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REMOVAL ACTION REPORT

Harmony Mine
Lemhi County, Idaho

TDD 03-09-0001

Prepared for

U.S. Environmental Protection Agency, Region 10

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Environmental Cleanup Office

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Harmony Mine
Lemhi County, Idaho

TDD 03-09-0001

Prepared for

U.S. Environmental Protection Agency, Region 10
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Boise, Idaho 83706

Prepared by

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March 5, 2004

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Attached are the following items:

One bound copy of the final Removal Action report for the Harmony Mine Site.

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Remarks:

By: _____

Copies to: Greg Weigel, USEPA
Ray Henderson, USFS
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Introduction

Herrera Environmental Consultants Inc. was tasked by the U.S. Environmental Protection Agency (EPA) under Superfund Technical Assessment and Response Team (START) contract 68-SO-01-03 to conduct a Removal Action at the Harmony Mine under Technical Direction Document (TDD) 03-09-0001. The Harmony Mine site covers approximately 330 acres located in Lemhi County, Idaho, latitude 45° 01' 00" north and longitude 113° 49' 21" west (Figure 1).

Objectives of the Removal Action were to conduct gross removal of tailings material to prevent catastrophic slope failures and subsequent discharge of contaminated material to Harmony Creek; construct a repository to accommodate the tailings material with a compacted rock cover to minimize the bioavailability of copper to the environment; provide erosion and sediment control during construction to prevent the discharge of sediments to Harmony Creek using Best Management Practices (BMPs) and other engineering controls; reclaim all disturbed areas using BMPs and other engineering controls to minimize erosion after completing the work; and minimize operations and maintenance (O&M) requirements.

Approximately two-thirds of the tailings pile was located on private patented property and approximately one-third of the tailings pile was located on public land administered by the United States Department of Agriculture (USDA) Forest Service (Forest Service). Under Executive Order 12580, EPA is allowed to use funds from the Hazardous Substance Superfund to pay for Removal Actions for releases or threatened releases under the jurisdiction, custody, or control of Executive departments or agencies, such as the Forest Service, provided the department or agency agrees to reimburse the Superfund. This Removal Action was implemented by the EPA, Forest Service, Emergency and Rapid Response Services (ERRS) contractor, and START contractor on both the public and private lands. The Forest Service provided funding to the EPA and in-kind services in support of the project equal to one-third of the extramural project cost (commensurate with the portion of property administered by the Forest Service). In-kind services provided by the Forest Service included use of Forest Service land to site a repository, a topographical site survey, archeological expertise, biological expertise, and coordination of Endangered Species Act (ESA) consultation with the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries), and U.S. Fish and Wildlife Service (EPA 2003).

The START conducted Removal Action activities from September 8, 2003 through October 20, 2003. During this time, the START documented removal activities in logbooks and with a digital camera, conducted health and safety monitoring, provided engineering design and support, and collected environmental samples for confirmation laboratory analysis.

Site Description

The Harmony Mine is a former copper mine and mill located in northeastern Lemhi County, Idaho, approximately 15 miles southeast of Salmon, Idaho. The property is completely

surrounded by the Salmon-Challis National Forest (Figure 2). Harmony Creek flows through the project area.

The mine property has had multiple owners. The private portion of the site is currently owned by four sets of private citizens (E&E 2000). The total private property area is 330 acres, comprised of two parcels: approximately 323.5 acres that includes the adits and subsurface workings in the upper drainage; and approximately 6.5 acres that includes the mill building and had, based upon a survey completed by the Forest Service in September 2003, an estimated 9,000 cubic yards (CY) of tailings material located downslope within Harmony Creek prior to commencement of Removal Action activities (Henderson 2003a). The project area covered approximately 12 acres and was limited to the smaller private parcel and adjacent Forest Service property surrounding the private property.

The former mill building and bunkhouses are located on the east slope of the valley at an elevation of 7,000 feet above mean sea level near the headwaters of Harmony Creek, a tributary to Withington Creek (Figure 3). Two former mine adits are located at an elevation of approximately 7,600 feet above mean sea level south of the mill buildings on the west slope of the valley.

Surface water features within the project area include Harmony Creek, with a September estimated flow of 3.2 cubic feet per second (cfs) through the middle of the tailings-impacted area, and various surface water drainages that contribute to surface water flow in the project area, including discharge from the adits (E&E 2000). Withington Creek is a tributary to the Lemhi River, which is a tributary to the Salmon River. Both Withington Creek and the Lemhi River have non-federal listed rainbow trout and Westslope cutthroat trout, a State Species of Concern. The Lemhi and Salmon Rivers are Designated Critical Habitat for chinook and steelhead salmon and bull trout (IDFG 1999).

