IDORA MILL AND RED MONARCH MINE
Idaho Panhandle National Forests

SITE INVESTIGATION - FINAL

Contract No. 53-0343-0-0009
Task Order No. MCS-IPNF-03-01

Prepared for
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May 10, 2004
110018.013.0

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SITE INVESTIGATION

Idora Mill and Red Monarch Mine
Idaho Panhandle National Forest

1.0 INTRODUCTION

This report summarizes the site investigation performed at the Idora Mill and Red Monarch Mine, abandoned mine sites in the upper Beaver Creek drainage of the Idaho Panhandle National Forest. Tailings from the Idora Mill were placed within the 100-year floodplain adjacent to Beaver Creek. Tailings are actively eroding into Beaver Creek and are a source of lead to the Beaver Creek watershed. A previous site investigation of the Idora Mill by Bitterroot Restoration Inc. (BRI) did not include groundwater interaction with tailings as a possible source of metals to Beaver Creek. MCS performed a limited hydrological/geo-hydrological study at the Idora Mill for the purpose of identifying groundwater recharge and discharge areas at the mill and determine if the mill is affecting flow and chemical characteristics of Beaver Creek. Data collected during this investigation at the Idora Mill will add to previous data collected at the site and be included in an Engineering Evaluation/Cost Analysis for the site.

Waste rock from the Red Monarch Mine was placed along Missoula Gulch, a tributary of Beaver Creek, partially filling the narrow canyon. No previous studies have investigated the Red Monarch Mine. The purpose of this investigation is to conduct a site investigation at the Red Monarch Mine to determine the chemical characteristics of the site waste and its affects to surface water and sediments in Missoula Gulch.

This report has been prepared for the USDA Forest Service in accordance with Contract No. 53-0343-0-009, Task Order No. MCS-IPNF-03-01.

2.0 BACKGROUND

2.1 SITE LOCATION

This investigation focused on two sites, the Red Monarch Mine and the Idora Mill, in the Upper Beaver Creek drainage north of Wallace, Idaho in Shoshone County (Figures 2.1 and 2.2). The Idora Mill is located on upper Beaver Creek on lands administered by the Idaho Panhandle National Forests in the southeast ¼ of Section 19, Township 49 North, Range 5 East. The Red Monarch Mine is located on Missoula Gulch, a tributary of Dobson Gulch and subsequently Beaver Creek, in the northeast ¼ of Section 36, Township 49 North, Range 4 East.

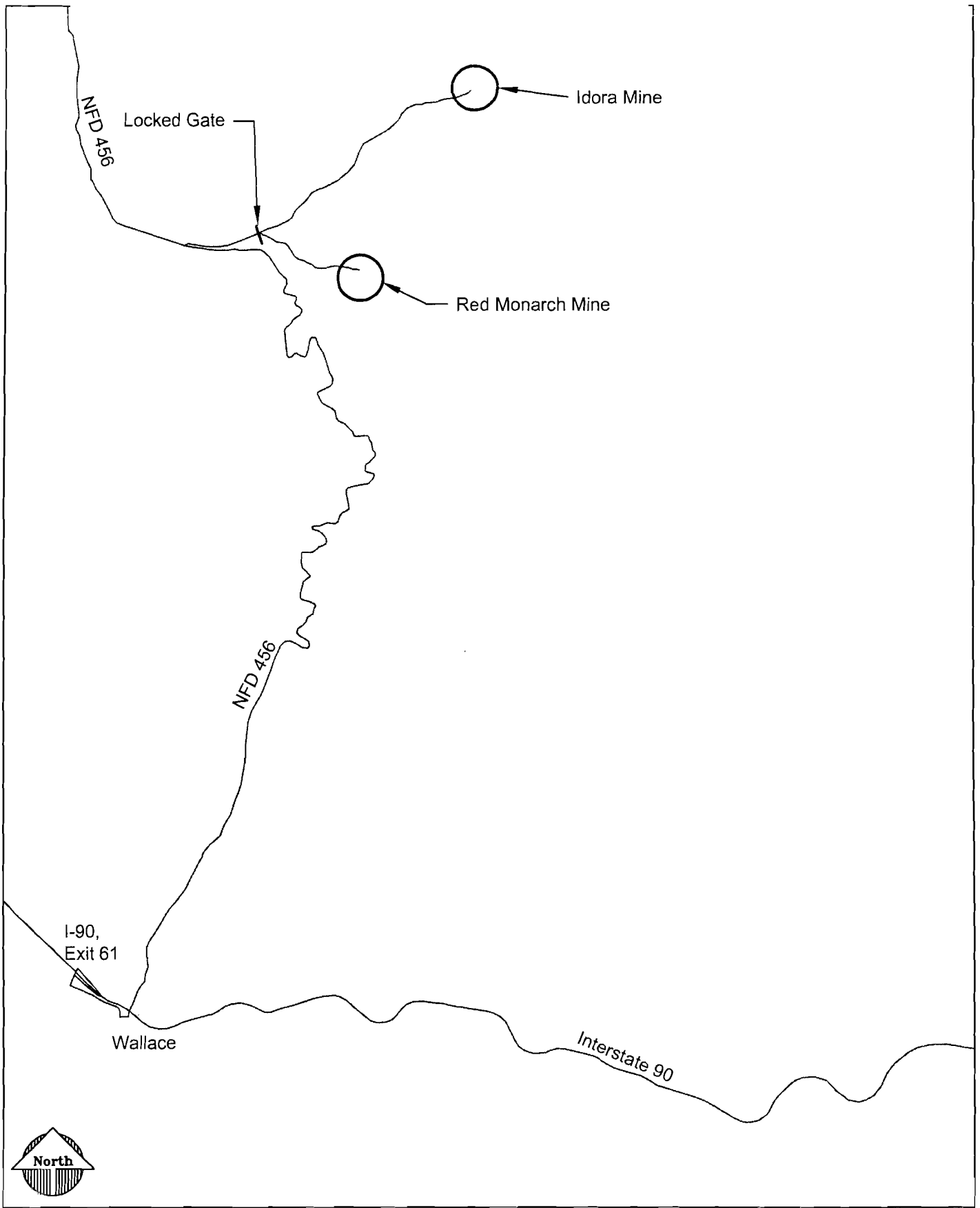
The sites can be accessed from Wallace, Idaho. Go north on 5th Street in Wallace. This street turns into Forest Development Road 456. Follow Forest Development Road 456 over Dobson Pass. The road descends from Dobson Pass to the Beaver Creek Valley. Immediately after the road reaches the bottom of the valley, turn right on the road that goes up the valley. A locked gate blocks the road shortly after the road crosses Dobson Gulch. A short distance past the locked gate, an old logging road goes to the right up Missoula Gulch. Follow this road approximately ¾ mile to the mine. The road is overgrown and is difficult to follow.

The Idora Mill is reached by following the closed road from the gate to the confluence of Beaver Creek and Carbon Creek. Cross to the north side of the valley, this requires a creek crossing, and follow an abandoned road about 1.25 miles to the Idora Mill.

2.2 SITE HISTORY

The Idora Mine and Mill sites are found at the headwaters of Beaver Creek and the Red Monarch Mine is located on Missoula Gulch, a tributary of Dobson Gulch then Beaver Creek (Bitterroot Restoration 2003; Science Applications 1993). Milling operations at the Idora Mill left an undetermined amount of tailings within the floodplain of Beaver Creek.

Little is known about the operating history of the Idora Mine. Reportedly, activities began in the early 1900s and continued until the mid 1950s. During this period, about 12,509 tons of ore were mined. Lead was the dominant metal produced at 876,941 pounds, followed by zinc at 7,475 pounds and silver with 19,948 ounces (Bitterroot Restoration 2003; Science Applications 1993). Small quantities of copper and gold were also recovered (Science Applications 1993).



LEGEND

Scale in Miles

1 0.75 0.5 0 1

Figure 2.1: Location Map

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11018.013	Nov. 2003	NA
SCALE: 1" = 1mile		DRAWN BY: TWC

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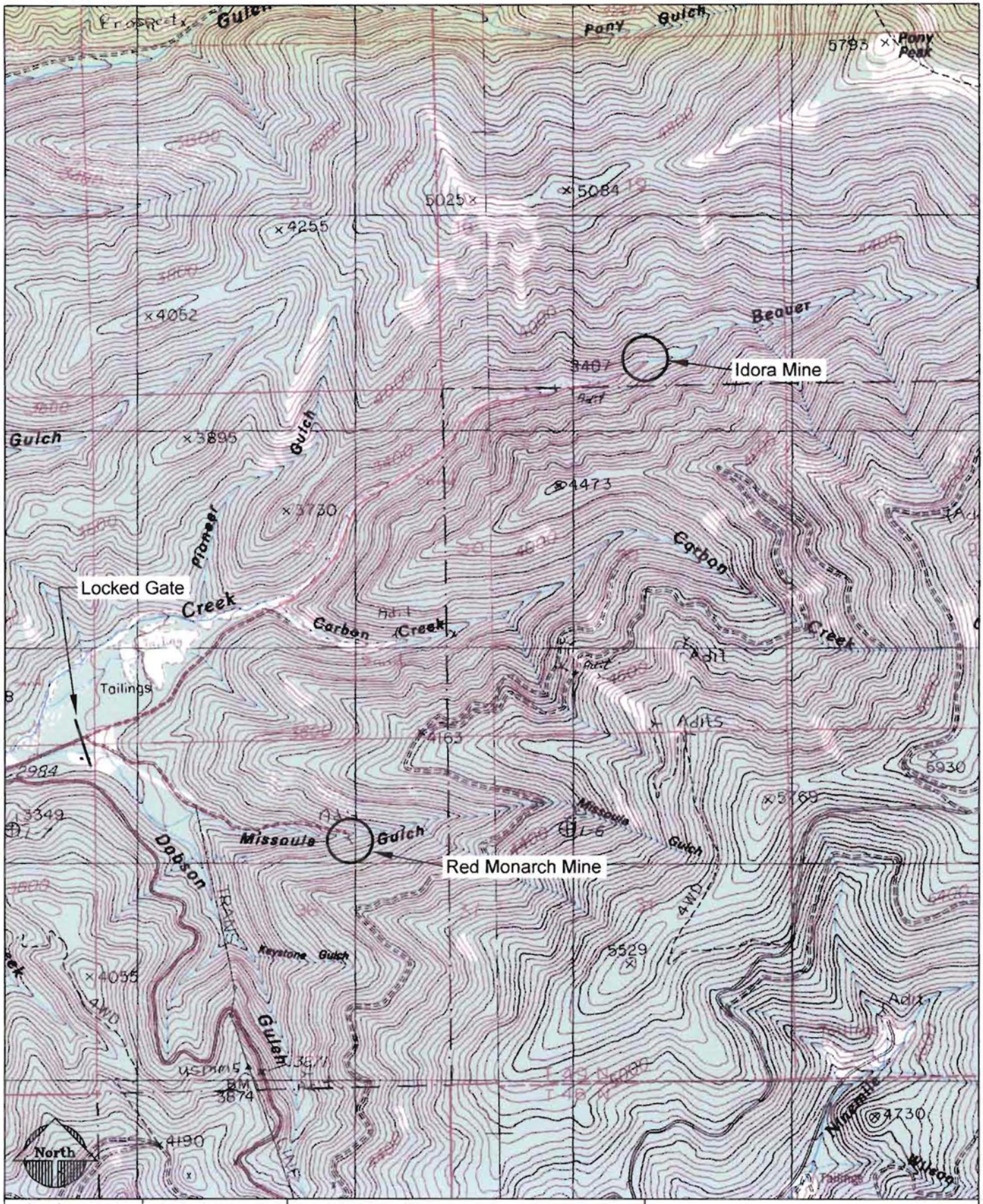

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LEGEND

Scale (miles)
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Figure 2.2: Vicinity Map

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The Red Monarch Mine production records are included in those of the Rex Mine complex. Like the Idora, lead was the primary metal recovered at 10,671,876 pounds, followed by zinc at 9,592,070 pounds. Silver, lead, and small quantities of gold were also produced. In all, 154,441 tons of ore were mined in the complex (Science Applications 1993). The amount of production attributed to the Red Monarch Mine is unknown.

Much of the activity within the complex took place between 1917 and 1919. By 1919, the Red Monarch Mine had 200 feet of raises, 600 feet of drifts, and a 4,410-foot adit. In 1922, the Rex Consolidated Mining Company purchased the Red Monarch property and planned to extend the Red Monarch adit beneath the Rex workings. However, little activity took place until 1926 when Delaware Mines Corporation acquired the property. At that time significant work was completed on the Red Monarch adit. The company began to explore the Rex vein from the Red Monarch adit in 1928. By the following year a new compressor was built and the adit was driven 1,000 feet (Kauffman et al. 1998).

In 1930, the Associated Mines Corporation, Ltd. reorganized the Red Monarch and Rex properties, but, two years later, the Idaho Supreme Court ruled that this reorganization was illegal. The Delaware Mines Corporation consequently regained the mine and all assets. The mine was inactive from 1932 to 1936. The Callahan Consolidated Mines Corporation leased the Red Monarch and Rex properties in 1937. In 1943, the company built a 100-ton flotation mill most likely on Ninemile Gulch. It mined the Red Monarch and Rex from 1943 to 1946 (most activity at the Rex). After 1947, evidently no more work took place on the Red Monarch adit (Kauffman et al. 1998).

2.3 SITE DESCRIPTION

The Red Monarch Mine is located in the Missoula Gulch drainage within the Beaver Creek watershed (Figure 2.2). The site consists of a waste rock dump and adit (Figure 2.3). The waste rock dump extends from the adit about 400 feet along the north side of the valley. Little vegetation is present on the steep dump facing the creek. At the time of the site visit, considerable water was present in the creek. Water discharges from the adit at 15 to 20 gallons per minute. At the time of the site investigation, flow in Missoula Gulch above the mine appeared to be about the same as the water flowing from the adit. The water disappears under the waste rock and can be heard flowing under the lowest portion of the dump. Surface water emerges below the dump for a short distance before disappearing underground again. No surface water was present in the lower reaches of the gulch.

The Idora site is adjacent to the creek and consists of an old mill building and tailings area immediately below the mill (Figure 2.4). Rock adjacent to the mill building appears to be mineralized and was apparently placed or spilled there during milling operations. The Idora Mine is

reportedly on the hillside above the mill. Tailings at one time apparently covered the narrow valley bottom. The creek has since eroded a channel through the tailings. Floods and seasonal high water actively erode the tailings to downstream areas. Tailings appear to have impacted the stream sediments for an undetermined distance from the mill.

An adit is located on the north side of the valley a short distance below the Idora Mill (Figure 2.5). Waste rock from the mine was apparently placed on the valley bottom both upstream and downstream from the adit opening. No vegetation is currently growing on the waste rock. Much of the waste rock below the adit has been eroded away from the dump. This dump may be the source of much of the waste that has degraded the lower reaches of the study area.

2.4 PREVIOUS INVESTIGATIONS

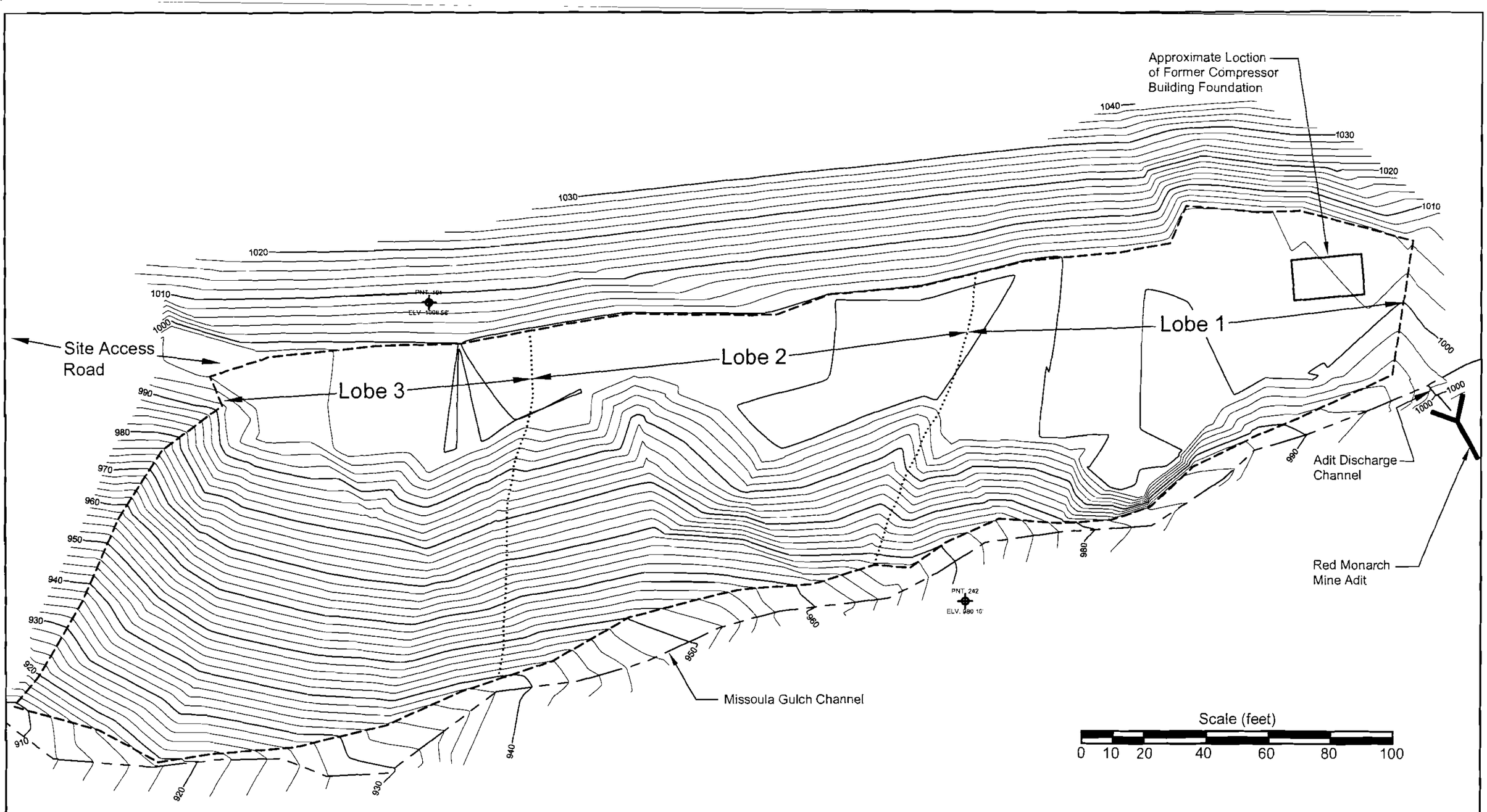
The Idaho Geological Survey conducted a preliminary investigation of the Red Monarch Mine (Kauffman et al. 1998). Missoula Gulch surface water was sampled above and below the mine, as was water flowing from the adit. Water flowing from the adit contained elevated concentrations of cadmium, iron, manganese, and zinc. Surface water from Missoula Gulch did not contain elevated metals concentrations above the mine. Below the mine, surface water contained elevated cadmium and zinc concentrations. One soil sample was collected from the waste rock dump. Metals with elevated concentrations in the waste rock were lead, arsenic, cadmium, copper, zinc, and iron.

The USGS completed a water quality and metals loading investigation of the Upper Beaver Creek watershed (Ott and Clark 2003). This investigation consisted of a synoptic study of Beaver Creek and Carbon Creek. Surface water samples were collected from five locations on Beaver Creek and three locations on Carbon Creek. Three sample locations were in the vicinity of the Idora Mill. Data indicates that at high flows, lead loading is from mobilization of fine-grained tailings particles contained in the sediment load of the creek. At low water, the lead load is primarily from seepage of tailings impacted water into the creek near the Idora Mill.

2.5 GEOLOGY

Geology of the Upper Beaver Creek area consists of Precambrian quartzite and siltite of the Pritchard Formation within the Lower Belt Supergroup. The Osburn Fault is a major structural feature of the mining district. Mineralization is typically found in fractures and faults associated with the Osburn Fault zone.

