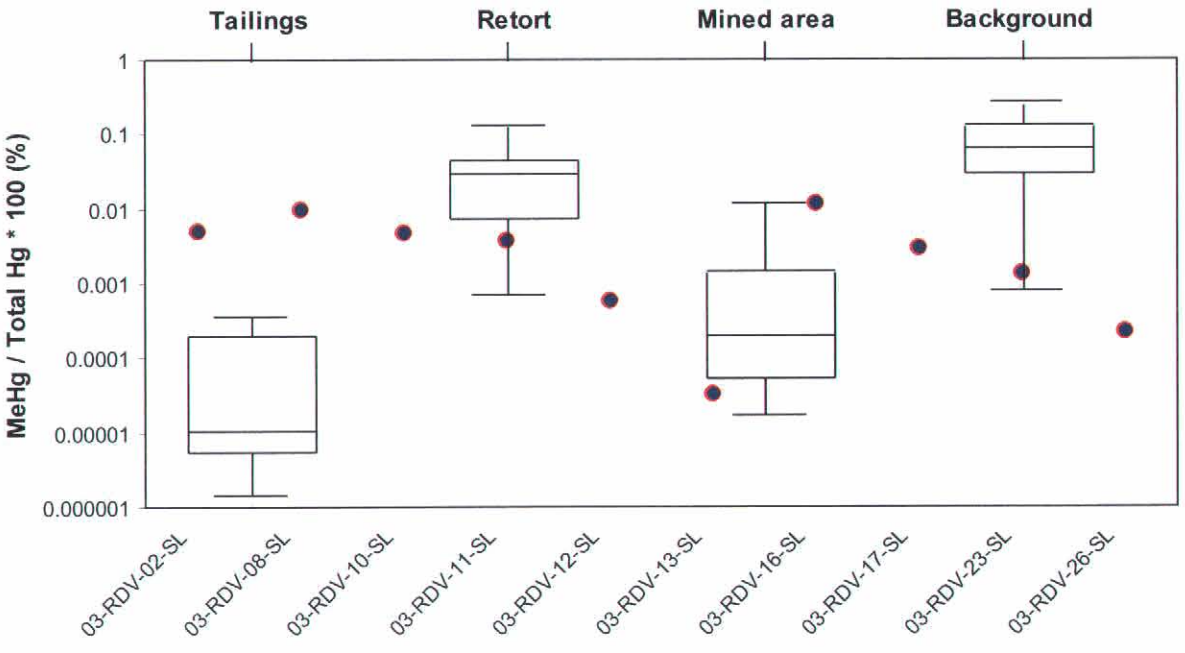
Engineering and Consulting, Inc.

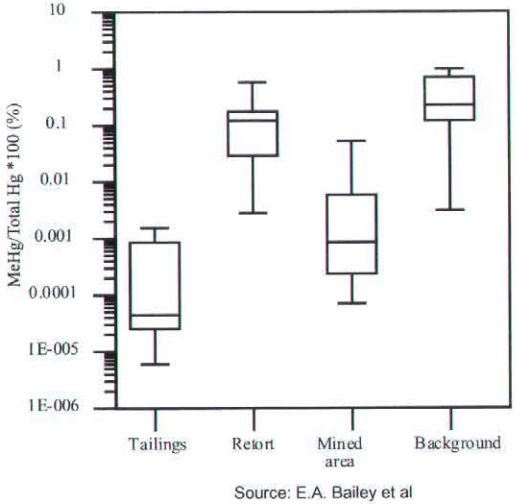
Percentile Hg(II) in Soil Samples

Red Devil Mine, Historic Source Area Investigation
Red Devil, Alaska

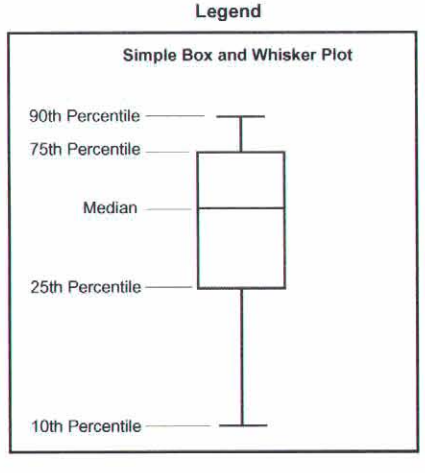
FIGURE
5

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
jp	57064	JBD	09/05	RDVHgFig5.cdr





Source: E.A. Bailey et al



Sample Result for 03-RDV-02-SL (typical)

MACTEC
Engineering and Consulting, Inc.

Percentile MeHg in Soil Samples

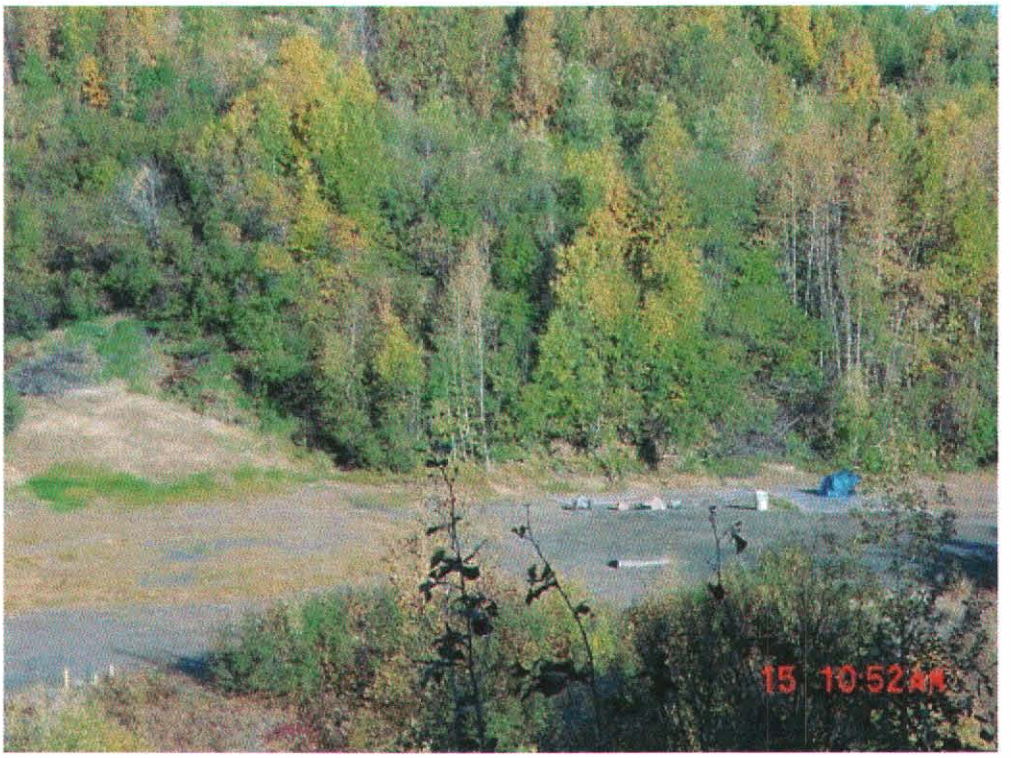
Red Devil Mine, Historic Source Area Investigation
Red Devil, Alaska

FIGURE
6

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
jp	57064	JED	09/05	RDVHgFig6.cdr

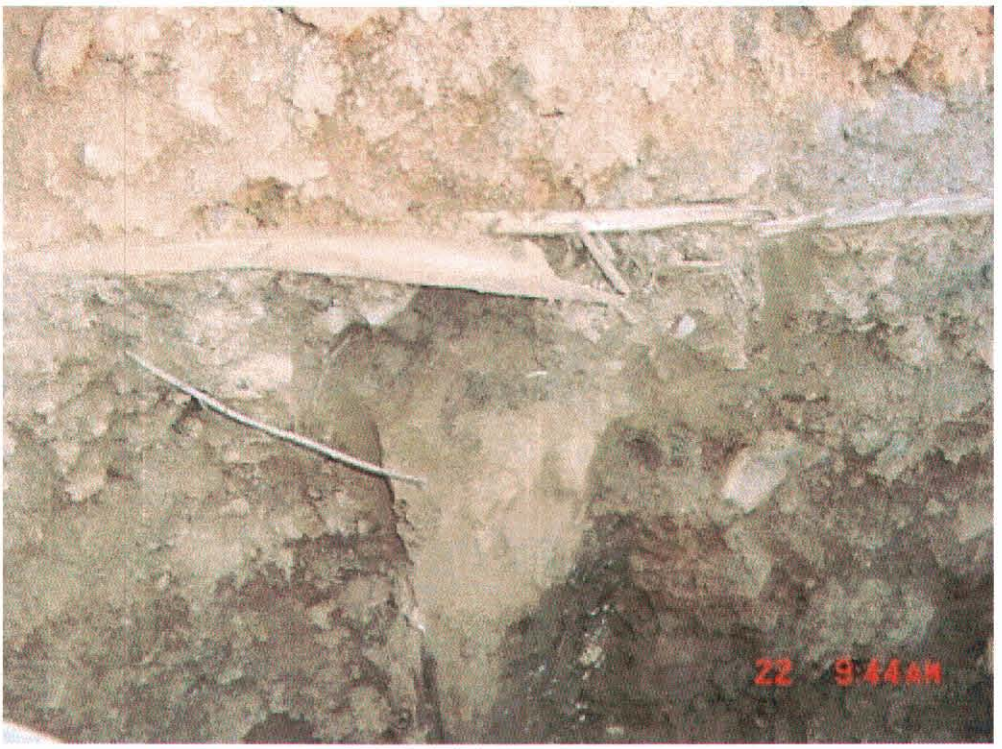
APPENDIX A

PHOTOGRAPHS



Photograph 1 - Overview of Rotary Furnace looking toward west-northwest. The concrete slab is adjacent to trenches and pits. The rotary furnace stack is directly uphill at the center of the photograph.

Photograph 2 - Rotary Furnace Long Trench Excavation. Building debris, dimensional lumber, and corrugated metal sheeting are exposed.



Photograph 3 - Rotary Furnace short Trench.
Piling and flooring—some charring noted on flooring.

Photograph 4 - Rotary Furnace Short Trench
Piling 2 with more flooring exposed.

Photograph 5 -Rotary Furnace Pit 2
Layer of plywood (possible flooring) burned on upper surface.

Photograph 6 - Rotary Furnace Pit 2
Excavation exposed another piling and driveshaft.

Photograph 7 - Rotary Furnace Pit 3
Excavation at the "L" of concrete slab; no dimensional lumber or building debris was encountered.