Shallow ground water occurs in surface unconsolidated sediments consisting of gravel with sand and silt and near-surface fractured bedrock comprised of metamorphosed rocks of sedimentary origin, such as quartzite. Well depths in the area range from 23 to 50 feet below ground surface. Average annual precipitation is approximately 10.17 inches and the 2-year 24-hour rainfall event recorded at the nearest station in Salmon is approximately 1.5 inches (E&E 2000).

In August of 2003, the Harmony and Withington Creek valley was subject to severe forest fires that completely destroyed the former mill, associated buildings, and surrounding vegetation. The instability associated with the loss of vegetation resulted in massive talus slope debris flows and surface water erosion throughout the project area. The tailings were at risk of severe erosion and catastrophic slope failure due to veneer instability or block failure primarily during spring runoff events. This could result in mass loading of copper-laden tailings to surface waters that ultimately discharge to the Lemhi and Salmon Rivers (Herrera 2003).

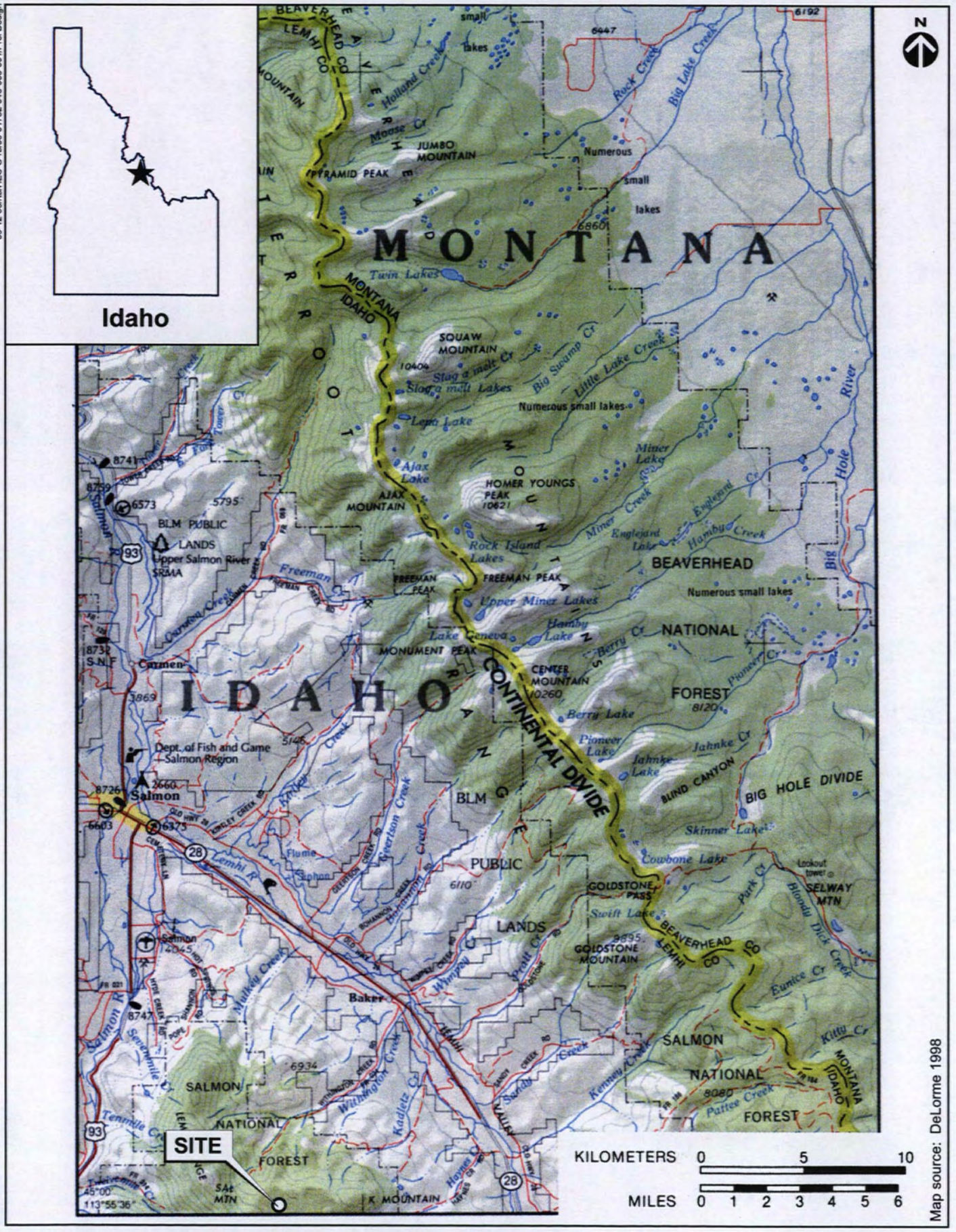


Figure 1. Vicinity map of the Harmony Mine site near Salmon, Idaho.