Bed sediments in upper Beaver Creek consist of cobbles and boulders (USGS 2003). Creek gradient in the area of the Idora Mill is 0.07 (Bitterroot Restoration 2003). The Beaver Creek Valley near the Idora Mill is V-shaped with a small amount of valley fill that creates a flat valley bottom. MCS



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LEGEND

- Project Bench Mark
- Mine Adit Location
- Approximate Limit of Waste Rock
- Approximate Limit of Waste Rock Lobe Sampling Sections
- Stream Center Line

North

* 2.0 foot contour interval based on arbitrary 1000 foot datum

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Figure 2.3: Red Monarch Site Map

Idora Mill and Red Monarch Mine
SHOSHONE COUNTY
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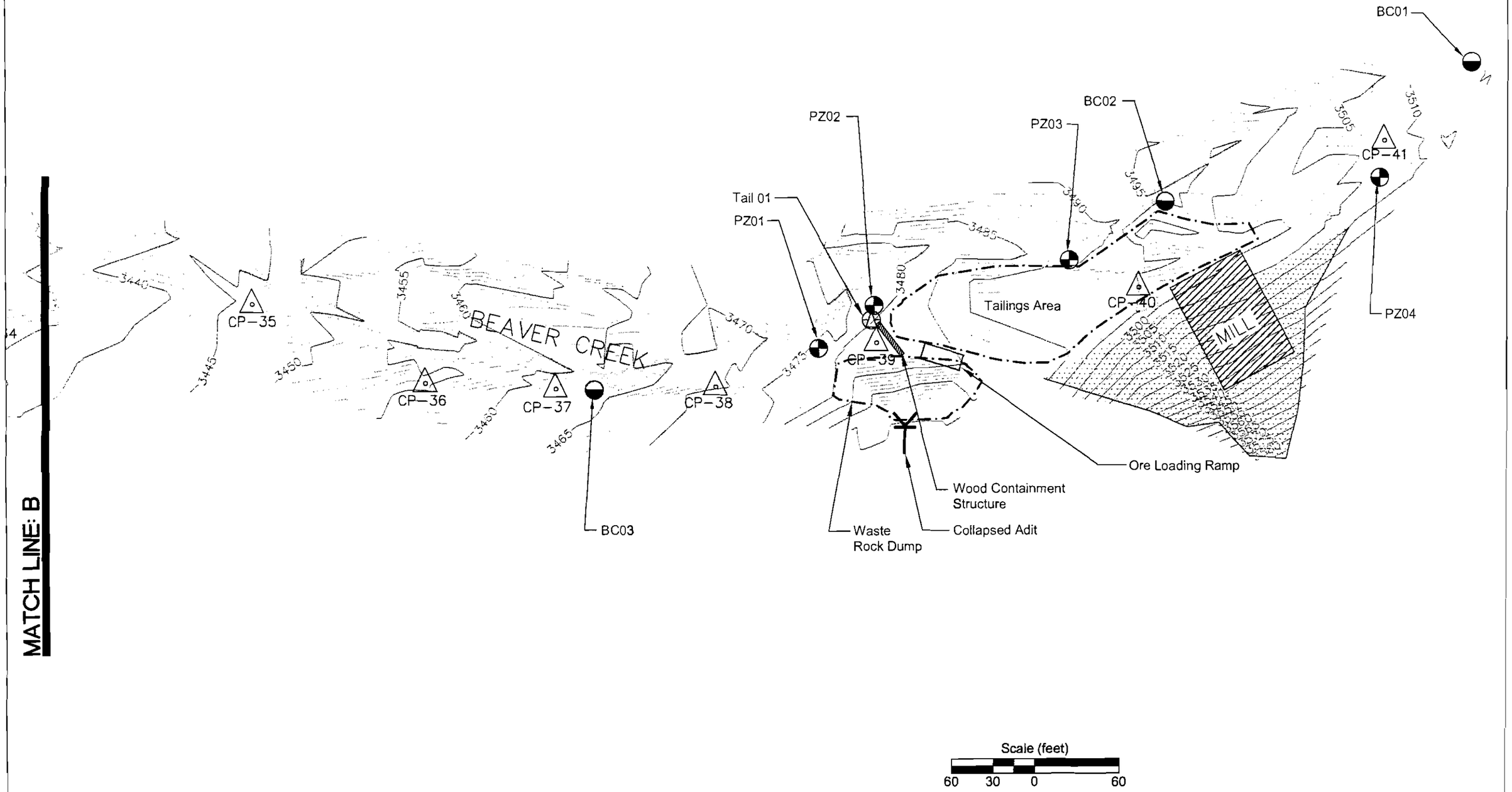

LEGEND

- Surface Water Sample
- Piezometer Location
- Tailings Sample Location
- CP-39 Survey Control Point Location
- Approximate Stream Location

Note: Contour Interval 1 foot relative to sea-level datum.

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North

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Figure 2.4: Idora Mill Site

Idora Mill and Red Monarch Mine
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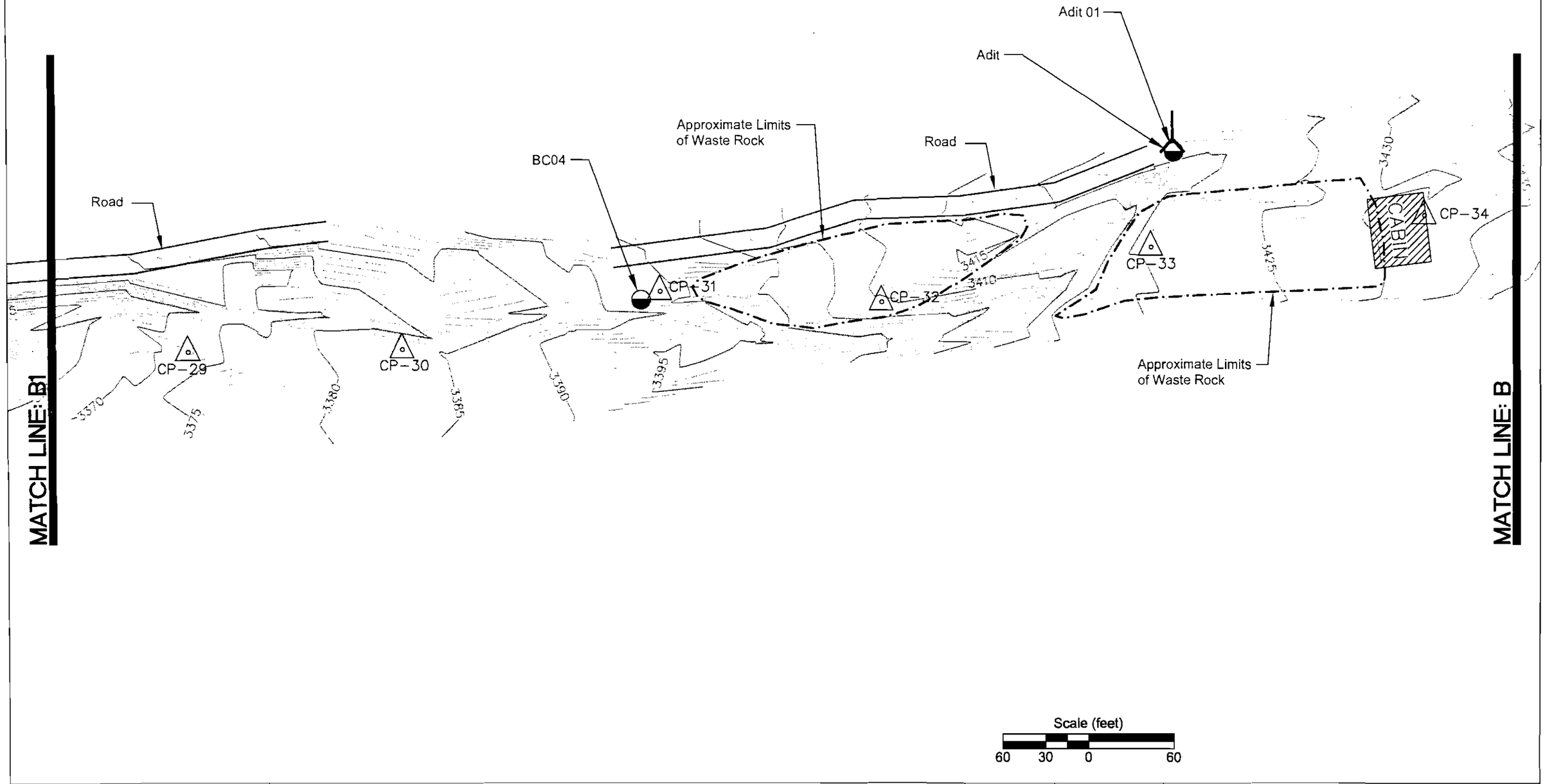
REF: Map Obtained from Bitterroot Restoration (Bitterroot Restoration 2003)



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LEGEND

North

Surface Water Sample

Approximate Extent of Waste Rock

Approximate Stream Location

CP-39 Survey Control Point Location

Note: Contour Interval 1 foot relative to sea-level datum.

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Figure 2.5: Mine Site below Idora Mill

Idora Mill and Red Monarch Mine
SHOSHONE COUNTY
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REF: Map Obtained from Bitterroot Restoration (Bitterroot Restoration 2003)

interprets the fill as the result of a depositional event that occurred in the recent geologic history, probably at the end of the last ice age. Deposition of sediments was from a high-energy system that allowed cobble and larger sized clasts to be deposited, while sand and gravel size clasts were washed down stream. The creek valley broadens and gradient drops below the confluence with Carbon Creek. MCS speculates that the bottom of the fill can be determined by inferring the valley sides down to where they meet.

2.6 HYDROLOGY

Upper Beaver Creek has its headwater on the north sides of Goose and Sunset Peaks then flows through a narrow steep valley to the Idora Mill site. Sunset Peak is the highest point in the drainage with an elevation of 6,424 feet. The Idora Mill is at an elevation of 3,510 feet, approximately 2 miles downstream from Sunset Peak. The nearest weather station is at Wallace, Idaho, which receives about 40 inches of precipitation per year. Precipitation at the Idora Mill is expected to be higher than in Wallace because of the higher elevation.

Gaging stations are located on the North Fork of the Coeur d'Alene River at Shoshone Creek and on the Coeur d'Alene river at Enaville. The Shoshone Creek gaging station is upstream from the confluence with Beaver Creek. The Coeur d'Alene River drainage basin above Enaville is 895 square miles (USGS 2004). The drainage area of Beaver Creek above the confluence with Carbon Creek is 2.67 square miles or 0.3% of the drainage basin above Enaville.

Peak flow in Beaver Creek is during spring runoff from snowmelt or from winter rains. Data obtained from the gauging station on the North Fork Coeur d'Alene River at Enaville indicate runoff events are typically one to two orders of magnitude higher than baseflow (USGS 2004). Base flow at Enaville is usually 200 to 300 cubic feet per second (cfs) with annual peak flow between 10,000 and 20,000 cfs most years.

Surface water measurements on Beaver Creek recorded by BRI during their site investigation ranged from 0.74 to 2.48 cfs. Creek flow is extremely variable, apparently because of the coarse alluvium that allows rapid discharge and recharge of the surface water when the water table falls below or rises above the surface water elevation.

2.7 SITE VEGETATION

This section presents a description of vegetation observed by MCS during the site investigation. The forest habitat types within the area are within the western hemolock (*Tsuga heterophylla*) series of habitats and western redcedar/lady fern (*Thuja plicata/Athyrium filix femina*) habitat type. Western hemolock dominates the majority of all exposures with the exception of the lower wet bottomlands

where it is codominant with western redcedar. Much of the area surrounding the Idora and Red Monarch Mine sites within the Beaver Creek and Missoula Gulch areas are forest old-growth stands intermixed with timber harvest units. Overstory composition includes western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), western white pine (*Pinus monticola*), western larch (*Larix occidentalis*), Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*) and an occasional Engelmann spruce (*Picea engelmannii*). Western hemlock appears to be the major climax tree species across the valleys with a mix of the other seral tree species at the Idora and Red Monarch Mine sites.

The understory is composed of a rich and diverse shrub, forb, grass-like, and grass vegetation mix. The major species of shrubs and forbs present in the understory include: mountain alder (*Alnus incana*), red-osier dogwood (*Cornus stolonifera*), Rocky Mountain maple (*Acer glabrum*), ribes (*Ribes spp.*), thimbleberry (*Rubus parviflorus*), wild ginger (*Gymnocarpium dryopteris*), and lady fern (*Athyrium filix femina*).

2.8 CLIMATE

The Idaho Panhandle climate is greatly influenced by maritime air patterns. For this reason, the region typically experiences wet, cool winters and hot, dry summers. This maritime influence is particularly acute in the winter as it is subject to more frequent precipitation and warmer temperatures than regions at about the same latitude and altitude mid-continent. Pacific storms continue to be influential on into the spring (WRCC 2001a).

Wallace Woodland Park is the closest weather station to the site. January is the coldest month at the Wallace locale, with an average maximum temperature of 33.2°F and an average minimum temperature of 19.0°F. August is typically the warmest month having an average maximum temperature of 80.1°F and an average minimum temperature of 47.1°F (WRCC 2001b).

The average total precipitation level at Wallace is 37.16 inches and the average snowfall is 82.9 inches. December and January are typically the wettest months, with average precipitation levels of 5.06 and 4.96 inches, respectively. The first snowfall usually occurs in late October or early November (WRCC 2001b). These storms are generally followed by several weeks of fair weather. By December the area is normally blanketed with snow. Heavy snows are frequent in the winter, as are periods of melting and freezing. The snow pack generally remains in the area for four months or longer, with spring thaw occurring in April or May.

3.0 METHODS OF INVESTIGATION

This site investigation consisted of two parts. The first part was the site investigation at the Red Monarch Mine and the second part was the limited hydrological/geohydrological study at the Idora Mill. MCS completed the field work at the site during July 2003.

3.1 SAMPLING METHODS

3.1.1 Red Monarch Site Investigation

The site investigation at the Red Monarch Mine consisted of three parts: (1) soil sampling at the waste rock dump; (2) surface water and sediment sampling: and (3) completion of an engineering survey of the site.

3.1.1.1 Waste Rock Sampling

Soil sampling at the site was a combination of composite and grab samples. Composite soil samples were collected according a method developed by the USGS for screening mine waste (Smith et al. 2000). This method requires collection of 30 individual samples from the zero to 6-inch depth interval (zero to 15 cm) on a grid within the waste rock dump. The total weight of each individual sample is about 100 grams. Samples are then sieved, retaining the less than 2 millimeter fraction and discarding the greater than 2 millimeter fraction. The end sample will weigh at least 1,000 grams. Due to the size of the waste rock dump, three composite samples were collected.

Grab samples were collected from different types of waste rock to confirm the composite sample concentrations. Soil samples were analyzed for total arsenic, cadmium, copper, lead, and zinc. Composite soil samples were also analyzed for acid base account (ABA) and digested using the synthetic precipitation leaching procedure (SPLP) with analysis for the same metals.

3.1.1.2 Surface Water and Sediment

Surface water and sediment samples were collected from Missoula Gulch above and below the Red Monarch waste rock dump. Water flowing from the adit was also sampled. A sediment sample was collected at each surface water sampling location. Surface water and sediment samples were analyzed for arsenic, cadmium, copper, lead, and zinc.

3.1.2 Idora Mill Hydrogeological Study

MCS completed a hydrological/geohydrological study at the Idora Mill.

3.1.2.1 Hydrogeological Site Reconnaissance

Groundwater from a seep adjacent to Beaver Creek and from a piezometer driven into the tailings at the Idora Mill site contained elevated concentrations of lead during the USGS investigation of metal loading into Beaver Creek (Ott and Clark 2003). The initial part of this investigation consisted of a site reconnaissance to map areas where groundwater appeared to be discharging to the creek. Specific attention was paid to structural features and mine workings that may affect the groundwater system. Obvious groundwater recharge and discharge areas were mapped.

3.1.2.2 Piezometer Installation

MCS installed four piezometers adjacent to the creek for the purpose of establishing groundwater elevations and sampling (Figure 2.4). Surface water elevations were measured adjacent to the piezometers. Piezometer locations were marked during the site reconnaissance. This portion of the investigation focused on Idora Mill tailings area where tailings may be in contact with groundwater. MCS personnel surveyed piezometers and surface water points to the datum established by BRI so that surface water elevations in the creek could be compared with groundwater adjacent to the creek.

Groundwater samples were collected from piezometers adjacent to Beaver Creek and analyzed for total metals. Piezometers were developed using a peristaltic pump with vinyl tubing and a small surge block. Water was purged from the piezometer until it was clear and no suspended sediment was visible. Groundwater samples were analyzed for arsenic, cadmium, copper, lead, zinc, pH, alkalinity, and hardness.

3.1.2.3 Surface Water and Sediment

MCS collected surface water samples from Beaver Creek. Samples were collected above the Idora Mill, adjacent to the mill, at the lower end of the tailings area, and below the floodplain waste rock dump. Total metals were analyzed for the surface water samples. Surface water and groundwater samples were analyzed for arsenic, cadmium, copper, lead, zinc, pH, alkalinity, and hardness. Sediment samples were analyzed for arsenic, cadmium, copper, lead, and zinc.

3.2 ANALYTICAL METHODS

MCS collected and preserved all samples in the field according to laboratory recommendations. After sample collection, MCS placed all samples in coolers containing doubled zip-lock bags filled with ice for preservation. MCS stored and shipped the samples under chain-of-custody procedures until MCS hand delivered the samples to SVL Analytical, Inc. (SVL) in Kellogg, Idaho. SVL, a certified and accredited laboratory, analyzed all samples collected during the site investigation according to EPA methods. Table 3.1 summarizes the analytical methods used by SVL.

Table 3.1 Analytical Methods

Analyte	Analytical Method(s)
Acid Base Accounting	LECO furnace for percent sulfur analytes and Modified Sobek Method (EPA 6002/7-054) for AGP, ABP, ANP
Synthetic Precipitation Leaching	EPA Method 1312
Metals	Solids: 6010B/200.7 by ICP; Water: 200.7 by ICP

Tailings and sediment samples were analyzed for arsenic, cadmium, copper, lead, and zinc. Analysis was according to EPA Method 200.7/6010B using ICP. Samples were digested using Method 3050. Selected samples were digested using EPA Method 1312, SPLP digestion. SPLP is an EPA SW-846 analytical method that simulates acid rain effects and is designed to evaluate the mobility of organic and inorganic constituents to groundwater. SPLP analysis included arsenic, cadmium, copper, lead, and zinc.

Acid base accounting is used to evaluate the acid- or alkaline-producing potential of mine waste rock and tailings. It is the balance between the acid generating and acid consumption/neutralization properties of these materials (Frey 2003 and Pettit et al. 1999).

Acid base accounting was analyzed on two selected samples using the LECO furnace method with titration to obtain percent sulfur values (non-extractable sulfur, pyritic sulfur, sulfate sulfur, and total sulfur. SVL used these values to calculate the acid base potential (ABP), acid generation potential (AGP), and acid neutralization potential (ANP) using the Modified Sobek Method as described in EPA document EPA 600-2/78-054. It estimates the acid potential based on the content of sulfide sulfur rather than total sulfur (Frey 2003). According to Frey (2003) each mole of sulfur produces two moles of acid and is neutralized by one mole of calcium carbonate; hence, there is a 1:1 mole ratio of sulfur to calcium carbonate. ABP, AGP, and ANP are reported as a ratio of tons calcium carbonate ($CaCO_3$) per 1000 tons ($TCaCO_3$/1000T). The Modified Sobek Method may miss acidity produced by other sulfates and; therefore, may underestimate the AGP of the material.

SVL analyzed surface water and groundwater samples for arsenic, cadmium, copper, lead, zinc using EPA Method 200.7. MCS measured pH, temperature, dissolved oxygen, and oxidation-reduction potential in the field using a YSI multi-parameter meter.

3.3 SURVEY OF WASTE ROCK DUMPS AND PRIVATE PROPERTY BOUNDARIES

BRI completed a survey from the confluence of Beaver Creek and Carbon Creek to the Idora Mill site as part of their site investigation. The drawings generated during this survey were used to present data collected by MCS at the Idora Mill. BRI explains their survey methodology in the Site Investigation of the Idora Mine Site (Bitterroot Restoration 2003)

MCS completed a survey of the piezometers at the Idora Mill site using BRI control points so that relative groundwater elevations could be compared. This allowed MCS to accurately insert piezometer locations into the existing BRI map. Maps were generated by MCS using Autodesk® Land Desktop 2002 and Autodesk® Civil Design 2002.

MCS staff conducted an engineering survey of the Red Monarch site using a Lyca Total Station. MCS focused the survey on the adit and waste rock dump. Two site benchmarks were established outside the waste rock area for control. The datum is relative to the site and not the actual elevation. The survey was a line survey that included all break lines within the site. Additional transects were surveyed between the break lines, where necessary. Two lines were surveyed along the natural slope above the waste rock dump so that the native surface could be inferred under the waste rock. Topographic contours and detailed site maps were generated by MCS using Autodesk® Land Desktop 2002 and Autodesk® Civil Design 2002. The survey is for use in constructing site maps, showing pertinent features and the site and for the site investigation, and for possible use in preliminary design drawings, as necessary.