Photograph 8 - Rotary Furnace Stack
Photographs taken before cleaning and sampling.

Photograph 9 - Rotary Furnace Stack
Site after clearing with excavation for sampling.

Photograph 10 - Retort Overview Looking North
Stump at center of photograph; retort stockpile far right of photograph

Photograph 11 - Retort Looking West
Stump to pole to raised wood platform may be southern boundary of retort site.

Photograph 12 - Retort
Pilings with vertical lumber (possibly a wall) near sample 03RDV05SL

Photograph 13 - Retort
Three pilings with vertical lumber near sample 03RDV05SL

Photograph 14 - Retort
Firebrick section near center of Retort Building site.

Photograph 15 - Retort
Retort Building site near northern boundary with boundary power pole, wire, and insulator.

Photograph 16 - Retort
Retort Building site looking south along westernmost boundary. Stake in foreground is near sample 03RDV08SL; stake in center near samples 03RDV10SL and 03RDV11SL.

APPENDIX B

DATA QUALITY ASSESSMENT AND ANALYTICAL RESULTS

Red Devil
Bureau of Land Management
MACTEC Project 57064

Sample Number	Date	Time	Depth	Location	Sample Type	Associated Sample Number	SW7470A/SW6020 (Mercury/Arsenic)	Lab		Mercury Speciation	Lab
03RDV01SL	9/21/2003	14:55	surface	Retort Building	PR		X	Analytica			
03RDV02SL	9/21/2003	15:10	surface	Retort Building	PR		X	Analytica		X	Frontier Geo.
03RDV03SL	9/21/2003	15:16	surface	Retort Building	PR		X	Analytica			
03RDV04SL	9/21/2003	15:22	surface	Retort Building	PR		X	Analytica			
03RDV05SL	9/21/2003	15:25	surface	Retort Building	PR		X	Analytica			
03RDV06SL	9/21/2003	15:41	surface	Retort Building	PR		X	Analytica			
03RDV07SL	9/21/2003	15:48	surface	Retort Building	PR		X	Analytica			
03RDV08SL	9/21/2003	15:55	surface	Retort Building	PR		X	Analytica		X	Frontier Geo.
03RDV09SL	9/21/2003	15:56	surface	Retort Building	QC	03RDV08SL	X	Analytica			
03RDV10SL	9/21/2003	16:10	surface	Retort Building	PR		X	Analytica		X	Frontier Geo.
03RDV11SL	9/21/2003	16:12	surface	Retort Building	QC	03RDV10SL				X	Frontier Geo.
03RDV12SL	9/21/2003	16:40	surface	Rotary Furnace Stack	PR		X	Analytica		X	Frontier Geo.
03RDV13SL	9/21/2003	16:45	surface	Retort Building Stockpile	PR		X	Analytica		X	Frontier Geo.
03RDV14SL	9/21/2003	17:05	surface	Rotary Furnace	PR		X	Analytica			
03RDV15SL	9/21/2003	17:14	surface	Rotary Furnace	PR		X	Analytica			
03RDV16SL	9/21/2003	17:25	surface	Rotary Furnace	PR		X	Analytica		X	Frontier Geo.
03RDV17SL	9/21/2003	17:40	surface	Rotary Furnace	PR		X	Analytica		X	Frontier Geo.
03RDV18SL	9/21/2003	17:45	surface	Rotary Furnace	PR		X	Analytica			
03RDV19SL	9/21/2003	17:58	surface	Rotary Furnace	PR		X	Analytica			
03RDV20SL	9/21/2003	18:02	surface	Rotary Furnace	PR		X	Analytica			
03RDV21SL	9/22/2003	11:45	surface	Rotary Furnace	PR		X	Analytica			
03RDV22SL	9/22/2003	11:38	surface	Rotary Furnace	PR		X	Analytica			
03RDV23SL	9/22/2003	10:00	surface	Rotary Furnace	PR		X	Analytica		X	Frontier Geo.
03RDV24SL	9/22/2003	11:40	surface	Rotary Furnace	QC	03RDV22SL	X	Analytica			
03RDV25SL	9/22/2003	11:55	surface	Rotary Furnace	PR		X	Analytica			
03RDV26SL	9/23/2003	11:35	surface	Rotary Furnace Burnt Ore Pile	PR		X	Analytica		X	Frontier Geo.

MACTEC

Client Bureau of Land Management (BLM) Laboratory Analytica Alaska

MACTEC Project 57064 Data Report Number/Date A0309193 / 10-28-2003

LABORATORY DATA REVIEW CHECKLIST

		YES	NO	NOT APPLICABLE
1.	Laboratory analytical data report appears complete (all data results present for all samples submitted for analysis) and there are no apparent transcription errors:	X		
2.	Samples analyzed within applicable holding times (based on date of sample collection):*	X		
3.	Trip blanks, field blanks or laboratory method blanks are free of blank contamination:	X		
4.	If field duplicate samples collected, calculated results meet Relative Percent Difference guidelines: **		X	
5.	Surrogate recoveries (organic analyses only) within laboratory reported recovery acceptance ranges:			X
6.	If Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples required to meet project objectives, Percent Recoveries (%R) and Relative Percent Difference (RPD) within laboratory reported acceptance ranges:		X	
7.	Reported detection limits meet project objectives (e.g., are capable of achieving applicable site standards):	X		
8.	Completed Chain-Of-Custody received noting sample/custody seal condition (with airbill, if appropriate):	X		
9.	Analytical costs within authorized budget for these services:	X		

COMMENTS:

1. Analytical data was reviewed according to the MACTEC Quality Assurance, August, 2003.

2. Field duplicates 03RDV22SL (PR) and 03RDV24SL (QC) have relative percent differences (RPD) greater than 50 percent for Mercury (58.33 percent). See attached RPD calculations.

3. Mercury was found to be outside the method control limit on the low side for the RPD correlation for precision for MS/MSD for the 6020 (Metals) analysis in samples 03RDV19SL and 03RDV25SL . Sample 03RDV19SL has aMercury concentration is greater than 4X the spike level, suggesting a recovery is not meaningful, and the result should be used as a replicate. Results are considered not significantly affected.

Notes: 1. This checklist is intended for use with the laboratory reporting formats typical of most projects. If "no" is answered to one or more of the above checklist questions 1 through 7, a more detailed Data Validation may be required, and a person knowledgeable in Data Validation protocols should be consulted. This checklist should not be used if the project scope requires Data Validation from the onset.

2. * = Based upon EPA Guidance and the applicable analytical method references. See reverse side of checklist for details.

GENERAL DATA REVIEW CRITERIA

Typical Holding Times for Water Samples:*

Volatile Organic Compounds (EPA Method 8260/624)	14 days to analysis when preserved with HCl (7 days if not preserved)
Semi-volatile Organic Compounds (EPA Method 8270)	7 days to extraction, 40 days to analysis
Pesticides/PCBs (EPA Method 8081/8082)	7 days to extraction, 40 days to analysis
Metals (except Mercury)	180 days to analysis when preserved with HNO_3
Mercury	28 days to analysis
Cyanide	14 days to analysis

Typical Relative Percent Difference (RPD) Guidelines:**

	Aqueous	Soil
Volatile Organic Compounds (EPA Method 8260/624)	<30	<50
Semi-volatile Organic Compounds (EPA Method 8270)	<30	<50
Pesticides/PCBs (EPA Method 8081/8082)	<30	<50
Metals and Cyanide	<30	<50

Notes:

RPD calculated as:

$$RPD = [\,|A-B|\,] / [\,(A+B)/2\,] \times 100$$

where:

RPD = Relative Percent Difference
A = Sample Result
B = Duplicate Sample Result

* = Based upon EPA Guidance and the applicable analytical method references.

** = Based upon EPA Guidance. Use these criteria on duplicate and sample results that exceed five times the reported detection limit.

ANALYTICA
Environmental Laboratories

Analytica Alaska Incorporated
website:
www.analyticagroup.com

Reviewed by JED 8/29/05

10/28/2003

Mactec Engineering & Consulting Inc.
601 E. 57th Place
Anchorage, AK 99518
Attn: Bryan Lund

Work Order #: A0309193
Date: 10/28/2003
Work ID: Red Devil Historic Survey
Date Received: 9/26/2003

Sample Identification

Lab Sample Number	Client Description	Lab Sample Number	Client Description
A0309193-01	03RDV01SL	A0309193-02	03RDV02SL
A0309193-03	03RDV03SL	A0309193-04	03RDV04SL
A0309193-05	03RDV05SL	A0309193-06	03RDV06SL
A0309193-07	03RDV07SL	A0309193-08	03RDV08SL
A0309193-09	03RDV09SL	A0309193-10	03RDV10SL
A0309193-11	03RDV12SL	A0309193-12	03RDV13SL
A0309193-13	03RDV14SL	A0309193-14	03RDV15SL
A0309193-15	03RDV16SL	A0309193-16	03RDV17SL
A0309193-17	03RDV18SL	A0309193-18	03RDV19SL
A0309193-19	03RDV20SL	A0309193-20	03RDV21SL
A0309193-21	03RDV22SL	A0309193-22	03RDV23SL
A0309193-23	03RDV24SL	A0309193-24	03RDV25SL
A0309193-25	03RDV26SL		

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Gina Durkin
Project Manager

Case Narrative

Analytica Alaska Inc.
Work Order: A0309193

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Standard Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures, ASTM D 2216-80, July 1980.

Test Methods for Evaluating Solid Waste, USEPA SW-846, Third Edition, Revision 4, December 1996.

REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN
A summary of our review is shown below, organized by test:

SAMPLE RECEIPT:
There were 25 samples received at Analytica-Anchorage (ADEC Laboratory Approval Number: UST-014) on 9/26/2003 in two coolers at temperatures of 2.4°C and 2.9°C. Samples were received in good condition and in order per chain of custody

Samples were transferred for Mercury analysis at Analytica Environmental Laboratories (AEL); 12189 Pennsylvania St. Thornton, CO 80241 where they were received at a temperature of 2.8°C in good condition and in order per chain of custody.

Samples fractions for Metals testing were transferred to Analytica-SE (5438 Shuane Dr. Juneau AK, 99801) where they were received in one cooler at temperature of 2.9°C on 10/1/2003. Samples were received in good condition and in order per chain of custody. Due to laboratory capacity limitations, method 6020 Metals samples were subsequently sent for subcontract analysis to BC Research Inc. 3650 Wesbrook Mall, Vancouver, BC, V6S 2L2. Results for 6020 metals are included within.