3.4 COMPARISON OF RESULTS WITH STANDARDS AND SCREENING LEVELS

The site is very remote and access is difficult. There is currently no improved road, trail, or hiking trail leading to the sites. Therefore, there is limited activity at the site by the public for recreation. MCS believes use of the site for public recreation is minimal. Residential and/or neighborhood cleanup values do not apply to this site. MCS compared analytical results with Minimum Use Recreational Cleanup Levels for rock hounds and gold panners (RH/GPs) based on a maximum of 7 days of exposure per year. TetraTech developed these recreational cleanup levels for the Abandoned Mines and Recreation Bureau (AMRB) in 1996 (TetraTech 1996). These values, presented in the analytical results tables in Sections 4 and 5, provide an initial comparison to possible cleanup values for the site.

MCS also compared soil, sediment, and surface water values for contaminants of ecological concern (COECs) to concentrations developed/presented in the Record of Decision (ROD) for the Bunker Hill Mining and Metallurgical Complex Operable Unit 3 (EPA 2002b). MCS used state-wide values

for Idaho for arsenic in surface water (IDEQ 2003). MCS used EPA water standards and health advisories for drinking water standards (2002a). The values presented in the tables in Sections 4 and 5 provide an initial comparison to possible cleanup values for the site.

4.0 RED MONARCH INVESTIGATION RESULTS

Results from the Red Monarch site investigation and Idora hydrogeological investigation are presented in separate sections. MCS completed the field work at the site during July 2003.

4.1 RED MONARCH SITE INVESTIGATION

The Red Monarch Mine site consists of a waste rock dump and an open adit draining about 15 gallons of water per minute (Figure 2.2). The adit and waste rock dump are on opposite sides of Missoula Gulch, which flows along the base of the waste rock dump. The waste rock dump is on the north side of the valley, is 400 feet long and contains three somewhat distinct lobes. For purposes of this investigation, the lobes were labeled lobe 1 through lobe 3, with lobe 1 being the eastern most portion closest to the adit. One composite soil sample and one grab sample were collected from each lobe. Some iron cementing of the waste, particularly in lobe 1, allows Missoula Gulch to erode near vertical walls into the upper part of the dump. Analytical results from the Red Monarch site are shown on Table 4.1. Table 4.2 presents surface water results and field parameter measurements. Acid base account results are shown on Table 4.3.

4.1.1 Lobe 1

Lobe 1 is closest to the adit. A large flat area above lobe 1 at one time contained a compressor that was used to power equipment in the mine. One 30 point composite sample was collected from this part of the dump. Iron cementing of the waste makes this part of the dump very steep, thus limiting access to the entire surface. Individual samples were collected from the accessible portions of this lobe. The Lobe 1 composite soil sample contained 5.4 mg/kg arsenic, 0.50 mg/kg cadmium, 25 mg/kg copper, 16.1 mg/kg lead, and 36 mg/kg zinc.

Acid base account analysis for the Lobe 1 composite sample showed an ABP of 2.12 $TCaCO_3$/1000T waste rock, acid generation potential (AGP) of 1.25 $TCaCO_3$/1000T, acid neutralization potential (ANP) of 3.37 $TCaCO_3$/1000T, 0.030 percent non-extractable sulfur, 0.040 percent pyritic sulfur, 0.13 percent sulfate sulfur, and 0.20 percent total sulfur. The SPLP extract from the Lobe 1 Composite sample contained <0.10 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, 0.0072 mg/L lead, and 0.0864 mg/L zinc. The Lobe 1 Grab sample contained 3.2 mg/kg arsenic, 0.51 mg/kg cadmium, 25.4 mg/kg copper, 12.6 mg/kg lead, and 29.4 mg/kg zinc.

Table 4.1 Red Monarch Tailings and Sediment Analytical Results

Sample ID	Station	Arsenic	Cadmium	Copper	Lead	Zinc
MDEQ Recreational Risk Cleanup Levels (mg/kg)		370.28	2078.75	63,616	2572	514,000
ROD Reference Cleanup Guidelines (mg/kg)		420			1000	
ROD Concentrations for Soil: Terrestrial Biota (mg/kg)		40	386	1,021	522	261
ROD Concentrations for Sediment: Aquatic Birds and Mammals (mg/kg)		138	664	2,209	718	390
Tailings Results (mg/kg)						
11018013200	Lobe 1 Composite	5.4	0.50	25.0	16.1	36
11018013211	Lobe 1 Grab	3.2	0.51	25.4	12.6	29.4
11018013201	Lobe 2 Composite	5.3	0.88	97.6	**611**	119
11018013210	Lobe 2 Grab	17.9	28.3	46.4	259	**8,250**
11018013202	Lobe 3 Composite	11.2	2.05	64.2	336	**368**
11018013209	Lobe 3 Grab	9.3	4.94	38.3	157	**1,390**
SPLP Results (mg/L)						
11018013200	Lobe 1 Composite	<0.010	<0.0020	<0.0030	0.0072	0.0864
11018013201	Lobe 2 Composite	<0.010	0.0025	0.0035	0.0434	0.138
11018013202	Lobe 3 Composite	<0.010	<0.0020	<0.0030	<0.0050	0.0386
***Sediment* Results (mg/kg)**						
11018013205	Missoula Gulch above mine	7.0	0.62	21.8	21.4	126
11018013208	Missoula Gulch below WR	4.5	3.89	28.0	91.0	**1,090**
11018013204	Red Monarch Adit Sed	11.3	27.9	50.9	674	**18,000**

< = analyte was not detected at or above the method detection limit, the value listed next to < is the method detection limit
SPLP = Synthetic Precipitation Leaching Procedure
mg/kg = milligrams per kilogram
mg/L = milligrams per liter
MDEQ *Recreational Cleanup* Levels based on rock hound/gold panner 50 day/year exposure scenario (TetraTech 1996; updated by MCS 2003)
ROD Reference Cleanup Guidelines: *Cleanup guideline based on recreational soil/sediment ingestion and dermal contact* (Table 7.1-20; EPA 2002b)
ROD Concentrations for Sediment: Concentrations of Ecological Concern (COEC) Concentrations for Sediment (mg/kg) Protective for Aquatic Birds and Mammals for Population ED20-Based (Table 7.2-7; EPA 2002b)
ROD Concentrations for Soil: COEC Concentrations for Soil (mg/kg) Protective for Terrestrial Biota for Population ED20-Based (Table 7.2-6; EPA 2002b)
Bold = concentration exceeds one or more of the listed standards or cleanup goals

Table 4.2 Surface Water Analytical Results

Sample ID#	Sample Location	Arsenic (mg/L)	Cadmium (mg/L)	Copper (mg/L	Lead (mg/L)	Zinc (mg/L)	pH (mg/L)	Temp (°C)	DO (mg/L)	SC (µS/cm[c])	ORP (mV)
Water Quality Standards											
Aquatic CMC (Acute)		0.360	0.0037	0.017	0.065	0.114	NS	NS	NS	NS	NS
Aquatic CCC (Chronic)		0.190	0.001	0.011	0.0025	0.105	6.5 - 9	NS	NS	NS	NS
Drinking Water MCL		0.01	0.005	1.3	0.015	NS	NS	NS	NS	NS	NS
Surface Water Results – Total Metals											
11018013206	Missoula Gulch 1	<0.010	<0.0020	<0.0030	<0.0050	0.010	7.3	12.6	7.9	38	98.0
11018013207	Missoula Gulch 2	<0.010	<0.0020	<0.0030	<0.0050	**0.516**	7.1	10.9	8.2	137	120.4
11018013203	RM Adit Discharge	<0.010	**0.0071**	<0.0030	**0.0699**	**2.18**	7.6	9.1	8.37	249	67.0

Surface water results for copper and lead are considered estimated due to out of control relative percent differences for the laboratory duplicate
< = analyte was not detected at or above the method detection limit, the value listed next to < is the method detection limit
Bold = exceeds one or more water quality standard
mg/L = milligrams per liter
°C = degrees Celcius
µS/cm = microSiemens per centimeter
mV = millivolts
Temp = temperature
DO = dissolved oxygen
SC = specific conductance
ORP = oxidation reduction potential – reading from YSI multi-parameter meter
CMC = Criteria Maxium Concentration (Acute): EPA-Approved Idaho Water Quality Standards, IDAPA 58.0102.284 & 58.0102.210 (IDEQ 2003)
CCC = Criterion Continuous Concentration (Chronic): EPA-Approved Idaho Water Quality Standards (IDEQ 2003), IDAPA 58.0102.284 & 58.0102.210 (IDEQ 2003)
EPA Water Quality Standards for cadmium, copper, lead, and zinc are based on a hardness value of 100 mg/L
MCL = Drinking Water Maximum Contaminant Level (EPA 2002 Edition of the Drinking Water Standards & Health Advisories (EPA 2002a)
NS = no standard

Table 4.3 Red Monarch Acid-Base Accounting Results

Sample ID	Station	ABP	AGP	ANP	Non-ext. Sulfur	Pyritic Sulfur	Sulfate Sulfur	Total Sulfur
		$TCaCO_3$/1000T			Percent			
11018013200	Lobe 1 Composite	2.12	1.25	3.37	0.030	0.040	0.130	0.200
11018013201	Lobe 2 Composite	<0.30	1.88	1.70	0.010	0.060	0.100	0.170
11018013202	Lobe 3 Composite	-1.00	4.38	3.37	0.020	0.140	0.130	0.290

ABP = acid base potential (also known as net neutralizing potential; NNP)

AGP = acid generating potential (also known as acid producing potential; AP)

ANP = acid neutralizing potential (also known as acid neutralization potential; NP)

$TCaCO_3$ / 1000T = tons $CaCO_3$ / 1000 tons
< = analyte was not detected at or above the method detection limit, the value listed next to < is the method detection limit

4.1.2 Lobe 2

Lobe 2 comprises the middle portion of the waste rock dump. Some iron cementing was present in lobe 2. The Lobe 2 Composite sample contained 5.3 mg/kg arsenic, 0.88 mg/kg cadmium, 97.6 mg/kg copper, 611 mg/kg lead, and 119 mg/kg zinc. Acid base account analysis for the Lobe 2 Composite sample showed an ABP of <0.30 $TCaCO_3$/1000T waste rock, AGP of 1.88 $TCaCO_3$/1000T, ANP of 1.70 $TCaCO_3$/1000T, 0.010 percent non-extractable sulfur, 0.060 percent pyritic sulfur, 0.10 percent sulfate sulfur, and 0.170 percent total sulfur. The SPLP extract from the Lobe 2 Composite sample contained <0.10 mg/L arsenic, 0.0025 mg/L cadmium, 0.0035 mg/L copper, 0.0434 mg/L lead, and 0.138 mg/L zinc. The Lobe 2 Grab sample contained 17.9 mg/kg arsenic, 28.3 mg/kg cadmium, 46.4 mg/kg copper, 259 mg/kg lead, and 8,250 mg/kg zinc.

4.1.3 Lobe 3

Lobe 3 is on the west edge of the dump, farthest from the adit. Little iron cementing was visible in this portion of the dump. More boulders are present in lobe 3 than other parts of the dump. Missoula Gulch can be heard flowing under boulders at the toe of the lowest part of the dump. The Lobe 3 Composite sample contained 11.2 mg/kg arsenic, 2.04 mg/kg cadmium, 64.2 mg/kg copper, 336 mg/kg lead, and 368 mg/kg zinc. Acid base account analysis for the Lobe 3 Composite sample showed an ABP of <-1.0 T $CaCO_3$/1000 T waste rock, AGP of 4.38 T $CaCO_3$/1000 T, ANP of 3.37 T $CaCO_3$/1000 T, 0.020 percent non-extractable sulfur, 0.140 percent pyritic sulfur, 0.13 percent sulfate sulfur, and 0.290 percent total sulfur. The SPLP extract from the Lobe 3 Composite sample contained <0.10 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, <0.0050 mg/L lead, and 0.0386 mg/L zinc. The Lobe 3 Grab sample contained 9.3 mg/kg arsenic, 4.94 mg/kg cadmium, 38.3 mg/kg copper, 157 mg/kg lead, and 1,390 mg/kg zinc.

4.1.4 Surface Water and Sediment

MCS collected surface water and sediment samples from Missoula Gulch above the adit and below the waste rock dump and from the adit discharge.

Missoula Gulch 1

The Missoula Gulch 1 surface water sample was collected above the confluence with water flowing from the adit and contained <0.010 mg/kg arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, <0.0050 mg/L lead, and 0.010 mg/L zinc. Missoula Gulch 1 sediment sample contained 7.0 mg/kg arsenic, 0.62 mg/kg cadmium, 21.8 mg/kg copper, 21.4 mg/kg lead, and 126 mg/kg zinc.

RM Adit Discharge

Water discharging from the adit was collected from the entrance to the Red Monarch Mine. This sample is RM Adit Discharge. Sample RM Adit Discharge contained <0.010 mg/kg arsenic, <0.0071 mg/L cadmium, <0.0030 mg/L copper, <0.0699 mg/L lead, and 2.18 mg/L zinc. The sediment sample collected from the same location contained 11.3 mg/kg arsenic, 27.9 mg/kg cadmium, 50.9 mg/kg copper, 674 mg/kg lead, and 18,000 mg/kg zinc.

Missoula Gulch 2

The Missoula Gulch 2 surface water sample, collected where water returns to surface flow below the waste rock dump, contained <0.010 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, <0.0050 mg/L lead, and 0.516 mg/L zinc. The Missoula Gulch 2 sediment sample contained 4.5 mg/kg arsenic, 3.89 mg/kg cadmium, 28.0 mg/kg copper, 91.0 mg/kg lead, and 1,090 mg/kg zinc.

4.2 WASTE ROCK VOLUME

Volume of the waste rock at the Red Monarch Mine is estimated at 10,400 cubic yards. Waste rock volumes were calculated using Autodesk® Land Desktop 2002 and Autodesk® Civil Design 2002. MCS used survey data to infer a pre waste rock surface. The volume between the two surfaces was calculated using the grid method with 1 foot grid spacing. Volumes were checked using hand calculations of area and average depth.

4.3 RED MONARCH MINE INVESTIGATION SUMMARY

4.3.1 Waste Rock

Metals concentrations in waste rock at the Red Monarch Mine are, in general, relatively low. Lobe 1 contains the first rock excavated from the adit. Metals concentrations in the Lobe 1 Composite and Grab samples are very low. As development of the mine continued, mineralization in the waste rock increased. This can be seen in the Lobe 2 Composite sample where lead (611 mg/kg) and zinc (119 mg/kg) show significant increases from lobe 1 (16.1 mg/kg lead and 36 mg/kg zinc). The Lobe 3 Composite sample contained 336 mg/kg lead and 368 mg/kg zinc. The Lobe 2 and Lobe 3 Grab samples contained 8,250 mg/kg and 1,390 mg/kg zinc, respectively. These two samples indicate that high concentrations of zinc are present in some portions of the waste rock.

MCS evaluated the AGP of waste rock from the site using the acid-base accounting results. According to Pettit, et al. (1999), the following conditions are likely acid generating:

- ABP results less than -20 $TCaCO_3$/1000T
- The ratio of ANP/AGP is less than 1

The ability to generate acid is uncertain under the following conditions:

- acid generating potential between -20 and 20 $TCaCO_3$/1000T
- The ratio of ANP/AGP is between 1 and 3

Acid generation is unlikely to occur under the following conditions:

- ABP results greater than 20 $TCaCO_3$
- The ratio of ANP/AGP greater than 3

Results for ABP were 2.12, less than 0.30, and -1.00 $TCaCO_3$/1000T for Lobe 1, Lobe 2, and Lobe 3, respectively. The ratio of ANP/AGP results was 2.7, 0.9, and 0.77 for Lobe 1, Lobe 2, and Lobe 3, respectively. This places waste rock from all three lobes in the uncertain category for acid generation according to ABP. Lobes 2 and 3 are in the acid generating category according to the ANP/AGP ratios. The samples all contained low ANP and AGP values, and low percentages of pyritic sulfur and total sulfur. The ABP and ANP/AGP results from waste rock at the site indicate the waste rock may have a minor potential to generate acid.

4.3.2 Surface Water and Sediment

Water flowing from the adit at the Red Monarch Mine contains elevated concentrations of cadmium (0.0071 mg/L), lead (0.070 mg/L), and zinc (2.18 mg/L). High concentrations of cadmium (27.9 mg/kg), copper (50.9 mg/kg), lead (674 mg/kg), and zinc (18,000 mg/kg) are found in the sediments at the location of where the water flows from the adit. Metals in the sediment have the adit discharge as their likely source through precipitation reactions as the adit water is exposed to oxygen.

Effects of the Red Monarch Mine can be seen in both the surface water and sediment of Missoula Gulch. Zinc is the only metal analyzed that is above the method detection limit in surface water from Missoula Gulch. Above the water flowing from the adit and mine, Missoula Gulch surface water contained 0.010 mg/L zinc. Below the waste rock dump surface water contained 0.516 mg/L zinc. Zinc in stream sediment also increased from 126 mg/kg above the mine to 1,090 mg/kg below the mine. Cadmium and lead concentrations also increase in sediments downstream across the site.

The source of metals, particularly zinc, to the sediment of Missoula Gulch below the mine is the adit discharge and waste rock dump. Adit discharge was estimated at 15 gallons per minute at the time of the fieldwork. Assuming that flow and a concentration of 2.18 mg/L of zinc, the adit discharge is contributing 188 grams of zinc per day or 69 kilograms per year to Missoula Gulch. The zinc concentrations in the three composite samples collected from the waste rock dump ranged from 36 mg/kg in lobe 1 to 368 mg/kg in lobe 3.

Grab samples from lobe 2 and lobe 3 of the waste rock dump contained 8,250 mg/kg and 1,390 mg/kg zinc, respectively. This compares with 1,090 mg/kg zinc found in stream sediment below the waste rock dump. The grab samples indicate that some pockets of high metal waste rock are present, but the composite samples probably accurately reflect the average concentration of the waste rock. Assuming the composite samples reflect the average metals concentrations of the waste rock, the adit discharge is the primary source of zinc to the sediments of Missoula Gulch below the waste rock dump.

5.0 IDORA MILL SITE HYDROGEOLOGICAL INVESTIGATION

MCS collected one tailings and three sediment samples as part of this investigation. Several groundwater and surface water samples were analyzed for total metals and field parameters. Other tailings, waste rock, and soil samples were collected by BRI during their site investigation of the Idora Mill. BRI's sample results were not available to MCS prior to this completing this report.

5.1 GROUNDWATER INVESTIGATION

MCS installed four piezometers in the vicinity of the Idora Mill. Three piezometers were installed adjacent to Beaver Creek and one was installed in a dry creek channel above the mill. Analytical results for samples collected at the Idora Mill are shown on Tables 5.1 and 5.2. Figure 2.4 shows the location of the piezometers.

5.1.1 PZ01

Piezometer PZ01 was installed adjacent to Beaver Creek at the lower end of the tailings. Groundwater was seeping from a cut-bank at the tailings/native soil zone adjacent to the piezometer. The water level in the piezometer was similar in elevation to that of the creek, about 2 feet below the bottom of the tailings. The groundwater seeping from the cut-bank at the tailings/native soil contact is higher than that in the piezometer and creek. The tailings are fine grained and have a higher specific retention than the underlying sandy gravel native soil material (Fetter 1994). The groundwater is likely seeping at this location because the higher specific retention of the tailings material is "perching" the water above the native material through specific retention.

Groundwater from PZ01 contained <0.010 mg/L arsenic, 0.005 mg/L cadmium, 0.0160 mg/L copper, 0.350 mg/L lead, and 0.958 mg/L zinc.

5.1.2 PZ02

Piezometer PZ02 was located adjacent to Beaver Creek a short distance upstream from PZ01. Groundwater was not visible in the tailings at this location. The water level in the piezometer was similar to the water level in the creek. The PZ02 groundwater sample contained <0.10 mg/L arsenic, 0.0056 mg/L cadmium, 0.0034 mg/L copper, 0.0166 mg/L lead, and 1.01 mg/L zinc.

5.1.3 PZ03

Piezometer PZ03 was installed adjacent to Beaver Creek where the currently dry channel that runs in front of the former mill reenters creek. This channel has become entrenched to about 1.5 to 2 feet

below the bottom of the tailings. Groundwater from PZ03 contained <0.010 mg/L arsenic, 0.0059 mg/L cadmium, <0.0030 mg/L copper, 0.0385 mg/L lead, and 0.903 mg/L zinc.