Test Method: Percent Moisture (ASTM D2216) - Solid

All method criteria was met for this test.

Test Method: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total Hg - Solid

HOLDING TIMES:
Holding times were met for this Test

SAMPLE PREPARATION ISSUES AND OBSERVATIONS:
There were no unusual observations.

INSTRUMENT PERFORMANCE CHECKS:
Instrument checks were within method criteria.

INITIAL CALIBRATIONS:
Initial calibrations were within method criteria.

CONTINUING CALIBRATIONS:
Continuing calibrations were within method criteria.

METHOD BLANK OUTLIERS:
There are no method blank outliers.

LCS OUTLIERS:

Case Narrative

Analytica Alaska Inc.
Work Order: A0309193
(continued)

The LCS shown below has the target slightly outside of control windows.

Type	BatchNumber	Analyte	Recovery	LCL	UCL	Status
LCS	T031016004	Mercury	130.	70	130	Complete

MS/MSD and DUP OUTLIERS:

As shown below, the MS' were outside of limits for Mercury. Sample 03RDV19SL (A0309193-18B) has a Mercury concentration greater than four times spike amount. In this case it is not appropriate to calculate a recovery. The result should be used as a replicate.

Type	Client Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	03RDV25SL	A0309193-24B	Mercury	-43.	70	130	2.94	2.53
MS	03RDV19SL	A0309193-18B	Mercury	35.8	70	130	23.2	2.30

Test Method: SW6020 - ICPMS - Total (BC Research) - Solid

METHOD BLANK OUTLIERS:
There are no method blank outliers.

DUP OUTLIERS:
There are no DUP outliers.

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV01SL**

Matrix: Soil Collection Date: 9/21/2003 2:55:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number: A0309193-01B
Prep Date: 10/2/2003
Analytical Method ID: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total
Prep Method ID: 7471A
Prep Batch Number: T031002018
Report Basis: Dry Weight Basis
Sample prep wt./vol: 0.63 g

Analysis Date: 10/8/2003 1:15:11PM
Instrument: CVAA_1
File Name: B31007S.WKS
Dilution Factor: 10
Percent Moisture 24
Analyst Initials: CS
Prep Extract Vol: 50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	7.6		mg/Kg	0.53	0.020	2

The following test was conducted by: BC Research Inc.

Lab Sample Number: A0309193-01A
Prep Date: 10/24/2003
Analytical Method ID: SW6020 - ICPMS - Total (BC Research)
Prep Method ID: 3050_ICP
Prep Batch Number: J031027001
Report Basis: Dry Weight Basis
Sample prep wt./vol: 1.00 g

Analysis Date: 10/24/2003 1:06:33PM
Instrument: Sub Contract
File Name:
Dilution Factor: 1
Percent Moisture 24
Analyst Initials: BC Research
Prep Extract Vol: 1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	732		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV02SL**

Matrix: Soil Collection Date: 9/21/2003 3:10:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-02B	Analysis Date:	10/8/2003 1:20:51PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31007S.WKS
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	19
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	4.5		mg/Kg	0.54	0.020	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-02A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	19
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	425		mg/Kg	0.0099	0.00017	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV03SL**

Matrix: Soil Collection Date: 9/21/2003 3:16:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-03B	Analysis Date:	10/8/2003 1:26:51PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31007S.WKS
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	21
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.56 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	2.9		mg/Kg	0.57	0.021	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-03A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	21
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	496		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV04SL**

Matrix: Soil Collection Date: 9/21/2003 3:22:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-04B	Analysis Date:	10/8/2003 1:32:44PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31007S.WKS
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	14
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.62 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	14		mg/Kg	0.47	0.018	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-04A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	14
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	1,250		mg/Kg	0.0094	0.00016	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV05SL**

Matrix: Soil Collection Date: 9/21/2003 3:25:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-05B	Analysis Date:	10/8/2003 1:38:28PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31007S.WKS
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	7.91
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.55 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	**4.8**		mg/Kg	0.49	0.018	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-05A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	7.91
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	**628**		mg/Kg	0.0087	0.00015	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV06SL**

Matrix: Soil Collection Date: 9/21/2003 3:41:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-06B	Analysis Date:	10/8/2003 1:44:33PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31007S.WKS
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	21
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.62 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	**6.0**		mg/Kg	0.51	0.019	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-06A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	21
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	**89.0**		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV07SL**

Matrix: Soil Collection Date: 9/21/2003 3:48:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-07B	Analysis Date:	10/8/2003 1:50:55PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31007S.WKS
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	13
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	5.2		mg/Kg	0.50	0.019	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-07A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	13
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	132		mg/Kg	0.0093	0.00016	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: Red Devil Historic Survey

Client: Mactec Engineering & Consulting Inc.

Client Project Number: Mactec

Report Section: Client Sample Report

Client Sample Name: 03RDV08SL

Matrix: Soil

Collection Date: 9/21/2003 3:55:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-08B	Analysis Date:	10/8/2003 1:56:33PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	23
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	23		mg/Kg	0.57	0.021	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-08A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	23
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	258		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: Red Devil Historic Survey

Client: Mactec Engineering & Consulting Inc.

Client Project Number: Mactec

Report Section: Client Sample Report

Client Sample Name: 03RDV09SL

Matrix: Soil Collection Date: 9/21/2003 3:56:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-09B	Analysis Date:	10/8/2003 2:08:05PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	24
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.59 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	29		mg/Kg	0.56	0.021	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-09A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	24
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	218		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: Red Devil Historic Survey

Client: Mactec Engineering & Consulting Inc.

Client Project Number: Mactec

Report Section: Client Sample Report

Client Sample Name: 03RDV10SL

Matrix: Soil Collection Date: 9/21/2003 4:10:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-10B	Analysis Date:	10/8/2003 2:13:48PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	23
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.59 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	32		mg/Kg	0.55	0.020	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-10A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	23
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	175		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV12SL**

Matrix: Soil Collection Date: 9/21/2003 4:40:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-11B	Analysis Date:	10/8/2003 2:19:38PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	15
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.56 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	3.4		mg/Kg	0.52	0.019	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-11A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	15
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	118		mg/Kg	0.0094	0.00016	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: 03RDV13SL

Matrix: Soil Collection Date: 9/21/2003 4:45:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-12B	Analysis Date:	10/9/2003 2:55:20PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031009S.WK
Prep Method ID:	7471A	Dilution Factor:	1,000
Prep Batch Number:	T031002018	Percent Moisture	7.07
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.60 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	940		mg/Kg	45	1.7	3

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-12A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	7.07
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	1,390		mg/Kg	0.0087	0.00015	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV14SL**

Matrix: Soil Collection Date: 9/21/2003 5:05:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-13B	Analysis Date:	10/8/2003 6:34:19PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	100
Prep Batch Number:	T031002018	Percent Moisture	21
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.58 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	140		mg/Kg	5.4	0.20	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-13A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	21
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	674		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV15SL**

Matrix: Soil Collection Date: 9/21/2003 5:14:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-14B	Analysis Date:	10/8/2003 2:37:44PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	22
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	5.3		mg/Kg	0.56	0.021	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-14A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	22
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	121		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV16SL**

Matrix: Soil

Collection Date: 9/21/2003 5:25:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-15B	Analysis Date:	10/8/2003 2:44:27PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	15
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	3.4		mg/Kg	0.52	0.019	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-15A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	15
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	95.0		mg/Kg	0.0094	0.00016	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV17SL**

Matrix: Soil

Collection Date: 9/21/2003 5:40:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-16B	Analysis Date:	10/8/2003 2:50:51PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	16
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.56 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	7.6		mg/Kg	0.54	0.020	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-16A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	16
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	194		mg/Kg	0.0096	0.00017	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV18SL**

Matrix: Soil Collection Date: 9/21/2003 5:45:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-17B	Analysis Date:	10/8/2003 2:56:40PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031002018	Percent Moisture	18
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.59 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	5.7		mg/Kg	0.52	0.019	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-17A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	18
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	38.0		mg/Kg	0.0098	0.00017	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV19SL**

Matrix: Soil Collection Date: 9/21/2003 5:58:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-18B	Analysis Date:	10/23/2003 6:02:34PM
Prep Date:	10/16/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31023S.WKS
Prep Method ID:	7471A	Dilution Factor:	100
Prep Batch Number:	T031016004	Percent Moisture	11
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.58 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	23		mg/Kg	4.9	0.18	3

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-18A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	11
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	2,000		mg/Kg	0.0090	0.00016	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV20SL**

Matrix: Soil Collection Date: 9/21/2003 6:02:00PM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-19B	Analysis Date:	10/23/2003 4:48:19PM
Prep Date:	10/16/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31023S.WKS
Prep Method ID:	7471A	Dilution Factor:	5
Prep Batch Number:	T031016004	Percent Moisture	22
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.62 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	2.9		mg/Kg	0.26	0.0096	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-19A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	22
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	645		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: Red Devil Historic Survey

Client: Mactec Engineering & Consulting Inc.

Client Project Number: Mactec

Report Section: Client Sample Report

Client Sample Name: 03RDV21SL

Matrix: Soil Collection Date: 9/22/2003 11:45:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-20B	Analysis Date:	10/23/2003 4:54:45PM
Prep Date:	10/16/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31023S.WKS
Prep Method ID:	7471A	Dilution Factor:	5
Prep Batch Number:	T031016004	Percent Moisture	13
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.63 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	2.5		mg/Kg	0.23	0.0085	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-20A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	13
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	983		mg/Kg	0.0092	0.00016	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV22SL**

Matrix: Soil Collection Date: 9/22/2003 11:38:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-21B	Analysis Date:	10/23/2003 5:01:01PM
Prep Date:	10/16/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31023S.WKS
Prep Method ID:	7471A	Dilution Factor:	5
Prep Batch Number:	T031016004	Percent Moisture	16
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.57 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	3.4		mg/Kg	0.26	0.0097	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-21A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	16
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	232		mg/Kg	0.0096	0.00017	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV23SL**

Matrix: Soil Collection Date: 9/22/2003 10:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-22B	Analysis Date:	10/23/2003 5:07:14PM
Prep Date:	10/16/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31023S.WKS
Prep Method ID:	7471A	Dilution Factor:	5
Prep Batch Number:	T031016004	Percent Moisture	13
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.61 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	2.9		mg/Kg	0.24	0.0088	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-22A	Analysis Date:	10/24/2003 1:06:33AM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	13
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	359		mg/Kg	0.0093	0.00016	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: Red Devil Historic Survey

Client: Mactec Engineering & Consulting Inc.

Client Project Number: Mactec

Report Section: Client Sample Report

Client Sample Name: 03RDV24SL

Matrix: Soil

Collection Date: 9/22/2003 11:40:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-23B	Analysis Date:	10/9/2003 2:37:58PM
Prep Date:	10/7/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031009S.WK
Prep Method ID:	7471A	Dilution Factor:	100
Prep Batch Number:	T031007004	Percent Moisture	22
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.58 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	6.2		mg/Kg	5.5	0.21	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-23A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	22
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	253		mg/Kg	0.011	0.00018	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV25SL**

Matrix: Soil Collection Date: 9/22/2003 11:55:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-24B	Analysis Date:	10/9/2003 2:44:06PM
Prep Date:	10/7/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031009S.WK
Prep Method ID:	7471A	Dilution Factor:	10
Prep Batch Number:	T031007004	Percent Moisture	11
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.63 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	**2.9**		mg/Kg	0.44	0.017	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-24A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	11
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	**230**		mg/Kg	0.0092	0.00016	1

Detailed Analytical Report

Analytica Alaska Inc.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Report Section: Client Sample Report

Client Sample Name: **03RDV26SL**

Matrix: Soil Collection Date: 9/23/2003 11:35:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	A0309193-25B	Analysis Date:	10/9/2003 2:49:42PM
Prep Date:	10/7/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031009S.WK
Prep Method ID:	7471A	Dilution Factor:	100
Prep Batch Number:	T031007004	Percent Moisture	14
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.60 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	160		mg/Kg	4.9	0.18	2

The following test was conducted by: BC Research Inc.

Lab Sample Number:	A0309193-25A	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	14
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	980		mg/Kg	0.0093	0.00016	1

Detailed Analytical Report

Analytica Environmental Laboratories, Inc.

Workorder (SDG): A0309193

Project: Red Devil Historic Survey

Client: Mactec Engineering & Consulting Inc.

Client Project Number: Mactec

Report Section: Method Blank Report

Client Sample Name: MB

Matrix: Solid Collection Date: 10/2/2003 12:00:00AM

The following test was conducted by: Analytica - Thornton

Lab Sample Number:	T031002018-MB	Analysis Date:	10/6/2003 12:03:52PM
Prep Date:	10/2/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031006S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T031002018	Percent Moisture	NA
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.50 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	ND		mg/Kg	0.050	0.0019	1

Lab Sample Number:	T031007004-MB	Analysis Date:	10/8/2003 3:50:00PM
Prep Date:	10/7/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B031008S.WK
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T031007004	Percent Moisture	NA
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.50 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	ND		mg/Kg	0.050	0.0019	1

Lab Sample Number:	T031016004-MB	Analysis Date:	10/23/2003 3:28:58PM
Prep Date:	10/16/2003	Instrument:	CVAA_1
Analytical Method ID:	SW7471A - Mercury in Solid or Semisolid Waste by CVAA - Total	File Name:	B31023S.WKS
Prep Method ID:	7471A	Dilution Factor:	1
Prep Batch Number:	T031016004	Percent Moisture	NA
Report Basis:	Dry Weight Basis	Analyst Initials:	CS
Sample prep wt./vol:	0.50 g	Prep Extract Vol:	50.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Mercury	7439-97-6	ND		mg/Kg	0.050	0.0019	1

The following test was conducted by: BC Research Inc.

Lab Sample Number:	J031027001-MB	Analysis Date:	10/24/2003 1:06:33PM
Prep Date:	10/24/2003	Instrument:	Sub Contract
Analytical Method ID:	SW6020 - ICPMS - Total (BC Research)	File Name:	
Prep Method ID:	3050_ICP	Dilution Factor:	1
Prep Batch Number:	J031027001	Percent Moisture	NA
Report Basis:	Dry Weight Basis	Analyst Initials:	BC Research
Sample prep wt./vol:	1.00 g	Prep Extract Vol:	1.00 ml

Analyte	CASNo	Result	Flags	Units	PQL	MDL	Rerun #:
Arsenic	7440-38-2	ND		mg/Kg	0.40	0.00014	1

Detailed Analytical Report

Analytica Alaska Southeast

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): A0309193
Project: Red Devil Historic Survey
Project Number:

QUALITY CONTROL REPORT

Prep Batch: **T031002018**

LCS REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To
MB: T031002018-MB
Prep Date: 10/2/2003
MB Anal. Date: 10/6/2003 12:03:52PM
LCS Anal. Date: 10/6/2003 12:10:19PM
Units: mg/Kg
Matrix: Solid

Analyte Name	SampResult	LCSRes.	SPLev	Recov.	Recov Lim	RPDLim	Flag
Mercury	ND	2.16	2.48	87.1	70 - 130		

Prep Batch: **T031007004**

SAMPLE DUPLICATE REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To
Base Sample: A0309193-24B
Prep Date: 10/7/2003
Samp. Anal. Date: 10/9/2003 2:44:06PM
DUP Anal. Date: 10/9/2003 3:12:26PM
Units: mg/Kg
Matrix: Soil

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Mercury	2.94	2.28	25.3	35	

LCS REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To
MB: T031007004-MB
Prep Date: 10/7/2003
MB Anal. Date: 10/8/2003 3:50:00PM
LCS Anal. Date: 10/8/2003 3:55:41PM
Units: mg/Kg
Matrix: Solid

Analyte Name	SampResult	LCSRes.	SPLev	Recov.	Recov Lim	RPDLim	Flag
Mercury	ND	2.34	2.48	94.4	70 - 130		

MS REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To
Parent: A0309193-24B
Prep Date: 10/7/2003
Samp. Anal. Date: 10/9/2003 2:44:06PM
MS Anal. Date: 10/9/2003 3:18:50PM
Units: mg/Kg
Matrix: Soil

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim	Flag
Mercury	2.94	1.85	2.53	-43.0	70 - 130	*lowMS*

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado
Workorder (SDG): A0309193
Project: Red Devil Historic Survey
Project Number:
Prep Batch: **T031016004**

QUALITY CONTROL REPORT

SAMPLE DUPLICATE REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To
Base Sample: A0309193-18B
Prep Date: 10/16/2003

Samp. Anal. Date: 10/23/2003 6:02:34PM
DUP Anal. Date: 10/23/2003 6:08:15PM
Units: mg/Kg
Matrix: Soil

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Mercury	23.2	0.00285	200.0	35	OUT

LCS REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To
MB: T031016004-MB
Prep Date: 10/16/2003

MB Anal. Date: 10/23/2003 3:28:58PM
LCS Anal. Date: 10/23/2003 5:56:45PM
Units: mg/Kg
Matrix: Solid

Analyte Name	SampResult	LCSRes.	SPLev	Recov.	Recov Lim	RPDLim	Flag
Mercury	ND	3.24	2.48	130.6	70 - 130		high

MS REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To
Parent: A0309193-18B
Prep Date: 10/16/2003

Samp. Anal. Date: 10/23/2003 6:02:34PM
MS Anal. Date: 10/23/2003 6:13:55PM
Units: mg/Kg
Matrix: Soil

Analyte Name	SampResult	MSRes.	SPLev	Recov.	Recov Lim		Flag
Mercury	23.2	24.1	2.30	39.1	70 - 130	*NOTE 2*	

SERIAL DILUTION REPORT

Analysis: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To
Base Sample: A0309193-18B
Prep Date: 10/16/2003

Samp. Anal. Date: 10/23/2003 6:02:34PM
SER DIL. Date: 10/23/2003 4:23:02PM
Units: mg/Kg
Matrix: Soil

Analyte Name	SampResult	PQL.	MDL.	SerialRes.	SerPQL.	RPD	Flag
Mercury	23.2	4.9	0.18	10.9	0.24	72.1	OUT

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Tests Run at: Analytica Environmental Laboratories - Thornton, Colorado

Workorder (SDG): A0309193

Project: Red Devil Historic Survey

Project Number:

Prep Batch: **T031018005**

QUALITY CONTROL REPORT

SAMPLE DUPLICATE REPORT

Analysis: Percent Moisture (ASTM D2216)

Base Sample: A0309193-12B

Prep Date: 10/17/2003

Samp. Anal. Date: 10/18/2003 10:27:13AM

DUP Anal. Date: 10/18/2003 10:27:13AM

Units: %

Matrix: Soil

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Moisture	7.07	7.84	10.3	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

Tests Run at: Analytica Environmental Laboratories - Juneau, Alaska

Workorder (SDG): A0309193

Project: Red Devil Historic Survey

Project Number:

QUALITY CONTROL REPORT

Prep Batch: **J031027001**

SAMPLE DUPLICATE REPORT

Analysis: SW6020 - ICPMS - Total (BC Research)

Base Sample: A0309193-14A
Prep Date: 10/24/2003

Samp. Anal. Date: 10/24/2003 1:06:33PM

DUP Anal. Date: 10/24/2003 1:06:33PM

Units: mg/Kg

Matrix: Soil

Analyte Name	SampResult	DUPRes.	RPD	RPDLim	Flag
Arsenic	121	111	8.6	20	

FOOTNOTES TO QC REPORT

Note 1: Results are shown to three significant figures to avoid rounding errors in calculations.

Note 2: If the sample concentration is greater than 4 times the spike level, a recovery is not meaningful, and the result should be used as a replicate. In such cases the spike is not as high as expected random measurement variability of the sample result itself.

Note 3: For sample duplicates, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample and duplicate results are not five times the PQL or greater, then the RPD is not expected to fall within the window shown and the comparison should be made on the basis of the absolute difference. Analytica uses the criterion that the absolute difference should be less than the PQL for water or less than 2XPQL for other matrices.

Note 4: For serial dilutions, if the result is less than the PQL, the duplicate RPD is not applicable. If the sample result is not 50 times the MDL or greater, then the fact that the RPD does not meet the 10% criterion has little signifcance. Otherwise it indicates that a matrix bias may exist at the analytical step.