Table 5.1 Idora Mill Sediment and Tailings Analytical Results

Sample ID	Station	Arsenic	Cadmium	Copper	Lead	Zinc
		All results in mg/kg				
MDEQ Recreational Risk Cleanup Levels		370	2079	63,616	2572	514,000
ROD Reference Cleanup Guidelines (mg/kg)		420			1000	
ROD Concentrations for Soil: Terrestrial Biota		40	386	1,021	522	261
ROD Concentrations for Sediment: Aquatic Birds and Mammals		138	664	2,209	718	390
Sediment Results						
11018013107	BC03	17.6	3.93	40.3	**1,090**	**903**
11018013108	BC04	12.3	3.24	28.5	**854**	**820**
11018013105	Sed01	12.6	2.76	20.9	203	**459**
Tailings Results						
11018013106	Tail01	**105**	31.7	590	**17,400**	**7,460**

< = analyte was not detected at or above the method detection limit, the value listed next to < is the method detection limit
SPLP = Synthetic Precipitation Leaching Procedure
mg/kg = milligrams per kilogram
MDEQ Recreational Cleanup Levels based on rock hound/gold panner 50 day/year exposure scenario (TetraTech 1996; updated by MCS 2003)
ROD Reference Cleanup Guidelines: Cleanup guideline based on recreational soil/sediment ingestion and dermal contact (Table 7.1-20; EPA 2002b)
ROD Concentrations for Sediment: Concentrations of Ecological Concern (COEC) Concentrations for Sediment (mg/kg) Protective for Aquatic Birds and Mammals for Population ED20-Based (Table 7.2-7; EPA 2002b)
ROD Concentrations for Soil: COEC Concentrations for Soil (mg/kg) Protective for Terrestrial Biota for Population ED20-Based (Table 7.2-6; EPA 2002b)
Bold = concentration exceeds one or more of the listed standards or cleanup goals

Table 5.2 Groundwater and Surface Water Analytical Results

Sample ID#	Sample Location	Arsenic (mg/L)	Cadmium (mg/L)	Copper (mg/L	Lead (mg/L)	Zinc (mg/L)	pH (mg/L)	Temp (°C)	DO (mg/L)	SC (µS/cm[c])	ORP (mV)
Water Quality Standards											
Aquatic CMC (Acute)		0.360	0.0037	0.017	0.065	0.114	NS	NS	NS	NS	NS
Aquatic CCC (Chronic)		0.190	0.001	0.011	0.0025	0.105	6.5 - 9	NS	NS	NS	NS
Drinking Water MCL		0.01	0.005	1.3	0.015	NS	NS	NS	NS	NS	NS
Groundwater Results – Total Metals											
11018013100	PZ01	<0.010	**0.0050**	0.0160	**0.350**	0.958	6.4	21.4	4.9	55	125.1
11018013102	PZ02	<0.010	**0.0056**	0.0034	**0.0166**	1.01	6.5	26.5	4.8	52	115.9
11018013103	PZ03	<0.010	**0.0059**	<0.0030	**0.0385**	0.903	6.6	32.2	5.4	590	85.1
11018013104	PZ04	<0.010	<0.0020	<0.0030	0.0062	0.0967	6.2	19.7	5.4	46	123.5
11018013101	Seep1	<0.010	0.0042	0.0043	**0.0376**	0.808	6.2	15.5	5.3	42	150.5
Surface Water Results – Total Metals											
11018013105	BC01	<0.010	<0.0020	<0.0030	<0.0050	0.0112	6.6	13.5	3.2	39	132.7
11018013106	BC02	<0.010	<0.0020	<0.0030	<0.0050	0.0889	**6.3**	12.9	4.3	37	162.4
11018013107	BC03	<0.010	<0.0020	<0.0030	**0.0117**	**0.180**	6.8	15.2	2.1	40	104.8
11018013109	BC04	<0.010	<0.0020	<0.0030	**0.0075**	**0.262**	7.2	16.2	2.4	41	90.0
11018013108	Adit01	<0.010	<0.0020	<0.0030	<0.0050	<0.0050	7.5	10.1	1.9	0.224	28.6

Surface water results for copper and lead are considered estimated due to out of control relative percent differences for the laboratory duplicate
Groundwater results were compared with Drinking Water MCLs, and surface water to aquatic water quality standards
< = analyte was not detected at or above the method detection limit, the value listed next to < is the method detection limit
Bold = exceeds one or more water quality standard
mg/L = milligrams per liter
°C = degrees Celcius
µS/cm = microSiemens per centimeter
mV = millivolts
Temp = temperature
DO = dissolved oxygen
SC = specific conductance
ORP = oxidation reduction potential – reading from YSI multi-parameter meter
CMC = Criteria Maxium Concentration (Acute): EPA-Approved Idaho Water Quality Standards, IDAPA 58.0102.284 & 58.0102.210 (IDEQ 2003)
CCC = Criterion Continuous Concentration (Chronic): EPA-Approved Idaho Water Quality Standards (IDEQ, 2003), IDAPA 58.0102.284 & 58.0102.210 (IDEQ 2003)
EPA Water Quality Standards for cadmium, copper, lead, and zinc are based on a hardness value of 100 mg/L
MCL = *Drinking Water Maximum Contaminant* Level (EPA 2002 Edition of the Drinking Water Standards & Health Advisories (EPA 2002a)
NS = no standard

5.1.4 PZ04

Piezometer PZ04 was located in the dry channel upstream from the mill site. This location was above any influence of the mill. The PZ04 groundwater sample contained <0.010 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, 0.0062 mg/L lead, and 0.0967 mg/L zinc.

5.1.5 Seep1

A seep located next to PZ01 was sampled during the investigation. Seep 1 was about 4 inches deep and had numerous caddis flies living in it. The Seep 1 sample contained <0.10 mg/L arsenic, 0.0042 mg/L cadmium, 0.0043 mg/L copper, 0.0376 mg/L lead, and 0.808 mg/L zinc.

The Sed01 sample was collected from this seep. This sample contained 12.6 mg/kg arsenic, 2.76 mg/kg cadmium, 20.9 mg/kg copper, 203 mg/kg lead, and 459 mg/kg zinc.

5.2 GROUNDWATER FLOW

Groundwater elevations were measured in each of the four piezometers. Surface water elevations in the creek were measured near each piezometer so that surface water and groundwater elevations could be compared. Groundwater elevations in the piezometers were similar to nearby surface water elevations. Figure 4.1 shows the groundwater contours within the area of the piezometers, assuming that surface water elevations reflect groundwater elevations adjacent to the creek.

Groundwater recharge and discharge areas in the vicinity of the mill were observed during the investigation. The debris dam above the mill is a major groundwater recharge area because the creek loses all surface expression at this location during low water. Some flow returns to the creek below the debris dam. Springs returning groundwater back to the creek were observed near the BC02 sample location (Figure 2.4). This appeared to mark the beginning of a groundwater discharge zone. A large spring was present at the downstream end of the tailings during the initial site visit (Photo 8), and continued to flow at the time of the site visit, but flow was much smaller than earlier in the summer. Additional springs were observed below the mill on the south side of the creek. Based on these observations, the tailings area is in a groundwater discharge area.

5.3 SURFACE WATER RESULTS

Four surface water samples were collected in the vicinity of the Idora Mill. Water sample BC01 was collected from Beaver Creek above the mill site. This sample contained <0.010 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, <0.0050 mg/L lead, and 0.112 mg/L zinc.

Water sample BC02 was collected from Beaver Creek adjacent to the former mill building. This sample location is above any observed effects from the mill. The BC02 sample contained <0.010 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, <0.0050 mg/L lead, and 0.0889 mg/L zinc.

Water sample BC03 was collected from Beaver Creek at the down stream end of the tailings. This sample contained <0.010 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, 0.0117 mg/L lead, and 0.180 mg/L zinc. The sediment sample collected at the BC03 sample location contained 17.6 mg/kg arsenic, 3.93 mg/kg cadmium, 40.3 mg/kg copper, 1,090 mg/kg lead, and 903 mg/kg zinc.

Surface water sample BC04 was collected from Beaver Creek below the waste rock dump down stream from the mill site. The BC04 sample contained <0.010 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, 0.0075 mg/L lead, and 0.262 mg/L zinc. The sediment sample collected at the BC04 sample location contained 12.3 mg/kg arsenic, 3.24 mg/kg cadmium, 28.5 mg/kg copper, 854 mg/kg lead, and 820 mg/kg zinc.

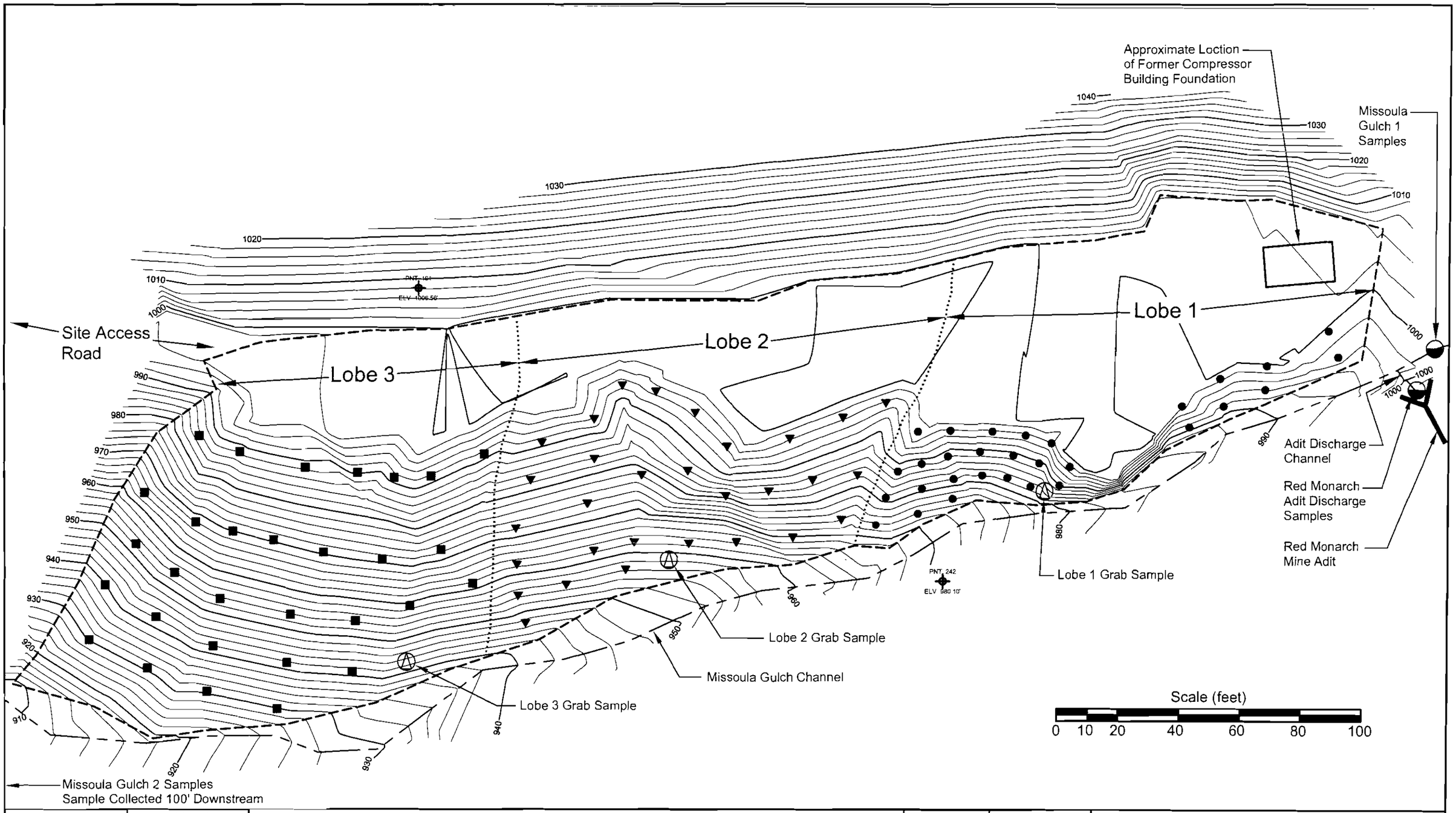
An adit is located on the north side of the creek downstream from the cabin. This adit is the likely source for the waste rock dump that extends from the cabin downstream to about 100 yards below the adit. Water was pooled near the adit entrance, but was not visibly flowing from out of the adit. Water sample Adit 01 was collected from the standing water at the entrance to the adit. This sample contained <0.010 mg/L arsenic, <0.0020 mg/L cadmium, <0.0030 mg/L copper, <0.0050 mg/L lead, and <0.0050 mg/L zinc.

5.4 TAILINGS SAMPLE

One tailings sample was collected from tailings immediately above the tailings/native soil interface. The sample consisted of red, black, and gray sandy gravel with some iron cementing. Tailings at this location appeared saturated and water was seeping from the base of the tailings. This is the material that is actively eroded into Beaver Creek during high water. The Tail01 sample contained 105 mg/kg arsenic, 31.7 mg/kg cadmium, 590 mg/kg copper, 17,400 mg/kg lead, and 7,460 mg/kg zinc.

5.5 WASTE ROCK AND TAILINGS VOLUME

MCS did not collect data to calculate tailings volume at the Idora Mill site.



MCS Environmental
5562 ALLOY SOUTH
MISSOULA, MT 59808
(406) 728-7755
FAX (406) 728-7367

LEGEND

- Project Bench Mark
- Mine Adit Location
- Approximate Limit of Waste Rock
- Approximate Limit of Waste Rock Lobe Sampling Sections
- Stream Center Line
- Lobe 1 Composite Sample Location
- Lobe 2 Composite Sample Location
- Lobe 3 Composite Sample Location
- Grab Sample Location
- Surface Water and Sediment Sample Location

* 2.0 foot contour interval based on arbitrary 1000 foot datum

PROJECT NO.	11018.013
DRAWN BY	WPP
REVISION NO.	NA
DATE	NOVEMBER 2003
SCALE	1" = 30'

Figure 4.1: Red Monarch Sample Locations

Idora Mill and Red Monarch Mine
SHOSHONE COUNTY
IDAHO PANHANDLE NATIONAL FOREST

REGION ONE

\\Environ\Current Projects\11018_Forest Service\11018.013 Idora\Drawings\Monarch\dwg\FX.X Info.dwg

REF. Surveyed Data Collected by MCS Environmental, July 07, 2003

5.6 IDORA MILL HYDROGEOLOGICAL INVESTIGATION SUMMARY

Conceptual Model

Upper Beaver Creek flows through a narrow V-shaped valley. The bottom of the valley has been filled with cobble to small boulder size sediments (Ott and Clark 2003) that create a wide floodplain. The drainage has a steep gradient (Bitterroot Restoration 2003). The lower portion of the creek within the study area above the confluence with Carbon Creek is overloaded with sediment. The sediment overloading begins where the gradient of the creek becomes less steep. This sediment overloading may occur naturally where the creek gradient is no longer steep enough to carry the bedload of cobble size sediments. A mine below the Idora Mill dumped waste rock into the floodplain of Beaver Creek. Much of the waste rock has been eroded to downstream locations. Erosion of this waste rock may be responsible for some of the degradation of the lower portions of Beaver Creek within the study area.

Beaver Creek has two inflection points where the gradient of the creek changes. The first gradient change is immediately above the Idora Mill site and the second is where the creek becomes overloaded with sediments, approximately ½ mile below the mill. The valley widens in the vicinity of the mill with a wider floodplain than the reach above the mill. The valley widens again where the creek becomes overloaded with sediment.

Hydraulic conductivity is related to the grain size of aquifer material (Fetter 1988). Stream bed sediment and aquifer material in upper beaver creek is dominated by cobbles (Bitterroot Restoration 2003; Ott and Clark 2003). Coarse cobble dominated aquifers have hydraulic conductivities that range from 100 to 100,000 meters per day (Driscoll 1989). Cobble and boulder dominated aquifers are the most conductive of alluvial aquifers. Piezometers installed by MCS show that groundwater elevations approximate nearby surface water elevations. Because the surface water is in direct contact with groundwater, water is easily exchanged between the two systems (Fetter 1988). The variable surface water flows measured by BRI (2003) during their investigation also provide evidence of the surface/groundwater interaction.

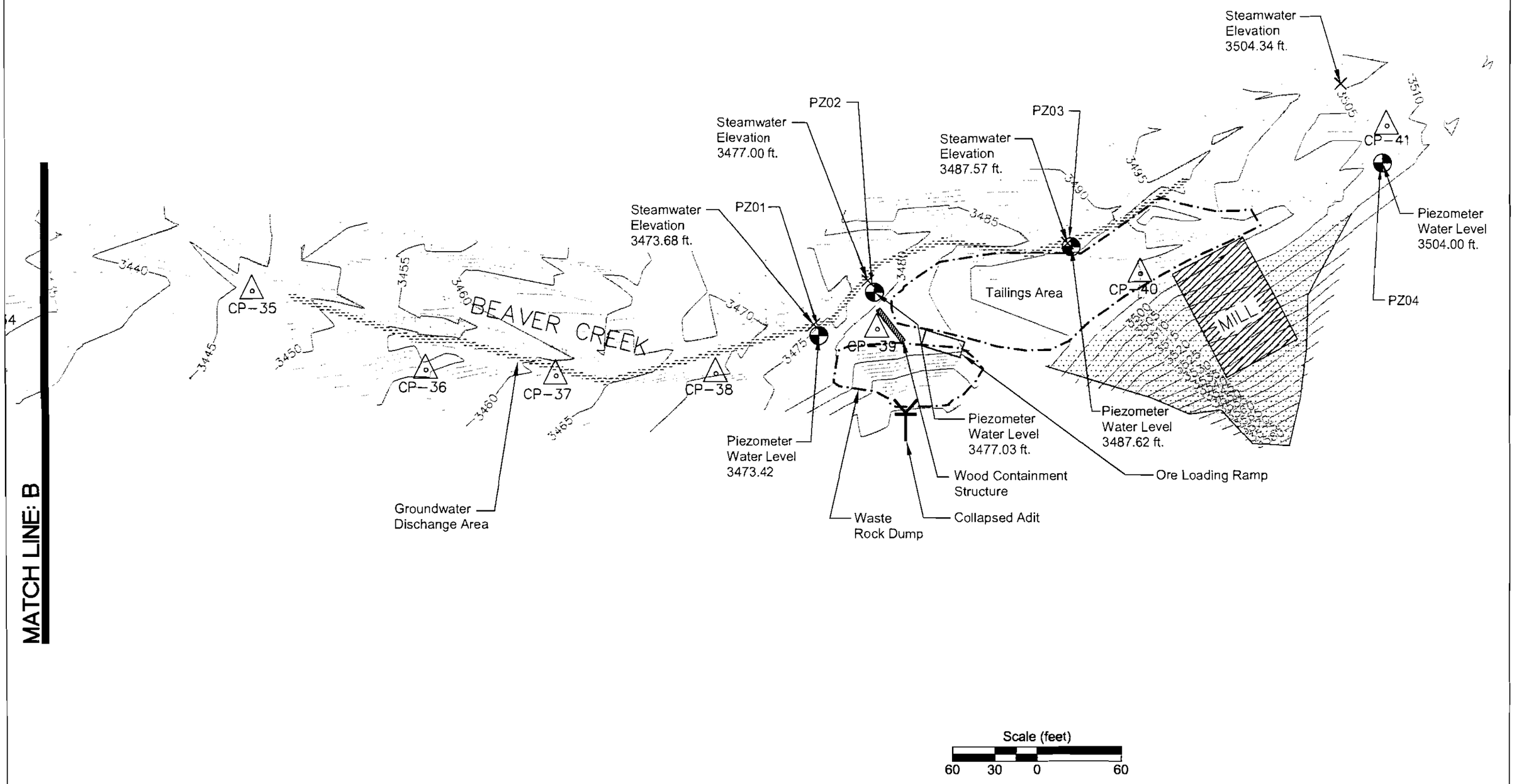
A large debris dam has formed above the mill site. The debris dam consists of a logjam that accumulated a large amount of stream sediments. All surface water in the creek infiltrates into the debris dam. Much of the water returns to the surface below the dam. A relatively new channel has been formed that leaves the old channel above the debris dam, flows down to the mill, in front of the mill building, then turns back toward the creek an enters the creek just below the mill building. This channel cut through and eroded mill tailings, perhaps when water backed up behind the debris dam and sought a new course. Presently, the channel flows only during high water. If the debris dam were to increase in size, it is possible that the creek could abandon the main channel and make the

new channel the primary channel. If this were to happen, much more of the tailings would be exposed to active erosion.

Groundwater elevations were below the base of the tailings throughout the tailings area. The tailings/native soil interface could be observed along the dry channel that flows through the upper part of the tailings area and along the creek. A wood containment structure was built across the lower tailings area before the tailings were slurried into place, possibly to contain the tailings. Water was seeping from the tailings next to the creek in the lower part of the site above the wood containment. The wood containment may act as a barrier to prevent horizontal flow of groundwater and force it towards the creek. This is the only portion of the tailings area where soil was observed under the tailings. This is the only location where perched water was observed in the tailings area.