Detailed Analytical Report

Analytica Alaska Southeast

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **19,942** **Lab Project Number:** **A0309193**

Prep Date: 10/2/2003

Lab Method Blank Id: T031002018-MB

Prep Batch ID: T031002018

Method: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
B0309283-01A	Batch QC	B031006S.WKS	10/6/2003 1:06:45PM
T031002018-LCS	LCS	B031006S.WKS	10/6/2003 12:10:19PM
B0309283-01A-DUP	DUP	B031006S.WKS	10/6/2003 1:12:34PM
B0309283-01A-MS	MS	B031006S.WKS	10/6/2003 1:18:31PM
A0309193-08B	03RDV08SL	B031008S.WKS	10/8/2003 1:56:33PM
A0309193-09B	03RDV09SL	B031008S.WKS	10/8/2003 2:08:05PM
A0309193-10B	03RDV10SL	B031008S.WKS	10/8/2003 2:13:48PM
A0309193-11B	03RDV12SL	B031008S.WKS	10/8/2003 2:19:38PM
A0309193-13B	03RDV14SL	B031008S.WKS	10/8/2003 6:34:19PM
A0309193-14B	03RDV15SL	B031008S.WKS	10/8/2003 2:37:44PM
A0309193-15B	03RDV16SL	B031008S.WKS	10/8/2003 2:44:27PM
A0309193-16B	03RDV17SL	B031008S.WKS	10/8/2003 2:50:51PM
A0309193-17B	03RDV18SL	B031008S.WKS	10/8/2003 2:56:40PM
A0309193-01B	03RDV01SL	B31007S.WKS	10/8/2003 1:15:11PM
A0309193-02B	03RDV02SL	B31007S.WKS	10/8/2003 1:20:51PM
A0309193-03B	03RDV03SL	B31007S.WKS	10/8/2003 1:26:51PM
A0309193-04B	03RDV04SL	B31007S.WKS	10/8/2003 1:32:44PM
A0309193-05B	03RDV05SL	B31007S.WKS	10/8/2003 1:38:28PM
A0309193-06B	03RDV06SL	B31007S.WKS	10/8/2003 1:44:33PM
A0309193-07B	03RDV07SL	B31007S.WKS	10/8/2003 1:50:55PM
A0309193-12B	03RDV13SL	B031009S.WKS	10/9/2003 2:55:20PM

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **19,942** **Lab Project Number:** **A0309193**

Prep Date: 10/7/2003

Lab Method Blank Id: T031007004-MB
Prep Batch ID: T031007004
Method: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
A0309193-23B	03RDV24SL	B031009S.WKS	10/9/2003 2:37:58PM
A0309193-24B	03RDV25SL	B031009S.WKS	10/9/2003 2:44:06PM
A0309193-25B	03RDV26SL	B031009S.WKS	10/9/2003 2:49:42PM
A0309193-24B-DUP	DUP	B031009S.WKS	10/9/2003 3:12:26PM
A0309193-24B-MS	MS	B031009S.WKS	10/9/2003 3:18:50PM
T031007004-LCS	LCS	B031008S.WKS	10/8/2003 3:55:41PM

Prep Date: 10/16/2003

Lab Method Blank Id: T031016004-MB
Prep Batch ID: T031016004
Method: SW7471A - Mercury in Solid or Semisolid Waste by CVAA - To

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
A0309193-18B	03RDV19SL	B31023S.WKS	10/23/2003 6:02:34PM
A0309193-19B	03RDV20SL	B31023S.WKS	10/23/2003 4:48:19PM
A0309193-20B	03RDV21SL	B31023S.WKS	10/23/2003 4:54:45PM
A0309193-21B	03RDV22SL	B31023S.WKS	10/23/2003 5:01:01PM
A0309193-22B	03RDV23SL	B31023S.WKS	10/23/2003 5:07:14PM
T031016004-LCS	LCS	B31023S.WKS	10/23/2003 5:56:45PM
A0309193-18B-DUP	DUP	B31023S.WKS	10/23/2003 6:08:15PM
A0309193-18B-MS	MS	B31023S.WKS	10/23/2003 6:13:55PM

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **19,942** **Lab Project Number:** **A0309193**

Prep Date: 10/17/2003

Lab Method Blank Id: T031018005-MB
Prep Batch ID: T031018005
Method: Percent Moisture (ASTM D2216)

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
A0309193-01B	03RDV01SL		10/18/2003 10:27:13AM
A0309193-02B	03RDV02SL		10/18/2003 10:27:13AM
A0309193-03B	03RDV03SL		10/18/2003 10:27:13AM
A0309193-04B	03RDV04SL		10/18/2003 10:27:13AM
A0309193-05B	03RDV05SL		10/18/2003 10:27:13AM
A0309193-06B	03RDV06SL		10/18/2003 10:27:13AM
A0309193-07B	03RDV07SL		10/18/2003 10:27:13AM
A0309193-08B	03RDV08SL		10/18/2003 10:27:13AM
A0309193-09B	03RDV09SL		10/18/2003 10:27:13AM
A0309193-10B	03RDV10SL		10/18/2003 10:27:13AM
A0309193-11B	03RDV12SL		10/18/2003 10:27:13AM
A0309193-12B	03RDV13SL		10/18/2003 10:27:13AM
A0309193-13B	03RDV14SL		10/18/2003 10:27:13AM
A0309193-14B	03RDV15SL		10/18/2003 10:27:13AM
A0309193-15B	03RDV16SL		10/18/2003 10:27:13AM
A0309193-16B	03RDV17SL		10/18/2003 10:27:13AM
A0309193-17B	03RDV18SL		10/18/2003 10:27:13AM
A0309193-18B	03RDV19SL		10/18/2003 10:27:13AM
A0309193-19B	03RDV20SL		10/18/2003 10:27:13AM
A0309193-12B-DUP	DUP		10/18/2003 10:27:13AM

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **19,942** **Lab Project Number:** **A0309193**

Prep Date: 10/17/2003

Lab Method Blank Id: T031018006-MB

Prep Batch ID: T031018006

Method: Percent Moisture (ASTM D2216)

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
A0309193-20B	03RDV21SL		10/18/2003 10:30:51AM
A0309193-21B	03RDV22SL		10/18/2003 10:30:51AM
A0309193-22B	03RDV23SL		10/18/2003 10:30:51AM
A0309193-23B	03RDV24SL		10/18/2003 10:30:51AM
A0309193-24A	03RDV25SL		10/18/2003 10:30:51AM
A0309193-25B	03RDV26SL		10/18/2003 10:30:51AM
B0310169-01A	Batch QC		10/18/2003 10:30:51AM
B0310169-01A-DUP	DUP		10/18/2003 10:30:51AM

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

QC BATCH ASSOCIATIONS - BY METHOD BLANK

Lab Project ID: **19,942** **Lab Project Number:** **A0309193**

Prep Date: 10/24/2003

Lab Method Blank Id: J031027001-MB

Prep Batch ID: J031027001

Method: SW6020 - ICPMS - Total (BC Research)

This Method blank and sample preparation batch are associated with the following samples, spikes, and duplicates:

SampleNum	ClientSampleName	DataFile	AnalysisDate
A0309193-01A	03RDV01SL		10/24/2003 1:06:33PM
A0309193-02A	03RDV02SL		10/24/2003 1:06:33PM
A0309193-03A	03RDV03SL		10/24/2003 1:06:33PM
A0309193-04A	03RDV04SL		10/24/2003 1:06:33PM
A0309193-05A	03RDV05SL		10/24/2003 1:06:33PM
A0309193-06A	03RDV06SL		10/24/2003 1:06:33PM
A0309193-07A	03RDV07SL		10/24/2003 1:06:33PM
A0309193-08A	03RDV08SL		10/24/2003 1:06:33PM
A0309193-09A	03RDV09SL		10/24/2003 1:06:33PM
A0309193-10A	03RDV10SL		10/24/2003 1:06:33PM
A0309193-11A	03RDV12SL		10/24/2003 1:06:33PM
A0309193-12A	03RDV13SL		10/24/2003 1:06:33PM
A0309193-13A	03RDV14SL		10/24/2003 1:06:33PM
A0309193-14A	03RDV15SL		10/24/2003 1:06:33PM
A0309193-15A	03RDV16SL		10/24/2003 1:06:33PM
A0309193-16A	03RDV17SL		10/24/2003 1:06:33PM
A0309193-17A	03RDV18SL		10/24/2003 1:06:33PM
A0309193-18A	03RDV19SL		10/24/2003 1:06:33PM
A0309193-19A	03RDV20SL		10/24/2003 1:06:33PM
A0309193-20A	03RDV21SL		10/24/2003 1:06:33PM
A0309193-21A	03RDV22SL		10/24/2003 1:06:33PM
A0309193-22A	03RDV23SL		10/24/2003 1:06:33AM
A0309193-23A	03RDV24SL		10/24/2003 1:06:33PM
A0309193-24A	03RDV25SL		10/24/2003 1:06:33PM
A0309193-25A	03RDV26SL		10/24/2003 1:06:33PM
A0309193-14A-DUP	DUP		10/24/2003 1:06:33PM

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

DATA FLAGS AND DEFINITIONS

The PQL is the Method Quantitation Limit as defined by USACE.
Reporting Limit: Limit below which results are shown as "ND". This may be the PQL, MDL, or a value between. See the report conventions below.

Result Field:

ND = Not Detected at or above the Reporting Limit
NA = Analyte not applicable (see Case Narrative for discussion)

Qualifier Fields:

LOW = Recovery is below Lower Control Limit
HIGH = Recovery , RPD, or other parameter is above Upper Control Limit
E = Reported concentration is above the instrument calibration upper range

Organic Analysis Flags:

B = Analyte was detected in the laboratory method blank
J = Analyte was detected above MDL or Reporting Limit but below the Quant Limit (PQL)

Inorganic Analysis Flags:

J = Analyte was detected above the Reporting Limit but below the Quant Limit (PQL)
W = Post digestion spike did not meet criteria
S = Reported value determined by the Method of Standard Additions (MSA)

Other Flags may be applied. See Case Narrative for Description

Workorder (SDG): A0309193

Project: **Red Devil Historic Survey**

Client: **Mactec Engineering & Consulting Inc.**

Client Project Number: **Mactec**

REPORTING CONVENTIONS FOR THIS REPORT

A0309193

TestPkgName	Basis	# Sig Figs	Reporting Limit
6020/3050B (Solid) - Total (BC Research)	Dry Weight Basis	3	Report to MDL, J qual below PQL
7471A/7471A (Solid) - Total Hg	Dry Weight Basis	2	Report to PQL
BPMoist	As Received	2	Report to MDL, J qual below PQL

ANALYTICA
ALASKA Inc.

Support Documentation

№ 30383

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FAX: (303) 469-5254

LGN: A0309193
Quote: A0308001L
Project ID #:

Chain of Custody Record / Analysis Request

Company Name: MACTEC
Company Address: 601 EAST 57th Place ANCHORAGE AK 99518
Telephone: 907 563-8102
Fax: 907-561-
Email: BDLUND@mactec.com

Project Name: RED DEVIL HISTORIC SURVEY
Report To: BRYAN LUND
Invoice To: BRYAN LUND
P.O. Number 57064

Sample ID	Date Collected	Time collected	Matrix	# Containers 4oz				Hg, AS 6020, 7470																	MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV01SL	9/21/03	1455	S	1				X																				1
03RDV02SL	9/21/03	1510	S	1				X																				2
03RDV03SL	9/21/03	1516	S	1				X																				3
03RDV04SL	9/21/03	1524	S	1				X																				4
03RDV05SL	9/21/03	1525	S	1				X																				5
03RDV06SL	9/21/03	1541	S	1				X																				6
03RDV07SL	9/21/03	1548	S	1				X																				7
03RDV08SL	9/21/03	1555	S	1				X																				8
03RDV09SL	9/21/03	1556	S	1				X																				9

COMMENTS
TEMP BLANK INCLUDED
Rlnq. DW 9-30-03 1,4pm
AS TO SE
Hg TO AEL

- ☐ 10 Business Days STANDARD TAT
- ☐ 15 Business Days
- ☐ other:_____ # Business Days
(Prior Authorization Required.)

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:	Cooler Receipt Information
Signature: R Farrage	Signature: S Finnegan	Signature: S Finnegan	Signature: Dollie Wheeler	Temp Received: 2.4 °C
Printed Name: R. FARRAGE	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dollie Wheeler	Temp Received: 4.2 °C
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: AAI	Coolers: 2
Date/ Time: 9/25/03 11 AM	Date/ Time: 9/26/03 10:00 AM	Date/ Time: 9/26/03 11:45	Date/ Time: 9-26-03 1:45	Seals: 2 SF
				Means of Delivery / Way Bill # Client

№ 30384

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www.analyticagroup.com

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FAX: (303) 469-5254

LGN: AV309193
Quote:
Project ID #:

Chain of Custody Record / Analysis Request

Company Name: MACTEC
Company Address: 601 EAST 57th PLACE
ANCHORAGE AK 99518
Telephone: 907-563-8102
Fax: 907 561 4574
Email: BDLUND@mactec.com

Project Name: RED DEVIL HISTORIC SURVEY
Report To: BRYAN LUND
Invoice To: BRYAN LUND
P.O. Number 57064

Sample ID	Date Collected	Time collected	Matrix	# Containers: 40z Amber				Hg, AK														MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV10SL	9/21/03	1610	S	1				X															Ø		10
03RDV12SL	9/21/03	1640	S	1				X															Ø		11
03RDV13SL	9/21/03	1645	S	1				X															Ø		12
03RDV14SL	9/21/03	1705	S	1				X															Ø		13
03RDV15SL	9/21/03	1714	S	1				X															Ø		14
03RDV16SL	9/21/03	1725	S	1				X															Ø		15
03RDV17SL	9/21/03	1740	S	1				X															Ø		16
03RDV18SL	9/21/03	1745	S	1				X															Ø		17
03RDV19SL	9/21/03	1758	S	1				X															Ø		18

COMMENTS
TEMP BLANK INCLUDED Relinq. DW 9-30-03 1,4pm

AS TO SE Hg TO AEL

☐ 10 Business Days STANDARD TAT
☐ 15 Business Days
☐ other:_____ # Business Days
(Prior Authorization Required.)

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:	Cooler Receipt Information
Signature: R Farrage	Signature: S Finnegan	Signature: S Finnegan	Signature: Dollie Wheeler	Temp Received: 2.4 °C
Printed Name: R. FARRAGE	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dollie Wheeler	Temp Received: 1.2 °C
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: AAI	Coolers: 2
Date/ Time: 9/25/03 11AM	Date/ Time: 9/26/03 10:00 AM	Date/ Time: 9/26/03 11:45	Date/ Time: 9-26-03 11:45	Seals: 2-SF
				Means of Delivery / Way Bill # Client

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FAX: (907) 780-6670

12189 Pennsylvania Street
Thornton, CO 80241
(303) 469-8868
FAX: (303) 469-5254

Nº 30385

LGN: A030919
Quote:
Project ID #:

Chain of Custody Record / Analysis Request

Company Name: MACTEC
Company Address: 601 EAST 57th Place
ANCHORAGE AK 99518
Telephone: 907 563-8102
Fax: 907-561-4574
Email:

Project Name: RED DEVIL HISTORIC SURVEY
Report To: BRYAN LUND
Invoice To: BLUND
P.O. Number 57064

Sample ID	Date Collected	Time collected	Matrix	# Containers (4oz Amber)				Hg, AS														MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV20SL	9/21/03	1802	S	1				X															Ø		19
03RDV21SL	9/22/03	1145	S	1				X															Ø		20
03RDV22SL	9/22/03	1138	S	1				X															Ø		21
03RDV23SL	9/22/03	10:00	S	1				X															Ø		22
03RDV24SL	9/22/03	11:40	S	1				X															Ø		23
03RDV25SL	9/22/03	1155	S	1				X															Ø		24
03RDV26SL	9/22/03	11:35	S	1				X															Ø		25
																							Ø		

COMMENTS Reling - DW 9-30-03 1,4pm

AS TO SE
Hg TO AEL

☐ 10 Business Days STANDARD
☐ 15 Business Days TAT
☐ other:_____ # Business Days
(Prior Authorization Required.)

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:	Cooler Receipt Information
Signature: R. Farrage	Signature: S. Finnegan	Signature:	Signature: Dave Wheeler	Temp Received: 2.4 °C
Printed Name: R FARRAGE	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dave Wheeler	Temp Received: 4.2 °C
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: FAI	Coolers: 2
Date/ Time: 9/25/03 11AM	Date/ Time: 9/26/03 10:00 AM	Date/ Time: 9/26/03	Date/ Time: 9-26-03 11:45	Seals: 2-SE
				Means of Delivery / Way Bill # Client

ANALYTICA

Cooler Receipt Form

AAI-ANCHORAGE

Client: Mactec Engineering & Consul **Client Code:** 010400 **Order #:** A0309193
Project: Red Devil Historic Survey

Cooler ID: 1

A. Preliminary Examination Phase: **Date cooler opened:** 9/29/2003 **Signature:** D. Wheeler
Cooler opened by: dw

1. **Was airbill Attached?** No **Airbill #:** **Carrier Name:** Client
2. **Custody Seals?** Yes **How many?** 2 **Location:** LID **Seal Name:** SF
3. **Seals intact?** Yes
4. **Screened for radiation?** N/A
5. **COC Attached?** Yes **Properly Completed?** Yes **Signed by AEL employee?** Yes
6. **Project Identification from custody paper:** Red Devil Historic Survey
7. **Preservative:** BlueGel **Temperature:** 2.4

Designated person initial here to acknowledge receipt: DW **Date:** 9-30-03

COMMENTS: 2 coolers received at AAI 2.4, 4.2

B. Log-In Phase: **Samples Log-in Date:** 9/30/2003 **Log-in By:** dw **Signature:** D. Wheeler

1. **Packing Type:** Bubblewrap
2. **Were samples in separate bags?** Yes
3. **Were containers intact?** Yes **Labels agree with COC?** Yes
4. **Number of bottles received:** 50 **Number of samples received:** 25
5. **Correct containers used?** Yes **Correct preservatives added?** Yes
6. **Sufficient sample volume?** Yes
7. **Bubbles in VOA samples?** N/A
8. **Was Project manager called and status discussed?** No
9. **Was anyone called?** No **Who was called?** _____ **By whom?** _____ **Date:** _____

COMMENTS:

№ 30383

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FAX: (907) 780-6670

12189 Pennsylvania Street
Thornton, CO 80241
(303) 469-8868
FAX: (303) 469-5254

LGN: AU309193
Quote: A03080016
Project ID #:

Chain of Custody Record / Analysis Request

Company Name: MACTEC
Company Address: 601 EAST 57th Place ANCHORAGE AK 99518
Telephone: 907 563-8102
Fax: 907-561-
Email: BDLUND@mactec.com

Project Name: RED DEVIL HISTORIC SURVEY
Report To: BRYAN LUND
Invoice To: BRYAN LUND
P.O. Number 57064

Sample ID	Date Collected	Time collected	Matrix	# Containers 4oz				Hg, AS 6020, 7470														MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV01SL	9/21/03	1455	S	1				X																	1
03RDV02SL	9/21/03	1510	S	1				X																	2
03RDV03SL	9/21/03	1516	S	1				X																	3
03RDV04SL	9/21/03	1524	S	1				X																	4
03RDV05SL	9/21/03	1525	S	1				X																	5
03RDV06SL	9/21/03	1541	S	1				X																	6
03RDV07SL	9/21/03	1548	S	1				X																	7
03RDV08SL	9/21/03	1555	S	1				X																	8
03RDV09SL	9/21/03	1556	S	1				X																	9

COMMENTS
TEMP BLANK INCLUDED
Rlnq- DW 9-30-03 1,4pm

☐ 10 Business Days STANDARD TAT
☐ 15 Business Days
☐ other:_____ # Business Days
(Prior Authorization Required.)

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature:	Signature:	Signature:	Signature: Dollie Wheeler
Printed Name: R. FARRAGE	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dollie Wheeler
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: AAI
Date/ Time: 9/25/03 11AM	Date/ Time: 9/26/03 10:00 AM	Date/ Time: 9/26/03 11:45	Date/ Time: 9-26-03 1:45

Cooler Receipt Information
Temp Received: 2.4 °C
Temp Received: 4.2 °C
Coolers: 2
Seals: 2-SF

Means of Delivery / Way Bill #
Client

Rec; Darla Morris 10-1-03 9:15 2.8°C

№ 30384

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FAX: (907) 780-6670

12189 Pennsylvania Street
Thornton, CO 80241
(303) 469-8868
FAX: (303) 469-5254

LGN: AV309193
Quote:
Project ID #:

Chain of Custody Record / Analysis Request

Company Name: MACTEC
Company Address: 601 EAST 57th PLACE
ANCHORAGE AK 99518
Telephone: 907-563-8102
Fax: 907 561 4574
Email: BDLUND@mactec.com

Project Name: RED DEVIL HISTORIC SURVEY
Report To: BRYAN LUND
Invoice To: BRYAN LUND
P.O. Number 57064

Sample ID	Date Collected	Time collected	Matrix	# Containers 4oz Amber	Hg, AK	MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV10SL	9/21/03	1610	S	1	X		Ø		10
03RDV12SL	9/21/03	1640	S	1	X		Ø		11
03RDV13SL	9/21/03	1645	S	1	X		Ø		12
03RDV14SL	9/21/03	1705	S	1	X		Ø		13
03RDV15SL	9/21/03	1714	S	1	X		Ø		14
03RDV16SL	9/21/03	1725	S	1	X		Ø		15
03RDV17SL	9/21/03	1740	S	1	X		Ø		16
03RDV18SL	9/21/03	1745	S	1	X		Ø		17
03RDV19SL	9/21/03	1758	S	1	X		Ø		18

COMMENTS
TEMP BLANK INCLUDED Relinq. DW 9-30-03 1:4pm

☐ 10 Business Days STANDARD
☐ 15 Business Days TAT
☐ other:_____ # Business Days
(Prior Authorization Required.)