Groundwater samples collected from piezometers indicate that metals concentrations increase as groundwater flows under the tailings. Piezometer PZ04 is located above all the mill disturbances. Groundwater at this location has similar metal concentrations to surface water above the mill. Groundwater at the PZ03 location has a relatively short travel distance under tailings. The lead concentration increases from 0.0062 mg/L at the PZ04 location to 0.0385 at PZ03. Lead concentrations increase to 0.350 mg/L at PZ01. The PZ01 location may also be affected by perched water infiltrating to groundwater. The PZ02 groundwater sample contained 0.0166 mg/L. This piezometer is a short distance above PZ01. The lower lead concentration may reflect a stronger surface water influence at this location. Zinc concentrations in groundwater were similar at all piezometer locations where tailings affect groundwater.

The USGS installed a hand driven piezometer into the tailings material near the mill. Groundwater samples collected from this piezometer contained 0.0606 and 0.0266 mg/L lead the two times it was sampled. Lead concentrations in the USGS piezometer water samples indicate that lead concentrations increase in groundwater flowing under the south portion of the tailings away from the creek. This piezometer was dry during the MCS sampling event.



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North

LEGEND

- Groundwater Discharge Area
- Piezometer Location
- Approximate Stream Location
- CP-39 Survey Control Point Location
- Groundwater Contour 0.5 foot interval relative to sea-level datum

Note: Contour Interval (Surface) 1.0 foot relative to sea-level datum.

PROJECT NO.	11018.013
DRAWN BY	WPP
REVISION NO.	NA
DATE	November 2003
SCALE:	1" = 60'

Figure 5.1: Idora Mill Potentiometric Surface

Idora Mill and Red Monarch Mine
SHOSHONE COUNTY
IDAHO PANHANDLE NATIONAL FOREST

REGION ONE

M:\Environmental\Current Projects\11018_Forest Service\11018.013 Idora\Drawings\Idora\dwg\FX.X Idora.dwg

\\Environs\Current Drawins\11018_Forest Service\11018.013 Idora\Drawings\Idora\dwg\FX.X Idora.dwg

REF: Map Obtained from Bitterroot Restoration (Bitterroot Restoration 2003)

6.0 PRELIMINARY CONCLUSIONS

6.1 RED MONARCH MINE

Waste rock at the Red Monarch Mine contains minor amounts of the metals. The first waste rock excavated from the adit was placed in lobe 1. Metals concentrations in lobe 1 are very low and probably similar to background. Metals concentrations increase in lobes 2 and 3. Table 6.1 contains the highest concentrations of individual metals found at the site along with cleanup levels derived by TetraTech (1996) for the Montana Department of Environmental Quality (MDEQ) and updated by MCS (2003). Cleanup guidelines are from the rockhound/gold panner scenario with maximum exposure of 50 days per year. Reference cleanup guidelines for arsenic and lead from the Bunker Hill Record of Decision (ROD) (EPA 2002b) are also included in the table. Arsenic and lead concentrations are below the ROD and MDEQ cleanup guidelines.

Table 6.1: Red Monarch Waste Rock Metals Concentrations and Potential Cleanup Guidelines

Chemicals of Potential Concern	Waste Rock Concentration mg/kg	ROD Reference Cleanup Guideline mg/kg	MDEQ Soil Ingestion/Dust Inhalation/Contact Guideline 50 Days mg/kg
Arsenic	17.90	420	370
Cadmium	28.30		2079
Copper	97.60		63,616
Lead	611.00	1000	2572
Zinc	8250.00		514,000

Adit discharge from the mine contains a high concentration of zinc (2.18 mg/L), which is also reflected in the adit discharge sediment (18,000 mg/kg zinc). Zinc exceeds the acute and chronic aquatic life standards in water samples from the adit discharge and Missoula Gulch below the mine. The annual contribution of zinc from the adit discharge to Missoula Gulch is estimated at 69 kilograms per year. Sediments in Missoula Gulch below the mine contain elevated concentrations of zinc. MCS believes that the adit discharge is a significant source of zinc to the creek sediments below the mine.

Missoula Gulch actively erodes waste rock at the Red Monarch Mine during runoff events. The rate of erosion is decreasing as the floodplain through the waste rock widens to accommodate runoff

A significant groundwater recharge reach is located a short distance above the Idora Mill at the debris dam. Groundwater discharges to the creek below the debris dam and a spring was observed adjacent to the creek opposite the mill. A significant groundwater discharge area is located at the lower end of the tailings (Photo 8). Much more groundwater was discharging from the lower end of the tailings on May 9, 2003 during the first site visit than in late July. The nature of the local groundwater system with a discharge area at the lower end of the tailings facilitates the migration of metals to Beaver Creek.

7.0 REFERENCES

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Photo 1: Top of Red Monarch waste rock dump.

Photo 2: Adit discharge at the Red Monarch Mine.

Photo 3: Missoula Gulch below Red Monarch adit. Adit discharge is on the right.

Photo 4: Red Monarch waste rock dump viewed from Missoula Gulch.

Photo 5: Idora Mill site looking up the valley.

Photo 6: Idora Mill with recently eroded channel.

Photo 7: Beaver Creek at the lower end of the Idora Mill site.

Photo 8: Seep at the lower end of the Idora Mill site.

APPENDIX A
LABORATORY REPORTS

SVL ANALYTICAL, INC.
One Government Gulch ▪ P.O. Box 929 ▪ Kellogg, Idaho 83827-0929 ▪ Phone: (208)784-1258 ▪ Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : MCS, INC. Sample Receipt: 7/31/03 Page 1 of 1
PROJECT: Report Date: 8/18/03 SVL JOB: 106935

SVL ID	CLIENT SAMPLE ID		As 200.7	Cd 200.7	Cu 200.7	Pb 200.7	Zn 200.7
W345510	11018013100	7/30/03	<0.010mg/L	0.0050mg/L	0.0160mg/L	0.350mg/L	0.958mg/L
W345511	11018013101	7/30/03	<0.010mg/L	0.0042mg/L	0.0043mg/L	0.0376mg/L	0.808mg/L
W345512	11018013102	7/30/03	<0.010mg/L	0.0056mg/L	0.0034mg/L	0.0166mg/L	1.01mg/L
W345513	11018013103	7/30/03	<0.010mg/L	0.0059mg/L	<0.0030mg/L	0.0385mg/L	0.903mg/L
W345514	11018013104	7/30/03	<0.010mg/L	<0.0020mg/L	<0.0030mg/L	0.0062mg/L	0.0967mg/L
W345515	11018013105	7/30/03	<0.010mg/L	<0.0020mg/L	<0.0030mg/L	<0.0050mg/L	0.112mg/L
W345516	11018013106	7/30/03	<0.010mg/L	<0.0020mg/L	<0.0030mg/L	<0.0050mg/L	0.0889mg/L
W345517	11018013107	7/30/03	<0.010mg/L	<0.0020mg/L	<0.0030mg/L	0.0117mg/L	0.180mg/L
W345518	11018013108	7/30/03	<0.010mg/L	<0.0020mg/L	<0.0030mg/L	<0.0050mg/L	<0.0050mg/L
W345519	11018013109	7/30/03	<0.010mg/L	<0.0020mg/L	<0.0030mg/L	0.0075mg/L	0.262mg/L
W345520	11018013203	7/31/03	<0.010mg/L	0.0071mg/L	<0.0030mg/L	0.0699mg/L	2.18mg/L
W345521	11018013206	7/31/03	<0.010mg/L	<0.0020mg/L	<0.0030mg/L	<0.0050mg/L	0.0105mg/L
W345522	11018013207	7/31/03	<0.010mg/L	<0.0020mg/L	<0.0030mg/L	<0.0050mg/L	0.516mg/L

Certificate: ID ID00019

Reviewed By: _____ Date: 8/18/03

SVL ANALYTICAL, INC.

Quality Control Report
Part I Prep Blank and Laboratory Control Sample

Client :MCS, INC.

SVL JOB No: 106935

Analyte	Method	Matrix	Units	Prep Blank	True	LCS	Found	LCS %R	Analysis Date
Arsenic	200.7	WATER	mg/L	<0.010	1.00		1.11	111.0	8/15/03
Cadmium	200.7	WATER	mg/L	<0.0020	1.00		1.07	107.0	8/15/03
Copper	200.7	WATER	mg/L	<0.0030	1.00		1.05	105.0	8/15/03
Lead	200.7	WATER	mg/L	<0.0050	1.00		1.07	107.0	8/15/03
Zinc	200.7	WATER	mg/L	<0.0050	1.00		1.06	106.0	8/15/03

LEGEND:

LCS = Laboratory Control Sample LCS %R = LCS Percent Recovery N/A = Not Applicable

SVL ANALYTICAL, INC.

Quality Control Report
Part II Duplicate and Spike Analysis

Client :MCS, INC. SVL JOB No: 106935

Test	Method	Matrix	QC SAMPLE ID	Units	Result	Duplicate or MSD Found	RPD%	Matrix Spike Result	SPK ADD		%R	Analysis Date
As	200.7	WATER	1	mg/L	<0.010	<0.010	UDL	1.09	1.00		109.0	8/15/03
As	200.7	WATER	2	mg/L	<0.010	N/A	N/A	1.12	1.00		112.0	8/15/03
Cd	200.7	WATER	1	mg/L	0.0050	0.0053	5.8	1.05	1.00		104.5	8/15/03
Cd	200.7	WATER	2	mg/L	0.0071	N/A	N/A	1.04	1.00		103.3	8/15/03
Cu	200.7	WATER	1	mg/L	0.0160	0.0209	26.6	1.04	1.00		102.4	8/15/03
Cu	200.7	WATER	2	mg/L	<0.0030	N/A	N/A	1.08	1.00		108.0	8/15/03
Pb	200.7	WATER	1	mg/L	0.350	0.531	41.1	1.69	1.00		134.0	8/15/03
Pb	200.7	WATER	1	mg/L	0.350	N/A	N/A	1.37	1.00	A	102.0	8/15/03
Pb	200.7	WATER	2	mg/L	0.0699	N/A	N/A	1.11	1.00		104.0	8/15/03
Zn	200.7	WATER	1	mg/L	0.958	1.02	6.3	2.07	1.00		111.2	8/15/03
Zn	200.7	WATER	2	mg/L	2.18	N/A	N/A	3.35	1.00		117.0	8/15/03

LEGEND:

RPD% = (|SAM - DUP| /((SAM + DUP)/2) * 100) UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.

RPD% = (|SPK - MSD| /((SPK + MSD)/2) * 100) M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC Sample 1: SVL SAM No.: 345510 Client Sample ID: 11018013100

QC Sample 2: SVL SAM No.: 345520 Client Sample ID: 11018013203

MCS Environmental
5562 Alloy South
Missoula, MT 59808
(406) 735-7095

All waters preserved by SVL upon arrival
YBM 7/31/03

CHAIN OF CUSTODY

10935

Fax copy of COC to MCS Missoula. YBM

MCS Environmental, Inc.
Job Number 11018013
COC Form # 1

Recorded by: RES

Checked by: _____

	Sample Matrix		Analysis Containers: Total Metals	Anions/Cations	Acid Base Acounting	As, Cd, Cu, Pb, Zn								
MCS Environmental, Inc. 11018013100 COC Initials: TM Date: 7/30/03 Time: 200	GW	Date: 7/30/03	X			X								1 Number of containers
		Time: 1200												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013101 COC Initials: TM Date: 7/30/03 Time: 1227	SW	Date: 7/30/03				X								1 Number of containers
		Time: 1227												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013102 COC Initials: TM Date: 7/30/03 Time: 1244	GW	Date: 7/30/03				X								1 Number of containers
		Time: 1244												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013103 COC Initials: TM Date: 7/30/03 Time: 1333	GW	Date: 7/30/03				X								1 Number of containers
		Time: 1333												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013104 COC Initials: TM Date: 7/30/03 Time: 1428	GW	Date: 7/30/03				X								1 Number of containers
		Time: 1428												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013105 COC Initials: TM Date: 7/30/03 Time: 1603	SW	Date: 7/30/03				X								1 Number of containers
		Time: 1603												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013105 COC Initials: RES Date: 7/30/03 Time: 1518	Blank	Date: 7/30/03				X								1 Number of containers
		Time: 1518												Number of Containers with Custody Seal Intact

Laboratory Sample Receipt		
Number of Sample Containers in Shipping Container		
Shipping Container Chain of Custody Seal Intact (Y/N)		
Receipt Condition Comments (e.g., thawed, warm)		

Relinquished By	Transported By	Received By
Name: BM Hallmark Date: 7/31/03 Time: 1546	Bob Stewart	Name: BM Hallmark Date: 7/31/03 Time: 1546
Name: Date: Time:		Name: Date: Time:
Name: Date: Time:		Name: Date: Time:

MCS Environmental
5562 Alloy South
Missoula, MT 59808
(406) 735-7095

CHAIN OF CUSTODY

106935

MCS Environmental, Inc.
Job Number 11018013
COC Form # 2

Recorded by: RES

Checked by: _____

Sample Matrix	Analysis Containers: Total Metals	Anions/Cations	Acid Base Accounting	As, Cd, Ca, Pb, Zn	Sample Info	Number of containers
[redacted]			X		Date: 7/30/03 Time: 1558	1
Sed			X		Date: 07/30/03 Time: 1620	1
Sed			X		Date: 07/30/03 Time: 1640	1
Sed			X		Date: 07/30/03 Time: 1700	1
Sed			X		Date: 07/30/03 Time: 1730	1
Sed			X		Date: 07/30/03 Time: 1740	1
Sed			X		Date: 07/30/03 Time: 1745	1

MCS Environmental, Inc.
11018013106
COC
Initials: TM
Date: 7/30/03 Time: 1558

MCS Environmental, Inc.
11018013106
COC
Initials: RES
Date: 7/30/03 Time: 1620

MCS Environmental, Inc.
11018013107
COC
Initials: RES
Date: 7/30/03 Time: 1640

MCS Environmental, Inc.
11018013107
COC
Initials: RES
Date: 7/30/03 Time: 1700

MCS Environmental, Inc.
11018013108
COC
Initials: TM
Date: 7/30/03 Time: 1730

MCS Environmental, Inc.
11018013109
COC
Initials: TM
Date: 7/30/03 Time: 1740

MCS Environmental, Inc.
11018013108
COC
Initials: TM
Date: 7/30/03 Time: 1745

Number of Sample Containers in Shipping Container		
Shipping Container Chain of Custody Seal Intact (Y/N)		
Receipt Condition Comments (e.g., thawed, warm)		

Relinquished By	Transported By	Received By
Name: Bob Stewart	Bob Stewart	Name: Don Marbo
Date: 7/31/03		Date: 7/31/03
Time: 1546		Time: 1546
Name:		Name:
Date:		Date:
Time:		Time:
Name:		Name:
Date:		Date:
Time:		Time:

MCS Environmental
5562 Alloy South
Missoula, MT 59808
(406) 735-7095

CHAIN OF CUSTODY

106935

MCS Environmental, Inc.
Job Number 11018013
COC Form # 3

Recorded by: _____

Checked by: _____

Sample Matrix		Analysis Containers: Total Metals	Anions/Cations	Acid Base Accounting	As, Cd, Cu, Pb, Zn	SPLP extraction	with analysis for	Some metals					
MCS Environmental, Inc. 11018013200 COC Initials: TM Date: 7/31/03 Time: 1120													
Soil	Date: 7/31/03			X	X		X						1 Number of containers
	Time: 1120												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013201 COC Initials: TM Date: 7/31/03 Time: 1155													
Soil	Date: 7/31/03			X	X		X						1 Number of containers
	Time: 1155												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013202 COC Initials: TM Date: 7/31/03 Time: 1215													
Soil	Date: 7/31/03			X	X		X						1 Number of containers
	Time: 1215												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013203 COC Initials: TM Date: 7/31/03 Time: 1302													
Water	Date: 7/31/03			X	X								1 Number of containers
	Time: 1302												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013204 COC Initials: TM Date: 7/31/03 Time: 1310													
Sed	Date: 7/31/03			X	X								1 Number of containers
	Time: 1310												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013205 COC Initials: TM Date: 7/31/03 Time: 1315													
Sed	Date: 7/31/03			X	X								1 Number of containers
	Time: 1315												Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013206 COC Initials: TM Date: 7/31/03 Time: 1320													
Water	Date: 7/31/03			X	X								1 Number of containers
	Time: 1320												Number of Containers with Custody Seal Intact

Laboratory Sample Receipt		
Number of Sample Containers in Shipping Container		
Shipping Container Chain of Custody Seal Intact (Y/N)		
Receipt Condition Comments (e.g., thawed, warm)		

Relinquished By	Transported By	Received By
Name: Bob Stewart	Bob Stewart	Name: Ben Mazer
Date: 7/31/03		Date: 7/31/03
Time: 1546		Time: 1546
Name:		Name:
Date:		Date:
Time:		Time:
Name:		Name:
Date:		Date:
Time:		Time:

MCS Environmental
5562 Alloy South
Missoula, MT 59808
(406) 735-7095

CHAIN OF CUSTODY

all waters preserved by SVL upon arrival from 106935

MCS Environmental, Inc.
Job Number 11018013
COC Form # 4

Recorded by: _____

Checked by: _____

Sample Matrix	Analysis Containers: Total Metals	Anions/Cations	Acid Base Accounting	As, Cd, Cu, Pb, Zn											
MCS Environmental, Inc. 11018013207 COC Initials: TM Date: 7/31/03 Time: 1350															
Sediment	Date: 7/31/03			X											1 Number of containers
	Time: 1350														Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013208 COC Initials: RF Date: 7/31/03 Time: 1400															
Sediment	Date: 7/31/03			X											1 Number of containers
	Time: 1400														Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013209 COC Initials: TM Date: 7/31/03 Time: 1410															
Soil	Date: 7/31/03			X											1 Number of containers
	Time: 1410														Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013210 COC Initials: TM Date: 7/31/03 Time: 1420															
Soil	Date: 7/31/03			X											1 Number of containers
	Time: 1420														Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013211 COC Initials: TM Date: 7/31/03 Time: 1430															
Soil	Date: 7/31/03			X											1 Number of containers
	Time: 1430														Number of Containers with Custody Seal Intact
Place Sample ID Label Here or Write ID Number Here	Date:														Number of containers
	Time:														Number of Containers with Custody Seal Intact
Place Sample ID Label Here or Write ID Number Here	Date:														Number of containers
	Time:														Number of Containers with Custody Seal Intact

Laboratory Sample Receipt		
Number of Sample Containers in Shipping Container		
Shipping Container Chain of Custody Seal Intact (Y/N)		
Receipt Condition Comments (e.g., thawed, warm)		

Relinquished By	Transported By	Received By
Name: Bob Plumb Date: 7/31/03 Time: 1516		Name: Ben Mart Date: 7/31/03 Time: 1546
Name: Date: Time:		Name: Date: Time:
Name: Date: Time:		Name: Date: Time:

CONFIRMATION REPORT - MEMORY SEND

Time : AUG-01-03 07:06
Fax number: +2087830891
Name : SVL ANALYTICAL

Job : 234
Date : AUG-01 07:02
To : 914067287367
Doc. pages : 01
Start time : AUG-01 07:03
End time : AUG-01 07:04
Pages sent : 01

Job:234 *** SEND SUCCESSFUL ***

SVL ANALYTICAL, INC.
One Government Gulch - Kellogg, ID 83837-0929

SAMPLE RECEIPT CONFIRMATION

CLIENT: ERIC SMART
MCS, INC.
5562 ALLOY SOUTH

MISSOULA MT 59808
FAX: (406)728-7367

SVL JOB No: 106935
Received: 7/31/03
Expected Due date: 8/14/03

SVL#	M	ClientID	Sampled	Time	By	Received	Sample Comments
345510	W	11018013100	7/30/03	12:00		7/31/03	
345511	W	11018013101	7/30/03	12:27		7/31/03	
345512	W	11018013102	7/30/03	12:44		7/31/03	
345513	W	11018013103	7/30/03	13:33		7/31/03	
345514	W	11018013104	7/30/03	14:28		7/31/03	
345515	W	11018013105	7/30/03	16:03		7/31/03	
345516	W	11018013106	7/30/03	15:58		7/31/03	
345517	W	11018013107	7/30/03	16:40		7/31/03	
345518	W	11018013108	7/30/03	17:30		7/31/03	
345519	W	11018013109	7/30/03	17:40		7/31/03	
345520	W	11018013203	7/31/03	13:02		7/31/03	
345521	W	11018013206	7/31/03	13:20		7/31/03	
345522	W	11018013207	7/31/03	13:50		7/31/03	

ADDITIONAL COMMENTS FOR JOB: Sample Cooler/Container temp not measured upon receipt.

[X] These samples will be DISPOSED 45 days after job completion.
[ ] These samples will be ARCHIVED 45 days, then you will receive a letter requesting disposal options.

Please contact Crystal Sevy (208-784-1258) if you have questions regarding the receipt of these samples. 7/31/03 18:20

SVL ANALYTICAL, INC.
One Government Gulch ▪ P.O. Box 929 ▪ Kellogg, Idaho 83837-0929 ▪ Phone: (208)784-1258 ▪ Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : MCS, INC.
PROJECT:

Sample Receipt: 7/31/03
Report Date: 8/18/03

SVL JOB: 106936

SVL ID	CLIENT SAMPLE ID		As 6010B	Cd 6010B	Cu 6010B	Pb 6010B	Zn 6010B	% Sol. 999
S345525	11018013105	7/30/03	12.6mg/kg	2.76mg/kg	20.9mg/kg	203mg/kg	459mg/kg	50.0%
S345526	11018013106	7/30/03	105mg/kg	31.7mg/kg	590mg/kg	17400mg/kg	7460mg/kg	89.2%
S345527	11018013107	7/30/03	17.6mg/kg	3.93mg/kg	40.3mg/kg	1090mg/kg	903mg/kg	80.9%
S345528	11018013108	7/30/03	12.3mg/kg	3.24mg/kg	28.5mg/kg	854mg/kg	820mg/kg	80.2%
S345529	11018013200	7/31/03	5.4mg/kg	0.50mg/kg	25.0mg/kg	16.1mg/kg	36.3mg/kg	98.4%
S345530	11018013201	7/31/03	5.3mg/kg	0.88mg/kg	97.6mg/kg	611mg/kg	119mg/kg	99.9%
S345531	11018013202	7/31/03	11.2mg/kg	2.05mg/kg	64.2mg/kg	336mg/kg	368mg/kg	99.9%
S345532	11018013204	7/31/03	11.3mg/kg	27.9mg/kg	50.9mg/kg	674mg/kg	18000mg/kg	80.9%
S345533	11018013205	7/31/03	7.0mg/kg	0.62mg/kg	21.8mg/kg	21.4mg/kg	126mg/kg	85.9%
S345534	11018013208	7/31/03	4.5mg/kg	3.89mg/kg	28.0mg/kg	91.0mg/kg	1090mg/kg	85.6%
S345535	11018013209	7/31/03	9.3mg/kg	4.94mg/kg	38.3mg/kg	157mg/kg	1390mg/kg	94.1%
S345536	11018013210	7/31/03	17.9mg/kg	28.3mg/kg	46.4mg/kg	259mg/kg	8250mg/kg	99.8%
S345537	11018013211	7/31/03	3.2mg/kg	0.51mg/kg	25.4mg/kg	12.6mg/kg	29.4mg/kg	96.2%

Soil Samples: As Received Basis

Certificate: ID ID00019

Reviewed By: _____ Date: 8/18/03

SVL ANALYTICAL, INC.
One Government Gulch ▪ P.O. Box 929 ▪ Kellogg, Idaho 83837-0929 ▪ Phone: (208)784-1258 ▪ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : MCS, INC.
PROJECT:
CLIENT SAMPLE ID: 11018013200
Sample Collected: 7/31/03 11:20
Sample Receipt : 7/31/03
Date of Report : 8/18/03 As Received Basis

SVL JOB: 106936
SAMPLE: 345529
% Solids: 98.4%
Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
ABP	2.12	TCaCO3/1000T		EPA600	8/12/03
Acid Generating	1.25	TCaCO3/1000T		EPA600	8/12/03
Acid Neut. Pot.	3.37	TCaCO3/1000T		EPA600	8/12/03
Non-Ext Sulfur,S	0.030	%		LECO	8/12/03
Pyritic Sulfur,S	0.040	%		LECO	8/12/03
Sulfate Sulfur,S	0.130	%		LECO	8/12/03
Total Sulfur, S	0.200	%		LECO	8/12/03

Reviewed By: _____ Date 8/18/03
8/18/03 11:19

SVL ANALYTICAL, INC.
One Government Gulch ▪ P.O. Box 929 ▪ Kellogg, Idaho 83837-0929 ▪ Phone: (208)784-1258 ▪ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : MCS, INC.
PROJECT:
CLIENT SAMPLE ID: 11018013201
Sample Collected: 7/31/03 11:55
Sample Receipt : 7/31/03
Date of Report : 8/18/03 As Received Basis

SVL JOB: 106936
SAMPLE: 345530
% Solids: 99.9%
Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
ABP	<0.30	TCaCO3/1000T		EPA600	8/12/03
Acid Generating	1.88	TCaCO3/1000T		EPA600	8/12/03
Acid Neut. Pot.	1.70	TCaCO3/1000T		EPA600	8/12/03
Non-Ext Sulfur,S	0.010	%		LECO	8/12/03
Pyritic Sulfur,S	0.060	%		LECO	8/12/03
Sulfate Sulfur,S	0.100	%		LECO	8/12/03
Total Sulfur, S	0.170	%		LECO	8/12/03

Reviewed By: _____ Date 8/18/03
8/18/03 11:19

SVL ANALYTICAL, INC.
One Government Gulch ▪ P.O. Box 929 ▪ Kellogg, Idaho 83837-0929 ▪ Phone: (208)784-1258 ▪ Fax: (208)783-0891

Certificate: ID ID00019

CLIENT : MCS, INC.
PROJECT:
CLIENT SAMPLE ID: 11018013202
Sample Collected: 7/31/03 12:15
Sample Receipt : 7/31/03
Date of Report : 8/18/03 As Received Basis

SVL JOB: 106936
SAMPLE: 345531
% Solids: 99.9%
Matrix: SOIL

Determination	Result	Units	Dilution	Method	Analyzed
ABP	-1.00	TCaCO3/1000T		EPA600	8/12/03
Acid Generating	4.38	TCaCO3/1000T		EPA600	8/12/03
Acid Neut. Pot.	3.37	TCaCO3/1000T		EPA600	8/12/03
Non-Ext Sulfur,S	0.020	%		LECO	8/12/03
Pyritic Sulfur,S	0.140	%		LECO	8/12/03
Sulfate Sulfur,S	0.130	%		LECO	8/12/03
Total Sulfur, S	0.290	%		LECO	8/12/03

Reviewed By: _____ Date 8/18/03
8/18/03 11:19

SVL ANALYTICAL, INC.

Quality Control Report
Part I Prep Blank and Laboratory Control Sample

Client :MCS, INC.

SVL JOB No: 106936

Analyte	Method	Matrix	Units	Prep Blank	True—LCS—Found		LCS %R	Analysis Date
Arsenic	6010B	SOIL	mg/kg	<1.0	110	108	98.2	8/15/03
Cadmium	6010B	SOIL	mg/kg	<0.20	101	100	99.0	8/15/03
Copper	6010B	SOIL	mg/kg	<0.30	118	115	97.5	8/15/03
Lead	6010B	SOIL	mg/kg	<0.50	102	106	103.9	8/15/03
Zinc	6010B	SOIL	mg/kg	<0.50	193	200	103.6	8/15/03
Acid Neut. Pot.	EPA600	SOIL	TCaCO3/k	N/A	52.0	53.2	102.3	8/12/03
Non-Ext Sulfur,S	LECO	SOIL	%	<0.010	N/A		N/A	8/12/03
Pyritic Sulfur,S	LECO	SOIL	%	<0.010	N/A		N/A	8/12/03
Sulfate Sulfur,S	LECO	SOIL	%	<0.010	N/A		N/A	8/12/03
Total Sulfur, S	LECO	SOIL	%	<0.010	0.298	0.290	97.3	8/12/03

LEGEND:

LCS = Laboratory Control Sample LCS %R = LCS Percent Recovery N/A = Not Applicable

SVL ANALYTICAL, INC.

Quality Control Report
Part II Duplicate and Spike Analysis

Client :MCS, INC. SVL JOB No: 106936

Test	Method	Matrix	QC SAMPLE ID	Units	Result	Duplicate or MSD Found		RPD%	Matrix Spike Result	SPK ADD	%R	Analysis Date
As	6010B	SOIL	1	mg/kg	5.4	105	M	0.9	106	100	100.6	8/15/03
As	6010B	SOIL	2	mg/kg	9.3	N/A		N/A	112	100	102.7	8/15/03
Cd	6010B	SOIL	1	mg/kg	0.50	105	M	1.0	104	100	103.5	8/15/03
Cd	6010B	SOIL	2	mg/kg	4.94	N/A		N/A	111	100	106.1	8/15/03
Cu	6010B	SOIL	1	mg/kg	25.0	131	M	1.5	133	100	108.0	8/15/03
Cu	6010B	SOIL	2	mg/kg	38.3	N/A		N/A	144	100	105.7	8/15/03
Pb	6010B	SOIL	1	mg/kg	16.1	117	M	3.4	121	100	104.9	8/15/03
Pb	6010B	SOIL	2	mg/kg	157	N/A		N/A	265	100	108.0	8/15/03
Zn	6010B	SOIL	1	mg/kg	36.3	138	M	0.7	137	100	100.7	8/15/03
Zn	6010B	SOIL	2	mg/kg	1390	N/A		N/A	1560	100	R >4S	8/15/03
% Sol.	999	SOIL	1	%	98.4	98.2		0.2	N/A	N/A	N/A	8/06/03
ABP	EPA600	SOIL	1	TCaCO3/	2.12	2.12		0.0	N/A	N/A	N/A	8/12/03
AGP	EPA600	SOIL	1	TCaCO3/	1.25	1.25		0.0	N/A	N/A	N/A	8/12/03
ANP	EPA600	SOIL	1	TCaCO3/	3.37	3.37		0.0	N/A	N/A	N/A	8/12/03
S N-EX	LECO	SOIL	1	%	0.030	0.030		0.0	N/A	N/A	N/A	8/12/03
S-PYR	LECO	SOIL	1	%	0.040	0.040		0.0	N/A	N/A	N/A	8/12/03
S-SO4	LECO	SOIL	1	%	0.130	0.130		0.0	N/A	N/A	N/A	8/12/03
S-TOT	LECO	SOIL	1	%	0.200	0.200		0.0	N/A	N/A	N/A	8/12/03

LEGEND:

RPD% = (|SAM - DUP| /((SAM + DUP)/2) * 100) UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.

RPD% = (|SPK - MSD| /((SPK + MSD)/2) * 100) M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC Sample 1: SVL SAM No.: 345529 Client Sample ID: 11018013200

QC Sample 2: SVL SAM No.: 345535 Client Sample ID: 11018013209

MCS Environmental
5552 Alloy South
Missoula, MT 59808
(406) 735-7095

All waters preserved by SVL upon arrival
JBM 7/31/03

CHAIN OF CUSTODY

106436

Fax copy of COC to MCS Missoula JB

MCS Environmental, Inc.
Job Number 11018013
COC Form # 1

Recorded by: RES

Checked by: _____

	Sample Matrix		Analysis Containers: Total Metals	Anions/Cations	Acid Base Accounting	As, Cd, Cu, Pb, Zn									
MCS Environmental, Inc. 11018013100 COC Initials: TM Date: 7/30/03 Time: 200	GW	Date: 7/30/03 Time: 1200				X									1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013101 COC Initials: TM Date: 7/30/03 Time: 1227	SW	Date: 7/30/03 Time: 1227				X									1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013102 COC Initials: _____ Date: _____ Time: _____	GW	Date: 7/30/03 Time: 1244				X									1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013103 COC Initials: _____ Date: _____ Time: _____	GW	Date: 7/30/03 Time: 1333				X									1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013104 COC Initials: TM Date: 7/30/03 Time: 1428	GW	Date: 7/30/03 Time: 1428				X									1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013105 COC Initials: TM Date: 7/30/03 Time: 1605	SW	Date: 7/30/03 Time: 1603				X									1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013105 COC Initials: RES Date: 7/30/03 Time: 1518	[illegible]	Date: 7/30/03 Time: 1518				X									1 Number of containers Number of Containers with Custody Seal Intact

Laboratory Sample Receipt		
Number of Sample Containers in Shipping Container		
Shipping Container Chain of Custody Seal Intact (Y/N)		
Receipt Condition Comments (e.g., thawed, warm)		

Relinquished By	Transported By	Received By
Name: RES Date: 7/31/03 Time: 1546	Name: Bob Stewart	Name: SVL courier Date: 7/31/03 Time: 1546
Name: Date: Time:		Name: Date: Time:
Name: Date: Time:		Name: Date: Time:

MCS Environmental
5562 Alloy South
Missoula, MT 59808
(406) 735-7095

CHAIN OF CUSTODY

Recorded by: RES

Checked by: _____

MCS Environmental, Inc.
Job Number 11018013
COC Form # 2

	Sample Matrix		Analysis Containers: Total Metals	Anions/Cations	Acid Base Accounting	As,Cd,Ca,Pb,Zn										
MCS Environmental, Inc. 11018013106 COC Initials: TM Date: 7/30/03 Time: 1558	SW	Date: 7/30/03 Time: 1558				X										1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013106 COC Initials: RES Date: 7/30/03 Time: 1620	DUP	Date: 07/30/03 Time: 1620				X										1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013107 COC Initials: RES Date: 7/30/03 Time: 1640	SW	Date: 07/30/03 Time: 1640				X										1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013107 COC Initials: RES Date: 7/30/03 Time: 1700	SED	Date: 07/30/03 Time: 1700				X										1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013108 COC Initials: TM Date: 7/30/03 Time: 1730	SW	Date: 07/30/03 Time: 1730				X										1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013109 COC Initials: TM Date: 7/30/03 Time: 1740	SW	Date: 07/30/03 Time: 1740				X										1 Number of containers Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013108 COC Initials: TM Date: 7/30/03 Time: 1745	DUP	Date: 07/30/03 Time: 1745				X										1 Number of containers Number of Containers with Custody Seal Intact

		Relinquished By	Transported By	Received By
Number of Sample Containers in Shipping Container		Name: Bob Stewart	Bob Stewart	Name: Ben Mark
Shipping Container Chain of Custody Seal Intact (Y/N)		Date: 7/31/03		Date: 7/31/03
Receipt Condition Comments (e.g., thawed, warm)		Time: 1546		Time: 1546
		Name:		Name:
		Date:		Date:
		Time:		Time:
		Name:		Name:
		Date:		Date:
		Time:		Time:

MCS Environmental
5562 Alloy South
Missoula, MT 59808
(406) 735-7095

CHAIN OF CUSTODY

7/31/03 1

MCS Environmental, Inc.
Job Number 11018013
COC Form # 3

Recorded by: _____

Checked by: _____

	Sample Matrix	Analysis Containers: Total Metals	Anions/Cations	Acid Base Accounting	As, Cd, Cu, Pb, Zn	SPLP extraction with analysis for same metals	SPLP on Job # 116737	Date:	Time:	Number of containers / Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013200 COC Initials: TM Date: 7/31/03 Time: 1120	Soil			X	X	X		7/31/03	1120	1
MCS Environmental, Inc. 11018013201 COC Initials: TM Date: 7/31/03 Time: 1155	Soil			X	X	X		7/31/03	1155	1
MCS Environmental, Inc. 11018013202 COC Initials: TM Date: 7/31/03 Time: 1215	Soil			X	X	X		7/31/03	1215	1
MCS Environmental, Inc. 11018013203 COC Initials: TM Date: 7/31/03 Time: 1302	Water			~~X~~				7/31/03	1302	1
MCS Environmental, Inc. 11018013204 COC Initials: TM Date: 7/31/03 Time: 1310	Sed			~~X~~				7/31/03	1310	1
MCS Environmental, Inc. 11018013205 COC Initials: TM Date: 7/31/03 Time: 1315	Sed			~~X~~	X			7/31/03	1315	1
MCS Environmental, Inc. 11018013206 COC Initials: TM Date: 7/31/03 Time: 1320	Water			~~X~~	X			7/31/03	1320	1

Laboratory Sample Receipt		
Number of Sample Containers in Shipping Container		
Shipping Container Chain of Custody Seal Intact (Y/N)		
Receipt Condition Comments (e.g., thawed, warm)		

Relinquished By	Transported By	Received By
Name: Bob Stuart	Bob Stuart	Name: Ben Mabe
Date: 7/31/03		Date: 7/31/03
Time: 1546		Time: 1546
Name:		Name:
Date:		Date:
Time:		Time:
Name:		Name:
Date:		Date:
Time:		Time:

MCS Environmental
5562 Alloy South
Missoula, MT 59808
(406) 735-7095

CHAIN OF CUSTODY

all waters preserved by SVL upon arrival from

MCS Environmental, Inc.
Job Number 11018013
COC Form # 4

Recorded by: _____

Checked by: _____

	Sample Matrix	Analysis Containers: Total Metals	Anions/Cations	Acid Base Accounting	As, Cd, Cu, Pb, Zn										
MCS Environmental, Inc. 11018013207 COC Initials: TM Date: 7/31/03 Time: 1350	Water				X										
	Date: 7/31/03														1 Number of containers
	Time: 1350														Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013208 COC Initials: RF Date: 7/31/03 Time: 1400	Sediment				X										
	Date: 7/31/03														1 Number of containers
	Time: 1400														Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013209 COC Initials: TM Date: 7/31/03 Time: 1410	Soil				X										
	Date: 7/31/03														1 Number of containers
	Time: 1410														Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013210 COC Initials: TM Date: 7/31/03 Time: 1420	Soil				X										
	Date: 7/31/03														1 Number of containers
	Time: 1420														Number of Containers with Custody Seal Intact
MCS Environmental, Inc. 11018013211 COC Initials: TM Date: 7/31/03 Time: 1430	Soil				X										
	Date: 7/31/03														1 Number of containers
	Time: 1430														Number of Containers with Custody Seal Intact
Place Sample ID Label Here or Write ID Number Here															
	Date:														Number of containers
	Time:														Number of Containers with Custody Seal Intact
Place Sample ID Label Here or Write ID Number Here															
	Date:														Number of containers
	Time:														Number of Containers with Custody Seal Intact

Laboratory Sample Receipt		
Number of Sample Containers in Shipping Container		
Shipping Container Chain of Custody Seal Intact (Y/N)		
Receipt Condition Comments (e.g., thawed, warm)		

Relinquished By	Transported By	Received By
Name: Bob Hallett Date: 7/31/03 Time: 1756		Name: Ben Mast Date: 7/31/03 Time: 1546
Name: Date: Time:		Name: Date: Time:
Name: Date: Time:		Name: Date: Time:

CONFIRMATION REPORT - MEMORY SEND

Time : AUG-01-03 07:06
Fax number: +2087830891
Name : SVL ANALYTICAL

Job : 235
Date : AUG-01 07:02
To : 914067287367
Doc. pages : 01
Start time : AUG-01 07:04
End time : AUG-01 07:04
Pages sent : 01

Job:235 *** SEND SUCCESSFUL ***

SVL ANALYTICAL, INC.
One Government Gulch - Kellogg, ID 83837-0929

CLIENT: ERIC SMART
MCS, INC.
5562 ALLOY SOUTH

MISSOULA MT 59808
FAX: (406)728-7367

SAMPLE RECEIPT CONFIRMATION

SVL JOB No: 106936
Received: 7/31/03
Expected Due date: 8/14/03

SVL#	M	ClientID	Sampled	Time	By	Received	Sample Comments
345525	S	11018013105	7/30/03	15:10		7/31/03	
345526	S	11018013106	7/30/03	16:20		7/31/03	
345527	S	11018013107	7/30/03	17:00		7/31/03	
345528	S	11018013108	7/30/03	17:45		7/31/03	
345529	S	11018013200	7/31/03	11:20		7/31/03	
345530	S	11018013201	7/31/03	11:55		7/31/03	
345531	S	11018013202	7/31/03	12:15		7/31/03	
345532	S	11018013204	7/31/03	13:10		7/31/03	
345533	S	11018013205	7/31/03	13:15		7/31/03	
345534	S	11018013208	7/31/03	14:00		7/31/03	
345535	S	11018013209	7/31/03	14:10		7/31/03	
345536	S	11018013210	7/31/03	14:20		7/31/03	
345537	S	11018013211	7/31/03	14:30		7/31/03	

ADDITIONAL COMMENTS FOR JOB: Sample Cooler/Container temp not measured upon receipt.
SVL TO ANALYZE SOILS AS RECEIVED, SPLP ON SEPARATE JOB

[ ] These samples will be DISPOSED 45 days after job completion.
[X] These samples will be ARCHIVED 45 days, then you will receive a letter requesting disposal options.