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:	Cooler Receipt Information
Signature: R Farrahe	Signature: S Finnegan	Signature: S Finnegan	Signature: Dollie Wheeler	Temp Received: 2.4 °C
Printed Name: R. FARRAHE	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dollie Wheeler	Temp Received: 4.2 °C
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: AAI	Coolers: 2
Date/ Time: 9/25/03 11AM	Date/ Time: 9/26/03 10:30AM	Date/ Time: 9/26/03 11:45	Date/ Time: 9-26-03 11:45	Seals: 2-SF
				Means of Delivery / Way Bill # Client

No 30385

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(303) 469-8868
FAX: (303) 469-5254

LGN: A030919
Quote:
Project ID #:

AEL-THORNTON

Chain of Custody Record / Analysis Request

Company Name: MACTEC
Company Address: 601 EAST 57th Place
ANCHORAGE AK 99518
Telephone: 907 563-8102
Fax: 907-561-4574
Email:

Project Name: RED DEVIL HISTORIC SURVEY
Report To: BRYAN LUND
Invoice To: BLUND
P.O. Number 57064

Sample ID	Date Collected	Time collected	Matrix	# Containers 4oz Amber	Hg, AS	MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV20SL	9/21/03	1802	S	1	X		Ø		19
03RDV21SL	9/22/03	1145	S	1	X		Ø		20
03RDV22SL	9/24/03	1136	S	1	X		Ø		21
03RDV23SL	9/22/03	10:00	S	1	X		Ø		22
03RDV24SL	9/22/03	11:40	S	1	X		Ø		23
03RDV25SL	9/22/03	1155	S	1	X		Ø		24
03RDV26SL	9/23/03	11:35	S	1	X		Ø		25
							Ø		
							Ø		

COMMENTS Relinq-DW 9-30-03 1,4,pm

☐ 10 Business Days STANDARD
☐ 15 Business Days TAT
☐ other:_____ # Business Days
(Prior Authorization Required.)

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: K. Image	Signature:	Signature:	Signature: Dollie Wheeler
Printed Name: R FARRAGE	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dollie Wheeler
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: AVAI
Date/ Time: 9/25/03 11AM	Date/ Time: 9/26/03 10:00 AM	Date/ Time: 9/26/03	Date/ Time: 9-29-03 11:45

Cooler Receipt Information
Temp Received: 2.4 °C
Temp Received: 4.2 °C
Coolers: 2
Seals: 2-SF

Means of Delivery / Way Bill #
Client

PEL Relinquished 10-1-03 9:15 2.8°C

ANALYTICA

Cooler Receipt Form

AEL-THORNTON

Client: Mactec Engineering & Consul **Client Code:** 010400 **Order #:** A0309193
Project: Red Devil Historic Survey

Cooler ID: 2

A. Preliminary Examination Phase: **Date cooler opened:** 10/1/2003 **Cooler opened by:** dm **Signature:** David S Morris

1. **Was airbill Attached?** Yes **Airbill #:** 7916 8375 3308 **Carrier Name:** FedEx
2. **Custody Seals?** Yes **How many?** 1 **Location:** front **Seal Name:** DW
3. **Seals intact?** Yes
4. **Screened for radiation?** N/A
5. **COC Attached?** N/A **Properly Completed?** Yes **Signed by AEL employee?** Yes
6. **Project Identification from custody paper:** Red Devel Historic Survey
7. **Preservative:** BlueGel **Temperature:** 2.8

Designated person initial here to acknowledge receipt: DSM **Date:** 10-1-03

COMMENTS:

B. Log-In Phase: **Samples Log-in Date:** 10/1/2003 **Log-in By:** dm **Signature:** David S Morris

1. **Packing Type:** Bubblewrap
2. **Were samples in separate bags?** Yes
3. **Were containers intact?** Yes **Labels agree with COC?** Yes
4. **Number of bottles received:** 25 **Number of samples received:** 25
5. **Correct containers used?** Yes **Correct preservatives added?** N/A
6. **Sufficient sample volume?** Yes
7. **Bubbles in VOA samples?** N/A
8. **Was Project manager called and status discussed?** No
9. **Was anyone called?** No **Who was called?** _____ **By whom?** _____ **Date:** _____

COMMENTS:

№ 30383

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12189 Pennsylvania Street
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FAX: (303) 469-5254

LGN: AU309193
Quote: A03a8co11e
Project ID #:

Chain of Custody Record / Analysis Request

AAISE-JUNEAU

Company Name: MACTEC
Company Address: 601 EAST 57th Place ANCHORAGE AK 99518
Telephone: 907 563-8102
Fax: 907-561-
Email: BDLUND@mactec.com

Project Name: RED DEVIL HISTORIC SURVEY
Report To: BRYAN LUND
Invoice To: BRYAN LUND
P.O. Number 57064

Sample ID	Date Collected	Time collected	Matrix	# Containers 4oz				Hg, As 6020, 7470																	MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV01SL	9/21/03	1455	S	1				X																				1
03RDV02SL	9/21/03	1510	S	1				X																				2
03RDV03SL	9/21/03	1516	S	1				X																				3
03RDV04SL	9/21/03	1524	S	1				X																				4
03RDV05SL	9/21/03	1525	S	1				X																				5
03RDV06SL	9/21/03	1541	S	1				X																				6
03RDV07SL	9/21/03	1548	S	1				X																				7
03RDV08SL	9/21/03	1555	S	1				X																				8
D3RDV09SL	9/21/03	1556	S	1				X																				9

COMMENTS
TEMP BLANK INCLUDED
Rleng- DW 9-30-03 1,4pm

☐ 10 Business Days STANDARD
☐ 15 Business Days TAT
☐ other:_____ # Business Days
(Prior Authorization Required.)

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:	Cooler Receipt Information
Signature: K FARRAGE	Signature:	Signature:	Signature: Dollie Wheeler	Temp Received: 2.4 °C 2.9°C
Printed Name: R. FARRAGE	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dollie Wheeler	Temp Received: 4.2 °C
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: AAI	Coolers: 2 1
Date/ Time: 9/25/03 11AM	Date/ Time: 9/26/03 10:00 AM	Date/ Time: 9/26/03 11:45	Date/ Time: 9-26-03 1:45	Seals: 2-SF y-DW
	rec. by: Kerrie Schrag 10/1/03 11:00			Means of Delivery / Way Bill # Client
				DHL# 8785612850

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FAX: (303) 469-5254

LGN: AN309193
Quote:
Project ID #:

Chain of Custody Record / Analysis Request

Company Name: MACTEC
Company Address: 601 EAST 57th PLACE
ANCHORAGE AK 99518
Telephone: 907-563-8102
Fax: 907 561 4574
Email: BDLUND@mactec.com

Project Name: RED DEVIL HISTORIC SURVEY
Report To: BRYAN LUND
Invoice To: BRYAN LUND
P.O. Number 57004

Sample ID	Date Collected	Time collected	Matrix	# Containers 4oz Amber	Hg, AK	MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV10SL	9/21/03	1610	S	1	X		Ø		10
03RDV12SL	9/21/03	1640	S	1	X		Ø		11
03RDV13SL	9/21/03	1645	S	1	X		Ø		12
03RDV14SL	9/21/03	1705	S	1	X		Ø		13
03RDV15SL	9/21/03	1714	S	1	X		Ø		14
03RDV16SL	9/21/03	1725	S	1	X		Ø		15
03RDV17SL	9/21/03	1740	S	1	X		Ø		16
03RDV18SL	9/21/03	1745	S	1	X		Ø		17
03RDV19SL	9/21/03	1758	S	1	X		Ø		18

COMMENTS
TEMP BLANK INCLUDED Relinq. DW 9-30-03 1:4pm

- ☐ 10 Business Days
- ☐ 15 Business Days
- ☐ other:_____ # Business Days
(Prior Authorization Required.)

STANDARD TAT

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:	Cooler Receipt Information
Signature: R Farrahé	Signature: S Finnegan	Signature: S Finnegan	Signature: Dollie Wheeler	Temp Received: 2.4 °C
Printed Name: R. FARRAHÉ	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dollie Wheeler	Temp Received: 4.2 °C
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: AAI	Coolers: 2
Date/ Time: 9/25/03 11AM	Date/ Time: 9/26/03 10:00AM	Date/ Time: 9/26/03 11:45	Date/ Time: 9-26-03 11:45	Seals: 2-SF
				Means of Delivery / Way Bill # Client

3 of 3

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(303) 469-8868
FAX: (303) 469-5254

LGN: A030919

Quote:

Project ID #:

Chain of Custody Record / Analysis Request

AAISE-JUNEAU

Company Name: MACTEC	Project Name: RED DEVIL HISTORIC SURVEY
Company Address: 601 EAST 57th Place ANCHORAGE AK 99518	Report To: BRYAN LUND
Telephone: 907-563-8102	Invoice To: BLUND
Fax: 907-561-4574	P.O. Number 57064
Email:	

Sample ID	Date Collected	Time collected	Matrix	# Containers (4oz Amber)	Hg, As	MS / MSD	Preserved?	Highly Concentrated?	LAB ID
03RDV20SL	9/21/03	1802	S	1	X		Ø		19
03RDV21SL	9/22/03	1145	S	1	X		Ø		20
03RDV22SL	9/22/03	1134	S	1	X		Ø		21
03RDV23SL	9/22/03	10:00	S	1	X		Ø		22
03RDV24SL	9/22/03	11:40	S	1	X		Ø		23
03RDV25SL	9/22/03	1155	S	1	X		Ø		24
03RDV26SL	9/23/03	11:35	S	1	X		Ø		25
							Ø		
							Ø		

COMMENTS Relinq - DW 9-30-03 1.4 pm

- ☐ 10 Business Days STANDARD
- ☐ 15 Business Days TAT
- ☐ other:_____ # Business Days

(Prior Authorization Required.)