Please contact Crystal Sevy (208-784-1258) if you have questions regarding the receipt of these samples. 7/31/03 18:32

SVL ANALYTICAL, INC.
One Government Gulch ▪ P.O. Box 929 ▪ Kellogg, Idaho 83827-0929 ▪ Phone: (208)784-1258 ▪ Fax: (208)783-0891

REPORT OF ANALYTICAL RESULTS

CLIENT : MCS, INC. Sample Receipt: 7/31/03 Page 1 of 1
PROJECT: Report Date: 8/18/03 SVL JOB: 106937

SVL ID	CLIENT SAMPLE ID		As 6010B	Cd 6010B	Cu 6010B	Pb 6010B	Zn 6010B
E345540	11018013200	7/31/03	<0.010mg/L E	<0.0020mg/L E	<0.0030mg/L E	0.0072mg/L E	0.0864mg/L E
E345541	11018013201	7/31/03	<0.010mg/L E	0.0025mg/L E	0.0035mg/L E	0.0434mg/L E	0.138mg/L E
E345542	11018013202	7/31/03	<0.010mg/L E	<0.0020mg/L E	<0.0030mg/L E	<0.0050mg/L E	0.0386mg/L E
E345543	EXTRACTION FLUID	7/31/03	<0.010mg/L E	<0.0020mg/L E	<0.0030mg/L E	<0.0050mg/L E	<0.0050mg/L E

Samples with SVL ID prefix 'E' were extracted according to: SPLP
Certificate: ID ID00019

Reviewed By: _____ Date: 8/18/03

SVL ANALYTICAL, INC.

Quality Control Report
Part I Prep Blank and Laboratory Control Sample

Client :MCS, INC. SVL JOB No: 106937

Analyte	Method	Matrix	Units	Prep Blank	True—LCS—Found		LCS %R	Analysis Date
Arsenic	6010B	ESOIL	mg/L EXT	<0.010	1.00	1.06	106.0	8/16/03
Cadmium	6010B	ESOIL	mg/L EXT	<0.0020	1.00	1.02	102.0	8/16/03
Copper	6010B	ESOIL	mg/L EXT	<0.0030	1.00	1.01	101.0	8/16/03
Lead	6010B	ESOIL	mg/L EXT	<0.0050	1.00	0.992	99.2	8/16/03
Zinc	6010B	ESOIL	mg/L EXT	<0.0050	1.00	1.01	101.0	8/16/03

LEGEND:
LCS = Laboratory Control Sample LCS %R = LCS Percent Recovery N/A = Not Applicable

SVL ANALYTICAL, INC.

Quality Control Report
Part II Duplicate and Spike Analysis

Client :MCS, INC. SVL JOB No: 106937

Test	Method	Matrix	QC SAMPLE ID Units	QC SAMPLE ID Result	Duplicate or MSD Found	Duplicate or MSD RPD%	Matrix Spike Result	Matrix Spike SPK ADD	Matrix Spike %R	Analysis Date
As	6010B	ESOIL	1 mg/L EX	<0.010	<0.010	UDL	1.08	1.00	108.0	8/16/03
Cd	6010B	ESOIL	1 mg/L EX	<0.0020	<0.0020	UDL	1.02	1.00	102.0	8/16/03
Cu	6010B	ESOIL	1 mg/L EX	<0.0030	<0.0030	UDL	1.01	1.00	101.0	8/16/03
Pb	6010B	ESOIL	1 mg/L EX	0.0072	0.0066	8.7	1.01	1.00	100.3	8/16/03
Zn	6010B	ESOIL	1 mg/L EX	0.0864	0.0873	1.0	1.10	1.00	101.4	8/16/03

LEGEND:

RPD% = (|SAM - DUP| /((SAM + DUP)/2) * 100) UDL = Both SAM & DUP not detected. *Result or *Found: Interference required dilution.

RPD% = (|SPK - MSD| /((SPK + MSD)/2) * 100) M in Duplicate/MSD column indicates MSD.

SPIKE ADD column, A = Post Digest Spike; %R = Percent Recovery N/A = Not Analyzed; R > 4S = Result more than 4X the Spike Added

QC Sample 1: SVL SAM No.: 345540 Client Sample ID: 11018013200

SPLP Extraction Log

JOB#: 106937

SVL ANALYTICAL, INC.

CASE #: SAS #: SDG #:

SVL#	M	ClientID	Fluid Type	mls Fluid	Sample Wt.	Tumble Ext. Time	Final pH
		pH 4 Buffer					4.02
		pH 7 Buffer					7.01
345540	ES	11018013200	WESTERN	2000 mls	100g	18 HR	4.93
345541	ES	11018013201	FLUID	2000 mls	100g	18 HR	4.66
345542	ES	11018013202	↓	2000 mls	100g	18 HR	6.38
345543	ES	EXTRACTION FLUID					5.01

Extraction Started By: [signature] Date/Time: 08/12/03 1200

Extraction Completed By: [signature] Date/Time: 08/13/03 0600

Client: MCS, INC.

Received: 7/31/03

v3.

MCS Environmental
5562 Alloy South
Missoula, MT 59808
(406) 735-7095

CHAIN OF CUSTODY

106937

7/31/03

MCS Environmental, Inc.
Job Number 11018013
COC Form # 3

Recorded by: _____

Checked by: _____

Sample Matrix		Analysis Containers: Total Metals	Anions/Cations	Acid Base Accounting	As, Cd, Cu, Pb, Zn	SPLP extraction with analysis for same metals	SPLP on Job # 106937	
Soil	Date: 7/31/03			X	X	X		1 Number of containers
	Time: 1120							Number of Containers with Custody Seal Intact
Soil	Date: 7/31/03			X	X	X		1 Number of containers
	Time: 1155							Number of Containers with Custody Seal Intact
Soil	Date: 7/31/03			X	X	X		1 Number of containers
	Time: 1215							Number of Containers with Custody Seal Intact
Water	Date: 7/31/03			~~X~~	X			1 Number of containers
	Time: 1302							Number of Containers with Custody Seal Intact
Soil	Date: 7/31/03			~~X~~	~~X~~			1 Number of containers
	Time: 1310							Number of Containers with Custody Seal Intact
Soil	Date: 7/31/03			~~X~~	X			1 Number of containers
	Time: 1315							Number of Containers with Custody Seal Intact
Water	Date: 7/31/03			~~X~~	X			1 Number of containers
	Time: 1320							Number of Containers with Custody Seal Intact

MCS Environmental, Inc.
11018013200
COC
Initials: TM
Date: 3/31/03 Time: 1120

MCS Environmental, Inc.
11018013201
COC
Initials: TM
Date: 7/31/03 Time: 1155

MCS Environmental, Inc.
11018013202
COC
Initials: ___
Date: 7/31/03 Time: 1215

MCS Environmental, Inc.
11018013203
COC
Initials: TM
Date: 7/31/03 Time: 1302

MCS Environmental, Inc.
11018013204
COC
Initials: TM
Date: 7/31/03 Time: 1310

MCS Environmental, Inc.
11018013205
COC
Initials: TM
Date: 7/31/03 Time: 1315

MCS Environmental, Inc.
11018013206
COC
Initials: TM
Date: 7/31/03 Time: 1320

Laboratory Sample Receipt		
Number of Sample Containers in Shipping Container		
Shipping Container Chain of Custody Seal Intact (Y/N)		
Receipt Condition Comments (e.g., thawed, warm)		

Relinquished By	Transported By	Received By
Name: Bob Stewart	Bob Stewart	Name: Ben Mead
Date: 7/31/03		Date: 7/31/03
Time: 1546		Time: 1546
Name:		Name:
Date:		Date:
Time:		Time:
Name:		Name:
Date:		Date:
Time:		Time:

APPENDIX B
DATA VALIDATION AND EVALUATION REPORT

IDORA MILL AND RED MONARCH MINE
IDAHO PANHANDLE NATIONAL FORESTS
DATA EVALUATION CHECKLIST

MCS Project Name: Idora Mill and Red Monarch Mine
MCS Project No.: 110018.013.0
Sampling Event: Site Investigation
Evaluation Prepared By: Rhianna Berge
Date Completed: December 4, 2003
Date Samples Collected: July 30 and 31, 2003
Sample Matrix: Surface Water and Groundwater
Project Sample ID#s: 11018013100, 11018013101, 11018013102, 11018013103, 11018013104, 11018013105, 11018013106, 11018013107, 11018013108, 11018013109, 11018013203, 1108013206, 11018013207

Analytical Laboratory: SVL Analytical, Inc. Kellogg, Idaho
Laboratory Job No: 106935

Analytical Laboratory Sample ID#s: W345510, W345511, W345512, W345513, W345514, W345515, W345516, W345517, W345518, W345519, W345520, W345521, W345522

Methods of Analysis: Arsenic, cadmium, copper, lead, and zinc: Method 200.7

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1. ***Is a Work Plan, Sampling and Analysis Plan, or Quality Assurance Project Plan available for the project?***

   Yes. The Work Plan is: Idora Red Monarch Mining Sites Idaho Panhandle National Forests, Site Investigation Work Plan. Prepared for USDA Forest Service, Region 1. Dated June 26, 2003.

2. ***Chain of Custody (COC) Records:***

   Are the COCs present?
   Yes, the COC is present with the data set.

   Were the COCs complete and signed off?
   Yes, the COC was completed and signed off as appropriate.

   Were the samples received at 4°±2°C?
   The sample container temperature was not measured upon receipt. All samples were stored and shipped in coolers containing self-sealing plastic bags filled with ice.

   Were all the samples on the COCs analyzed?
   Yes, the 13 samples on the COC were analyzed by the laboratory.

   Were any problems noted on the COCs?
   No problems were noted on the COC.

3. ***Was a project narrative provided by the laboratory?***

   No. A project narrative was not included with the analytical results.

   Were any problems noted in the narrative?
   Not applicable.

4. ***Were all sample holding times met?***

   Yes. The sample was analyzed within the six month holding time for metals.

5. Was the frequency stated in the Work Plan or Sampling and Analysis Plan for field duplicates, equipment rinsate blanks, and field blanks met?

The Work Plan recommended the collection of one surface water field duplicate. No equipment rinsate blanks or field blanks were recommended in the Work Plan. Not collecting a field duplicate is a deviation from the Work Plan.

6. Were all equipment rinsate, field blank, and method blank results less than the method detection limit (practical quantitation limit, etc.)?

Yes. No constituents in the laboratory preparation blanks were detected at or above the method detection limit. No other blanks were analyzed in this data set for the project.

7. Were all matrices, units, and detection limits reported correctly?

Yes. The matrix reported was water. All water results were reported as mg/L.

8. Were all MS recoveries and field and laboratory RPDs within control limits?

MS control limits (75% to 125%): MS recoveries within control limits ranged from 102.0% to 117.0%. One lead value (Sample ID 11018013100) was outside control limits at 134.0%. For this reason, a post-digestion spike was conducted. This result was acceptable at 102.0%.

Laboratory Duplicates/MSD (±20% water; ±30% soil): Duplicate RPDs that were within control limits and ranged from undetected to 6.3%. One copper RPD (Sample ID 11018013100) and one lead RPD (Sample ID 11018013100) were outside control limits at 26.6% and 41.1%, respectively. The sample results and duplicate results for these analytes were greater than 5x the CRDL. The laboratory gave no explanation in the narrative for the out of control duplicate results. The results were verified with the laboratory. Copper and lead results are considered estimated. The sample result and duplicate result for both analytes were greater than 5x the CRDL. No explanation was given by the laboratory for the out of control RPDs.

Field Duplicates (±30% water; ±50% soil): No field duplicates were collected.

9. Were all LCS spike recoveries within control limits (80% to 120%)?

Yes. LCS recoveries ranged from 105.0% to 111.0%, within control limits.

10. What are the DQOs for the project?

A. The data quality objectives of the project are to: 1) perform surface water sampling to determine the chemical characteristics of the surface water at the Site 2) determine if tailings from the Idora Mill are a source of lead to Beaver Creek, 3) determine if waste rock from the Red Monarch Mine, placed in Missoula Gulch, presents a threat to human health and the environment, 4) and 4) evaluate the possible use of the data for selecting reclamation alternatives.

B. The number of samples and sample locations was determined in the field upon examination of Site conditions. Analysis of the samples includes arsenic, cadmium, copper, lead, and zinc.

C. The general quality assurance objective for this project was to collect data of known quality and to verify and document that the samples collected are representative of the actual field conditions. To accomplish this, the analytical data should have an appropriate degree of accuracy, precision, and be reproducible. Samples should be comparable to other samples collected at the Site and other sites with similar conditions.

Specific QA objectives for this project are as follows:

- Establish sampling techniques in such a manner that the analytical results are complete, reproducible, precise, accurate, and representative of the media and conditions.

- Collect and analyze a sufficient number of field and/or laboratory duplicate samples to assess the laboratory performance.

*11. **Discussion of DQOs for the data set:***

A. The data set meets the objective for #10A. Results characterize the concentrations of metals and general chemistry parameters within the surface water. The sample collected and analyzed was from an appropriate area for characterization of surface water potentially impacted by tailings at the Site. The sample is suitable for the evaluation of whether concentrations of metals in the surface water pose a potential threat to human health and the environment. The results in this data package are suitable for use to evaluate possible reclamation alternatives.

B. The data set meets the objective for #10B above. All constituents for both samples were analyzed.

C. Quality assurance objectives (#10C) for the data set is as follows:

- ***Accuracy:*** There were no field blanks or equipment rinsate blanks collected for the data set to assess the accuracy of the data with respect to blanks collected in the field. No laboratory preparation blanks were at or above method control limits. Laboratory MS and LCS sample recoveries were within acceptable control limits.

- ***Precision:*** Laboratory duplicate results were within control limits. No field duplicates were collected.

- ***Representativeness:*** The data set meets the objectives in #10A and #10B for the collection of samples to characterize surface water potentially impacted by tailings, for use to evaluate potential threats to human health and the environment, and for use in evaluating reclamation alternatives. The analytes were selected to assess the concentration of particular metals in surface water potentially impacted by tailings at the Site and were based on other similar sites and Site history.

- ***Comparability:*** The data would be comparable to other data collected in the same manner and analyzed by the same analytical methods.

*12. **Was the project completeness goal met?***

The water samples listed on the COC was received and analyzed by the laboratory as requested. One copper result and one lead result were outside the MSD control limits of *±20%* and are therefore qualified as estimated.. The project is 100% complete.

Comments:

The data is of Level B quality. Copper and lead results are considered estimated due to out of control laboratory duplicate RPDs.

IDORA MILL AND RED MONARCH MINE
IDAHO PANHANDLE NATIONAL FORESTS
DATA EVALUATION CHECKLIST

MCS Project Name: Idora Mill and Red Monarch Mine
MCS Project No.: 110018.013.0
Sampling Event: Site Investigation
Evaluation Prepared By: Rhianna Berge
Date Completed: December 4, 2003
Date Samples Collected: July 31, 2003
Sample Matrix: Soil (includes sediment and soil)
Project Sample ID#s: 11018013105, 11018013106, 11018013107, 11018013108, 11018013200, 11018013201, 11018013202, 11018013204, 11018013205, 11018013208, 11018013209, 11018013210, 11018013211

Analytical Laboratory: SVL Analytical, Inc. Kellogg, Idaho
Laboratory Job No: 106936

Analytical Laboratory Sample ID#s: S345525, S 345526, S345527, S345528, S345529, S345530, S345531, S345532, S345533, S345534, S345535, S345536, S345537

Methods of Analysis: Arsenic, cadmium, copper, lead, and zinc: Method 6010B; ABP, AGP, ANP: EPA600; non-ext. sulfur, pyritic sulfur, sulfate sulfur, total sulfur: LECO

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1. Is a Work Plan, Sampling and Analysis Plan, or Quality Assurance Project Plan available for the project?
Yes. The Work Plan is: Idora Red Monarch Mining Sites Idaho Panhandle National Forests, Site Investigation Work Plan. Prepared for USDA Forest Service, Region 1. Dated June 26, 2003.

2. Chain of Custody (COC) Records:

Are the COCs present?
Yes, the COC is present with the data set.

Were the COCs complete and signed off?
Yes, the COC was completed and signed off as appropriate.

Were the samples received at 4°±2°C?
The sample container temperature was not measured upon receipt. All samples were stored and shipped in coolers containing doubled self-sealing plastic bags filled with ice.

Were all the samples on the COCs analyzed?
Yes, the 13 samples on the COC were analyzed by the laboratory.

Were any problems noted on the COCs?
No problems were noted on the COC.

3. Was a project narrative provided by the laboratory?
No. A project narrative was not included with the analytical results.

Were any problems noted in the narrative?
Not applicable.

4. Were all sample holding times met?
Yes. All samples were analyzed within the six month holding time for metals. Holding times are not applicable to ABP, AGP, and ANP.

5. Was the frequency stated in the Work Plan or Sampling and Analysis Plan for field duplicates, equipment rinsate blanks, and field blanks met?

The Work Plan recommended the collection of two soil field duplicates. No equipment rinsate blanks or field blanks were recommended. Because of the heterogeneity of soil, no field duplicates were collected. This is a deviation for the Work Plan.

6. Were all equipment rinsate, field blank, and method blank results less than the method detection limit (practical quantitation limit, etc.)?

Yes. No constituents in the laboratory preparation blanks were detected at or above the method detection limit. No other blanks were analyzed in this data set for the project.

7. Were all matrices, units, and detection limits reported correctly?

Yes. The matrix reported was soil. Soil metals results were reported as mg/kg. ABP, AGP, and ANP were reported as $TCaCO_3/1000T$. Non-ext. sulfur, pyritic sulfur, sulfate sulfur, and total sulfur were reported as percentages.

8. Were all MS recoveries and field and laboratory RPDs within control limits?

MS control limits (75% to 125%): MS recoveries within control limits ranged from 100.6% to 108.0%. One zinc value (Sample ID 11018013209) was more than four times the spike added, thus, spike recovery limits do not apply.

Laboratory Duplicates/MSD (±20% water; ±30% soil): Duplicate RPDs ranged from 0% to 3.4%, within control limits

Field Duplicates (±30% water; ±50% soil): No field duplicates were collected.

9. Were all LCS spike recoveries within control limits (80% to 120%)?

Yes. LCS recoveries ranged from 97.3% to 103.9%, within control limits.

10. What are the DQOs for the project?

A. The data quality objectives of the project are to: 1) determine if tailings from the Idora Mill are a source of lead to Beaver Creek, 2) perform sampling to determine the chemical characteristics of the tailings and impacted soil, 3) determine if waste rock from the Red Monarch Mine, placed in Missoula Gulch, presents a threat to human health and the environment, and 4) evaluate the data for possible use in selection of reclamation alternatives.

B. The number of samples and sample locations was determined in the field upon examination of Site conditions. Analysis of the samples included: arsenic, cadmium, copper, lead, zinc, ABP, AGP, ANP, non-ext. sulfur, pyritic sulfur, sulfate sulfur, total sulfur.

C. The general quality assurance objective for this project was to collect data of known quality and to verify and document that the samples collected are representative of the actual field conditions. To accomplish this, the analytical data should have an appropriate degree of accuracy, precision, and be reproducible. Samples should be comparable to other samples collected at the Site and other sites with similar conditions.

Specific QA objectives for this project are as follows:

- Establish sampling techniques in such a manner that the analytical results are complete, reproducible, precise, accurate, and representative of the media and conditions.
- Collect and analyze a sufficient number of field and/or laboratory duplicate samples to assess the laboratory performance.

11. Discussion of DQOs for the data set:

A. The data set meets the objective for #10A. Samples within this data set were collected to characterize the variability of tailings material and concentrations of metals within the tailings and underlying native soil. Samples were collected and analyzed from the appropriate areas for characterization of the tailings and underlying native soil and evaluate whether concentrations of metals in the tailing pose a potential threat to human health and the environment. The results in this data package are suitable for use to evaluate possible reclamation alternatives.

B. The data set meets the objective for #10B above.

C. Quality assurance objectives (#10C) for the data set is as follows:

- ***Accuracy:*** There were no field blanks or equipment rinsate blanks collected for the data set to assess the accuracy of the data with respect to blanks collected in the field. No laboratory preparation blanks were at or above method control limits. Laboratory MS and LCS sample recoveries were within acceptable control limits.

- ***Precision:*** Field and laboratory duplicate results were within control limits.

- ***Representativeness:*** The data set meets the objectives in #10A and #10B for the collection of samples to characterize tailings and soil and for use to evaluate potential threats to human health and the environment and for use in evaluating reclamation alternatives. The analytes were selected to assess the concentration of particular metals at each of these areas based on other similar sites and Site history.

- ***Comparability:*** The data would be comparable to other data collected in the same manner and analyzed by the same analytical methods.

12. Was the project completeness goal met?

All soil samples listed on the COCs were received and analyzed by the laboratory as requested. No sample results were objected during the evaluation process. The project is 100% complete.

Comments:

The data is of Level B quality.

IDORA MILL AND RED MONARCH MINE
IDAHO PANHANDLE NATIONAL FORESTS
DATA EVALUATION CHECKLIST

MCS Project Name: Idora Mill and Red Monarch Mine
MCS Project No.: 110018.013.0

Sampling Event: Site Investigation
Evaluation Prepared By: Rhianna Berge
Date Completed: December 4, 2003

Date Samples Collected: July 31, 2003
Sample Matrix: Soil extract

Project Sample ID#s: 11018013200, 11018013201, 11018013202, EXTRACTION FLUID

Analytical Laboratory: SVL Analytical, Inc. Kellogg, Idaho
Laboratory Job No: 106937

Analytical Laboratory Sample ID#s: E345540, E345541, E345542, E345543

Methods of Analysis: Synthetic precipitation leaching procedure (SPLP) with analysis for arsenic, cadmium, copper, lead, and zinc: Method 6010B

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1. Is a Work Plan, Sampling and Analysis Plan, or Quality Assurance Project Plan available for the project?

Yes. The Work Plan is: Idora Mill and Red Monarch Mine Idaho Panhandle National Forests, Site Investigation Work Plan. Prepared for USDA Forest Service, Region 1. Dated June 26, 2003..

2. Chain of Custody (COC) Records:

Are the COCs present?
Yes, the COC is present with the data set.

Were the COCs complete and signed off?
Yes, the COC was completed and signed off as appropriate.

Were the samples received at 4°±2°C?
The sample container temperature was not measured upon receipt. All samples were stored and shipped in coolers containing doubled self-sealing bags filled with ice.

Were all the samples on the COCs analyzed?
Yes, the three samples on the COCs were analyzed by the laboratory.

Were any problems noted on the COCs?
No problems were noted on the COC.

3. Was a project narrative provided by the laboratory?

No. A project narrative was not included with the analytical results.

Were any problems noted in the narrative?
Not applicable.

4. Were all sample holding times met?

Yes. All samples were extracted within the six month holding time for metals.

5. Was the frequency stated in the Work Plan or Sampling and Analysis Plan for field duplicates, equipment rinsate blanks, and field blanks met?

The Work Plan recommended the collection of two soil field duplicates. No equipment rinsate blanks or field blanks were recommended. Because of the heterogeneity of soil, no soil field duplicates were collected. This is a deviation from the Work Plan.

6. Were all equipment rinsate, field blank, and method blank results less than the method detection limit (practical quantitation limit, etc.)?

Yes. No constituents in the laboratory preparation blanks were detected at or above the method detection limit. No other blanks were analyzed in this data set for the project.

7. Were all matrices, units, and detection limits reported correctly?

Yes. The matrix reported was soil. All water results were reported as mg/L.

8. Were all MS recoveries and field and laboratory RPDs within control limits?

MS control limits (75% to 125%): MS recoveries within control limits ranged from 100.3% to 108.0%, within control limits.

Laboratory Duplicates/MSD (±20% water; ±30% soil): Duplicate RPDs ranged from undetected to 8.7%, within control limits

Field Duplicates (±30% water; ±50% soil): No field duplicates were collected.

9. Were all LCS spike recoveries within control limits (80% to 120%)?

Yes. LCS recoveries ranged from 99.2% to 106.0%, within control limits.

10. What are the DQOs for the project?

A. The data quality objectives of the project are to: 1) evaluate the potential for precipitation and infiltrating water to leach metals from the tailings at the Site; 2) evaluate whether leaching metals at the Site poses a threat to human health or the environment; and 3) evaluate the possible use of the data for selecting reclamation alternatives.

B. The number of samples and sample locations was determined in the field upon examination of Site conditions. Analysis of the SPLP extracted soil samples includes arsenic, cadmium, copper, lead, and zinc.

C. The general quality assurance objective for this project was to collect data of known quality and to verify and document that the samples collected are representative of the actual field conditions. To accomplish this, the analytical data should have an appropriate degree of accuracy, precision, and be reproducible. Samples should be comparable to other samples collected at the Site and other sites with similar conditions.

Specific QA objectives for this project are as follows:

- Establish sampling techniques in such a manner that the analytical results are complete, reproducible, precise, accurate, and representative of the media and conditions.
- Collect and analyze a sufficient number of field and/or laboratory duplicate samples to assess the laboratory performance.

11. Discussion of DQOs for the data set:

A. The data set meets the objective for #10A. Results characterize the possible concentrations of leachable metals. Samples collected and analyzed were from the appropriate areas for

characterizing the tailings at the Site. Samples are suitable for the evaluation of whether concentrations of metals in the leachate from the tailings pose a potential threat to human health and the environment. The results in this data package are suitable for use to evaluate possible reclamation alternatives.

B. The data set meets the objective for #10B above. All constituents for the samples were analyzed.

C. Quality assurance objectives (#10C) for the data set is as follows:

- ***Accuracy:*** There were no field blanks or equipment rinsate blanks collected for the data set to assess the accuracy of the data with respect to blanks collected in the field. No laboratory preparation blanks were at or above method control limits. Laboratory MS and LCS sample recoveries were within acceptable control limits.

- ***Precision:*** Laboratory duplicate results were within control limits. No field duplicates were collected.

- ***Representativeness:*** The data set meets the objectives in #10A and #10B for the collection of samples to characterize tailings for use to evaluate potential threats to human health and the environment and for use in evaluating reclamation alternatives. The analytes were selected to assess the concentration of particular metals in leachate from the tailings based on other similar sites and Site history.

- ***Comparability:*** The data would be comparable to other data collected in the same manner and analyzed by the same analytical methods.

12. ***Was the project completeness goal met?***

All soil samples listed on the COCs were received and analyzed by the laboratory as requested. No sample results were objected during the evaluation process. The project is 100% complete.

Comments:

The data is of Level B quality.

APPENDIX C
SEDIMENT AND SOIL SAMPLE DESCRIPTIONS

WATER QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013207
Sample Form
Initials: TM
Date: 7/31/03 Time: 1250

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Location	Station
073103	1350	TM	Redmon	MG2

Coordinates		Rep	Gear	Sample Type	Weath.
North	East				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		
			10.9	°C		8.2	mg/L		.137	mS					7.1		120.4	ORP	

Field Comments: Collected immediately below waste rock dump where full flow of creek emerges.

Place
Field Sample ID Label Here

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Location	Station

Coordinates		Rep	Gear	Sample Type	Weath.
North	East				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		

Field Comments:

WATER QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013203
Sample Form
Initials: TM
Date: 7/31/05 Time: 1302

Place

Field Duplicate Sample ID Label Here

Red Mountain Adit + above

Date (mm/dd/yy)	Time (military)	Initials
07/31/05	1302	TM

Location	Station
Adit	1

Coordinates		Rep	Gear	Sample Type	Weath.
North	East				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		
			9.1			8.57	mg/L		0.249						7.60		67.2	ORP	

Field Comments: Collected from adit + open up

MCS Environmental, Inc.
11018013206
Sample Form
Initials: TM
Date: 7/31/05 Time: 1320

Place

Field Duplicate Sample ID Label Here

Missoula Gulch above adit

Date (mm/dd/yy)	Time (military)	Initials
07/31/05	1320	TM

Location	Station
MG	1

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			Grab	

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		
			12.6			7.9	mg/L		.038						7.31		98.0	ORP	

Field Comments: Sample collected upward ~15' above where adit discharges creek

WATER QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013108
Sample Form
Initials: [illegible]
Date: [illegible] Time: [illegible]

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Location	Station
07/30/03	1730	RES	Idaho	Adit 01

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			SURWA	Sunny
NA	NA				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		
NA			10	°C		13	mg/L					NA			7.5				

Field Comments: 0.224 ms/cm ORP = 28.6
Sample collected from adit on north side of BC

MCS Environmental, Inc.
11018013109
Sample Form
Initials: TM
Date: 7/30/03 Time: 1740

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Location	Station
07/30/03	1740	RES	Idaho	BCOH

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			SURWA	Sunny
NA	NA				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		
NA			16.2	°C		21	mg/L					NA			7.2				

Field Comments: 0.041 ms/cm ORP = 200
Collected at end of waste rock dump

WATER QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc
11018013105
Sample Form
Initials:_____
Date:_____ Time:_____

Place

Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials
07/30/03	1604	TM

Location	Station
BC01	BC04

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			SURWA	Sunny
NA	NA				

Field Measurements															
Depth	Unit	Temp	Unit	DO	Unit	Cond.	Unit	Alkalinity	Unit	pH		Eh (mv)	
NA		13.5	°C	3.2	mg/L	0.139	mS	NA		6		ORP 132.7	

Field Comments: Collected from the creek above a large debris dam above the site. [illegible]

MCS Environmental, Inc.
11018013107
Sample Form
Initials:_____
Date:_____ Time:_____

Place

Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials
07/30/03	1610	RES

Location	Station
Idaho	BC03

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			SURWA	Sunny
NA	NA				

Field Measurements															
Depth	Unit	Temp	Unit	DO	Unit	Cond.	Unit	Alkalinity	Unit	pH		Eh (mv)	
NA		12.1	°C	2.1	mg/L	0.092	mS	NA		6.8		ORP=104.8	

Field Comments: Collected [illegible]

WATER QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013104
Sample Form
Initials: [illegible]
Date: [illegible] Time: _____

Place

Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Location	Station
073003	1428	RES	Ilona	PZ04

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			SWDWA	Sunny
NA	NA				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		
NA			19.7	°C		5.4	mg/L		0.046	mS/cm		NA			6.2		ORP= 123.5		

Field Comments: PZ 04 located on the channel east of mill and south of Bear L.

MCS Environmental, Inc.
11018013106
Sample Form
Initials: [illegible]
Date: [illegible] Time: 1558

Place

Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Location	Station
073003	1555	RES	Ilona	BC02

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			SURWA	Sunny
NA	NA				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		
NA			12.9	°C		14.3	mg/L		0.037	mS/cm		MA			6.3		ORP= 162.4		

Field Comments: Sample from spring on creek bed by PZ

WATER QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013102
Sample Form
Initials:______
Date:______ Time:______

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials
07 2[illegible] 03	12[illegible]	R F [illegible]

Location	Station
Idona	PZ02

Coordinates North	Coordinates East
NA	NA

Rep	Gear	Sample Type	Weath.
		GNDWA	Sunny

Field Measurements											
Depth	Unit	Temp	Unit	DO	Unit	Cond.	Unit	Alkalinity	Unit	pH	Eh (mv)
NA		[illegible]	[illegible]	[illegible]	mg/L			NA		6.5	

0.[illegible] mS/cm ORP = [illegible]

Field Comments: [illegible] water sample from PZ 02 located [illegible] of PZ01

MCS Environmental, Inc.
11018013103
Sample Form
Initials:______
Date:______ Time:______

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials
073003	1333	RES

Location	Station
Idona	PZ03

Coordinates North	Coordinates East
NA	NA

Rep	Gear	Sample Type	Weath.
		GNDWA	Sunny

Field Measurements											
Depth	Unit	Temp	Unit	DO	Unit	Cond.	Unit	Alkalinity	Unit	pH	Eh (mv)
NA		32.2°	C	5.4	mg/L					6.6	

0.59 mS/cm ORP = 85.1

Field Comments: [illegible] water sample from PZ03 located [illegible] of PZ02

WATER QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013100
Sample Form
Initials: _____
Date: 7/30/03 Time: 1200

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials
07/30/03	1220	RES

Location	Station
Idaho	PZ01

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			SURFACE WATER	Sunny
NA	NA				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		~~Eh (mv)~~		
NA			14	°C		4.9	mg/L		0.055 mS/cm			NA			6.4		ORP = 125.1		

Field Comments: Sampled located at lower end of tailing between Tailings & Creek. Groundwater adjacent to creek

---

MCS Environmental, Inc.
11018013101
Sample Form
Initials: TM
Date: 7/30/03 Time: 1227

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials
07/30/03	1227	RES

Location	Station
Idaho	SEEP01

Coordinates		Rep	Gear	Sample Type	Weath.
North	East			SURFACE WATER	Sunny
NA	NA				

Field Measurements																			
Depth	Unit		Temp	Unit		DO	Unit		Cond.	Unit		Alkalinity	Unit		pH		Eh (mv)		
NA			15.5	°C		5.3	mg/L		0.1042 mS/cm			NA			6.2		ORP = 150.5		

Field Comments: Groundwater seep adjacent to PZ01

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013108
Sample Form
Initials:
Date: Time:

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
073003	1740	RC		NA	NA

Location	Station	Area Designation	Rep	Sample Depth	Unit	Material Type	Weath.
1217	BC01			0-5	cm	SED	[illegible]

Particle Size (Circle Best Description):

Silty Clayey **(Sandy)** Gravelly Cobbley

Silt Clay Sand Gravel Cobble Bedrock

Other:

Moisture Description (Circle Best Description):

Dry Moist **(Saturated)** Other:

Color Description (Circle Best Description):

Brownish Brown
Blackish Black
Redish Red
Grayish **(Gray)**
Greenish Green
Other:

Density Description (Circle Best Description):

(Soft) Firm Other:

Angularity Description:

Sorting Description: [illegible]

Field Comments: [illegible]

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013107
Sample Form
Initials: [illegible]
Date: [illegible] Time: [illegible]

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
073003	1700	RES	Scoop	NA	NA

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Edori	BC03			0-5	cm	Sed	

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand Gravel Cobble Bedrock

Other: _____

Moisture Description (Circle Best Description):

Dry (Moist) Saturated Other: _____

Density Description (Circle Best Description):

(Soft) Firm Other: _____

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	(Gray)
Greenish	Green

Other: _____

Angularity Description: Angular

Sorting Description: Poorly sorted

Field Comments: Sediment from the EC03 location

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc
11018013106
Sample Form
Initials:_____
Date:_____ Time:_____

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
07/20/11	1400	RFS	bkgd	NA	NA

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Idaho 3	T2:101			2	FT		bkgd

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand (Gravel) Cobble Bedrock

Other: _____

Moisture Description (Circle Best Description):

Dry (Moist) Saturated Other: _____

Density Description (Circle Best Description):

Soft (Firm) Other: _____

Color Description (Circle Best Description):

Brownish	Brown
(Blackish)	Black
(Reddish)	Red
(Grayish)	Gray
Greenish	Green

Other: Interbedded black and red tones

Angularity Description: Angular

Sorting Description: Poorly sorted

Field Comments: Talus from the parent soil material. Some iron staining present

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013105
Sample Form
Initials: [illegible]
Date: [illegible] Time: [illegible]

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
07 30 03	1518	RFS	3/4 ton	NA	NA

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Iowa	FED01	MILL		05	CM		Dry

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand Gravel Cobble Bedrock

Other: _____

Moisture Description (Circle Best Description):

Dry Moist (Saturated) Other: _____

Density Description (Circle Best Description):

(Soft) Firm Other: _____

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
(Grayish)	Gray
Greenish	Green

Other: _____

Angularity Description: Angular

Sorting Description: Well sorted

Field Comments: Off sand pool adjacent to BC

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013211
Sample Form
Initials:
Date: Time:

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
07/31/25	1430	TM			

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Kelly Ranch	WF	Lake 1		1	+/-	WF	

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand (Gravel) Cobble Bedrock

Other:

Moisture Description (Circle Best Description):

(Dry) Moist Saturated Other:

Density Description (Circle Best Description):

Soft (Firm) Other:

Angularity Description:

Angular

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	Gray
Greenish	Green

Other: yellow brown

Sorting Description: poorly sorted

Field Comments: Collected from the base of lake 1.

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013210
Sample Form
Initials: TM
Date: 8/30/10 Time: 1110

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
8-30-10	1110	TM			

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Fed Mon	WR	Lobe 2		1	FT	WR	

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand (Gravel) Cobble Bedrock

Other: _____

Moisture Description (Circle Best Description):

(Dry) Moist Saturated Other: _____

Density Description (Circle Best Description):

Soft (Firm) Other: _____

Angularity Description:
Angular

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	Gray
Greenish	Green

Other: yellow-brown

Sorting Description: _____

Field Comments: Collected from the base of Lobe 2

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013209
Sample Form
Initials: [illegible]
Date: [illegible] Time: [illegible]

Place
Field Duplicate Sample ID Label Here

Lake 3

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
[illegible]	[illegible]	TM			

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Pelican	WR	Lake 3		1	AT	WR	

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand (Gravel) Cobble Bedrock

Other: _____

Moisture Description (Circle Best Description):

(Dry) Moist Saturated Other: _____

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	Gray
Greenish	Green

Other: [illegible]

Density Description (Circle Best Description):

Soft (Firm) Other: _____

Angularity Description:

angular

Sorting Description: poorly sorted

Field Comments: Collected from the base of Lake 3

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013208
Sample Form
Initials: TM
Date: 7/31/08 Time: 1400

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
073108	1400	TM			

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
RedMan	MGZ					Sed	

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand (Gravel) Cobble Bedrock

Other: _____

Moisture Description (Circle Best Description):

Dry Moist (Saturated) Other: _____

Density Description (Circle Best Description):

(Soft) Firm Other: _____

Angularity Description:

Subangular

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
(Redish)	Red
Grayish	(Gray)
Greenish	Green

Other: _____

Sorting Description: Poorly sorted

Field Comments: Collected from [illegible]

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013205
Sample Form
Initials:
Date: Time:

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
9 7 / 5 7	1 5 : 5	T M			

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Flat Creek	MS 4			2	A	S S	

Particle Size (Circle Best Description):

Silty Clayey Sandy Gravelly Cobbley

Silt Clay Sand Gravel Cobble Bedrock

Other:

Moisture Description (Circle Best Description):

Dry Moist Saturated Other:

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	Gray
Greenish	Green

Other:

Density Description (Circle Best Description):

Soft Firm Other:

Angularity Description:

Sub angular

Sorting Description: poorly sorted

Field Comments: Collected from Missoula gulch immediately above mouth.

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013204
Sample Form
Initials: TM
Date: 7/31/03 Time: 1310

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates	
				North •	East •
073103	1310	TM			

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Red Monarch	Adit 1					Sed	

Particle Size (Circle Best Description):

Silty Clayey Sandy Gravelly Cobbley

Silt Clay (Sand) Gravel Cobble Bedrock

Other: _____

Moisture Description (Circle Best Description):

Dry Moist (Saturated) Other: _____

Density Description (Circle Best Description):

(Soft) Firm Other: _____

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	Gray
Greenish	Green

Other: yellow-brown

Angularity Description:

angular

Sorting Description: _____

Field Comments: Collected from adit discharge stream at mouth of adit

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013202
Sample Form
Initials:
Date: Time:

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
9/7/11					

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Red Mountain	WR	Lobe 3		12	in	WF	

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand (Gravel) Cobble Bedrock

Other:

Moisture Description (Circle Best Description):

(Dry) Moist Saturated Other:

Density Description (Circle Best Description):

Soft (Firm) Other:

Angularity Description:

Angular

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	Gray
Greenish	Green

Other: Brownish yellow

Sorting Description:

Field Comments: Composite soil sample collected from Lobe 3. [illegible] weathered material [illegible] of the waste rock dump.

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013201
Sample Form
Initials: TM
Date: 7/31/03 Time: 1155

Place
Field Duplicate Sample ID Label Here

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
073103	1155	TM			

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
Rcld Monarch	WR_	Lobe 2		12	in	WR	

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand (Gravel) Cobble Bedrock

Other: grains coated with fine dust

Moisture Description (Circle Best Description):

(Dry) Moist Saturated Other: _____

Density Description (Circle Best Description):

Soft (Firm) Other: _____

Angularity Description:

Angular

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	Gray
Greenish	Green

Other: yellow

Sorting Description: _____

Field Comments: Composite sample collected from lobe 2, the middle lobe of the waste rock dump. Access to the entire face of the dump is difficult + samples were collected where possible

SOIL QUALITATIVE SAMPLE CHARACTERISTICS

MCS Environmental, Inc.
11018013200
Sample Form
Initials:_____
Date:_____ Time:_____

Place
Field Duplicate Sample ID Label Here

Lab # 1

Date (mm/dd/yy)	Time (military)	Initials	Gear	Coordinates North	Coordinates East
5 7 [illegible]	1 1 2 5	T M			

Location	Station	Area Designation	Rep	Sample Depth	Sample Unit	Material Type	Weath.
F E A Meadow	W K	L O b ≤ 1		1 2	i n	W K	

Particle Size (Circle Best Description):

Silty Clayey (Sandy) Gravelly Cobbley

Silt Clay Sand (Gravel) Cobble Bedrock

Other: _____

Moisture Description (Circle Best Description):

(Dry) Moist Saturated Other: _____

Color Description (Circle Best Description):

Brownish	Brown
Blackish	Black
Redish	Red
Grayish	Gray
Greenish	Green

Other: Orange-yellow

Density Description (Circle Best Description):

Soft (Firm) Other: _____

Angularity Description:

Angular

Sorting Description: _____

Field Comments: Composite sample collected from the eastern ½ of the waste rock dump. The dump is well stemmed with grass. Individual samples were collected within proximity.