RELINQUISHED BY SAMPLER:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: K. Image	Signature:	Signature:	Signature: Dollie Wheeler
Printed Name: K FARRAGE	Printed Name: S. FINNEGAN	Printed Name: S. FINNEGAN	Printed Name: Dollie Wheeler
Firm: MACTEC	Firm: MACTEC	Firm: MACTEC	Firm: FAI
Date/ Time: 9/25/03 11AM	Date/ Time: 9/26/03 10:00 AM	Date/ Time: 9/26/03	Date/ Time: 9-26-03 11:45

Cooler Receipt Information

Temp Received: 2.4 °C

Temp Received: 4.2 °C

Coolers: 2

Seals: 2-SF

Means of Delivery / Way Bill # Client

ANALYTICA

AAISE-JUNEAU

Cooler Receipt Form

Client: Mactec Engineering & Consul Client Code: 010400 Order #: A0309193
Project: Red Devil Historic Survey

Cooler ID: 3

A. Preliminary Examination Phase: Date cooler opened: 10/1/2003
Cooler opened by: KS Signature: KS

1. Was airbill Attached? Yes Airbill #: DHL #8785612850 Carrier Name: DHL
2. Custody Seals? Yes How many? 1 Location: on cooler Seal Name: DW
3. Seals intact? Yes
4. Screened for radiation? No
5. COC Attached? Yes Properly Completed? Yes Signed by AEL employee? Yes
6. Project Identification from custody paper: Red Devil Historical Survey
7. Preservative: BlueGel Temperature: 2.9

Designated person initial here to acknowledge receipt: Kevin Schmidt Date: 10/6/03

COMMENTS:

B. Log-In Phase: Samples Log-in Date: 10/6/2003 Log-in By: KS Signature: KS

1. Packing Type: Other
2. Were samples in separate bags? Yes
3. Were containers intact? Yes Labels agree with COC? Yes
4. Number of bottles received: 25 Number of samples received: 25
5. Correct containers used? Yes Correct preservatives added? Yes
6. Sufficient sample volume? Yes
7. Bubbles in VOA samples? N/A
8. Was Project manager called and status discussed? No
9. Was anyone called? No Who was called? _____ By whom? _____ Date: _____

COMMENTS:

Mercury Speciation in Red Devil Minesite Solids (Mactech)

analyzed by

Frontier Geosciences Aquatic Geochemistry Group 414 Pontius North Seattle, WA 98109 USA
phone: 206-622-6960 fax: 206-622-6870 e-mail: nicolasb@frontiergeosciences.com

	dry	Sequential Selective Extraction Mercury Levels, ng/g (ppb)							CH_3Hg	Hg^0	
sample	fraction	F1	F2	F3	F4	F5	F6	sum	(ng/g)	($\mu g/m^3$)	comments
03-RDV-02-SL	0.813	305	43.9	149	2,430	27,542	292	30,762	1.566	<4.5	
dry basis		375	54.0	183	2,989	33,877	359	37,837	1.926		
% in fraction		1.0	0.1	0.5	7.9	89.5	0.9	100.0	0.0051		
03-RDV-08-SL	0.785	221	152	104	2,796	13,370	140	16,783	1.688	<4.5	
dry basis		282	193	132	3,562	17,032	179	21,379	2.150		
% in fraction		1.3	0.9	0.6	16.7	79.7	0.8	100.0	0.0101		
03-RDV-10-SL	0.786	206	21.0	1,102	3,800	14,185	98	19,412	0.913	<4.5	
dry basis		262	26.7	1,402	4,835	18,047	125	24,697	1.162		
% in fraction		1.1	0.1	5.7	19.6	73.1	0.5	100.0	0.0047		
03-RDV-11-SL	0.813	86	13.9	374	2,311	6,589	135	9,509	0.357	<4.5	
dry basis		106	17.1	460	2,843	8,105	166	11,697	0.439		
% in fraction		0.9	0.1	3.9	24.3	69.3	1.4	100.0	0.0038		
03-RDV-12-SL	0.857	87	19.5	167	1,299	6,654	164	8,390	0.050	17.3	
dry basis		101	22.8	195	1,516	7,764	191	9,790	0.058		
% in fraction		1.0	0.2	2.0	15.5	79.3	1.9	100.0	0.0006		
03-RDV-13-SL	0.921	40.3	0.4	37.4	7,272	1,340,246	2,120	1,349,716	0.445	<4.5	
dry basis		43.8	0.4	40.6	7,896	1,455,207	2,302	1,465,490	0.483		
% in fraction		0.0	0.0	0.0	0.5	99.3	0.2	100.0	0.00003		
03-RDV-16-SL	0.846	34.6	2.9	151	397	939	94	1,619	0.186	<4.5	
dry basis		40.9	3.4	178	469	1,110	111	1,913	0.220		
% in fraction		2.1	0.2	9.3	24.5	58.0	5.8	100.0	0.0115		
03-RDV-17-SL	0.855	110	26.5	253	3,024	14,650	728	18,792	0.563	<4.5	
dry basis		129	31.0	296	3,537	17,135	852	21,979	0.658		
% in fraction		0.6	0.1	1.3	16.1	78.0	3.9	100.0	0.0030		

Mercury Speciation in Red Devil Minesite Solids (Mactech)

analyzed by

Frontier Geosciences Aquatic Geochemistry Group 414 Pontius North Seattle, WA 98109 USA

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sample	dry fraction	Sequential Selective Extraction Mercury Levels, ng/g (ppb) F1	F2	F3	F4	F5	F6	sum	CH_3Hg (ng/g)	Hg^0 ($\mu g/m^3$)	comments
03-RDV-23-SL	0.883	128	9.7	158	2,800	34,660	812	38,567	0.518	6.2	
dry basis		145	11.0	179	3,171	39,253	919	43,678	0.587		
% in fraction		0.3	0.0	0.4	7.3	89.9	2.1	100.0	0.0013		
03-RDV-26-SL	0.876	1,217	3,965	1,463	14,344	333,775	816	355,580	0.807	<4.5	
dry basis		1,389	4,526	1,670	16,374	381,022	931	405,913	0.921		
% in fraction		0.3	1.1	0.4	4.0	93.9	0.2	100.0	0.0002		
HgS in kaolin		1,270	2,653	367	11,462	2,929,615	1,301	2,946,668	*nd*	*nd*	
% in fraction		0.0	0.1	0.0	0.4	99.4	0.0	100.0	*nd*	*nd*	
$HgSO_4$ in kaolin		83,412	3,219,865	305,549	113,926	34,195	5,728	3,762,675	*nd*	*nd*	
% in fraction		2.2	85.6	8.1	3.0	0.9	0.2	100.0	*nd*	*nd*	
Hg^0 in kaolin		77,596	77,851	205,828	20,243,953	82,936	421	20,688,585	*nd*	*nd*	
% in fraction		0.4	0.4	1.0	97.9	0.4	0.0	100.0	*nd*	*nd*	
reference material		NIST-2710	NIST-2710	NIST-2710	NIST-2710	NIST-2710	NIST-2710	NIST-2710	IAEA-405	Hg^0/kaol	Hg^0 @ 23.3°C
observed		130	29	686	20,158	10,837	37	31,877	6.04	17,982	
expected		135	24	584	17,330	12,736	49	32,600	5.49	17,250	*SSE based on 21 replicates*
% recovery		96.3	120.8	117.5	116.3	85.1	75.5	97.8	110.0	104.2	*in 2001-2002*
blank-1		-0.1	0.8	0.4	0.1	0.2	1.4	2.8	0.001	4.3	
blank-2		0.0	0.6	1.5	0.4	-0.3	0.6	2.9	0.001	5.0	
blank-3		0.2	0.6	0.3	0.3	-0.3	0.7	1.6	0.002	7.2	
mean		0.0	0.7	0.7	0.3	-0.1	0.9	2.4	0.001	5.5	
estimated MDL		0.4	0.5	2.1	0.5	0.9	1.2	2.2	0.002	4.5	
replicated sample		RDV-13	RDV-13	RDV-13	RDV-13	RDV-13	RDV-13	RDV-13	RDV-12	Hg^0/kaol	Hg^0 @ 23.3°C
replicate #1		28.6	0.42	30.7	7,487	667,083	1,138	675,768	0.054	18,680	

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sample	dry fraction	Sequential Selective Extraction Mercury Levels, ng/g (ppb) F1	F2	F3	F4	F5	F6	sum	CH_3Hg (ng/g)	Hg^0 ($\mu g/m^3$)	comments
replicate #2		52.4	0.38	44.6	7,508	1,934,742	2,397	1,944,744	0.045	17,284	
replicate #3		40.0	0.36	36.9	6,821	1,418,913	2,825	1,428,636	*nd*	*nd*	
average		40.3	0.39	37.4	7,272	1,340,246	2,120	1,349,716	0.050	17,982	
RSD (%)		29.5	7.9	18.6	5.4	47.6	41.4	47.3	12.9	5.5	
spiked sample		RDV-23	RDV-23	RDV-23	RDV-23	RDV-23	RDV-23	*nd*	RDV-12	*nd*	
matrix spike level		159	39.7	397	6,345	158,629	1,269	*nd*	4.24	*nd*	
sample + matrix spike		311	45.9	543	10,079	184,741	2,212	*nd*	4.48	*nd*	
% recovery		115.1	91.2	97.0	114.7	94.6	110.4	*nd*	104.5	*nd*	
matrix spike dup level		159	39.7	397	6,345	158,629	1,269	*nd*	4.17	*nd*	
sample + matrix spike dup		307	51.2	551	9,541	194,343	2,234	*nd*	4.40	*nd*	
% recovery		112.6	104.5	99.0	106.2	100.7	112.1	*nd*	104.3	*nd*	
mean		113.8	97.9	98.0	110.5	97.6	111.2	*nd*	104.4	*nd*	
RPD (%)		2.2	13.6	2.1	7.7	6.2	1.6	*nd*	0.2	*nd*	
method		Au-CVAFS	Au-CVAFS	Au-CVAFS	Au-CVAFS	Au-CVAFS	Au-CVAFS	summation	GC-CVAFS	Au-CVAFS	
date analyzed		10-Oct-03	15-Oct-03	16-Oct-03	17-Oct-03	17-Oct-03	20-Oct-03		14-Oct-03	16-Oct-03	
				15-Oct-03	16-Oct-03						

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Historic Source Area Investigation
Red Devil, Alaska

September 2, 2005

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