2nd page for color Figure 1

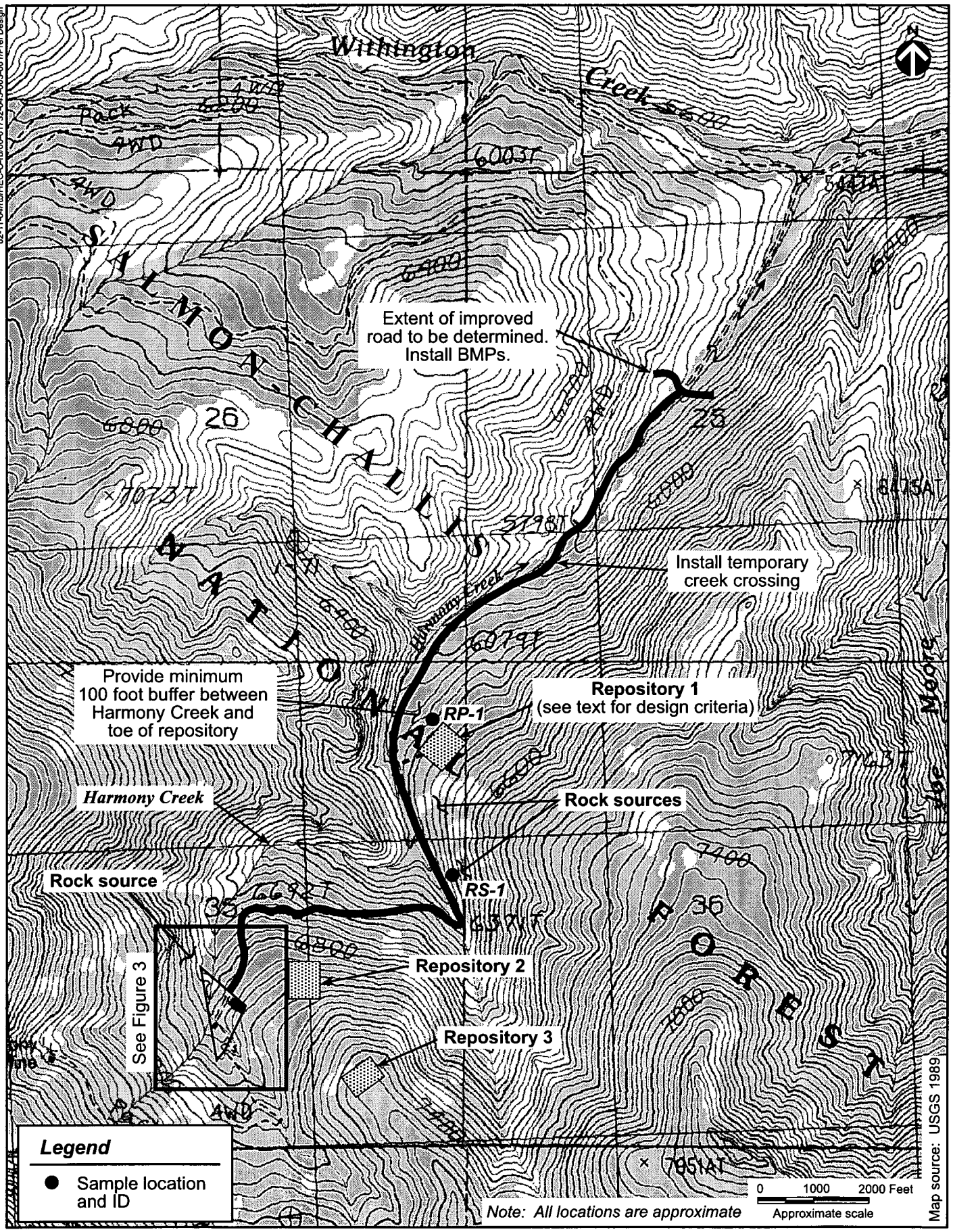


Figure 2. Project area and preliminary design site plan of the Harmony Mine site near Salmon, Idaho.

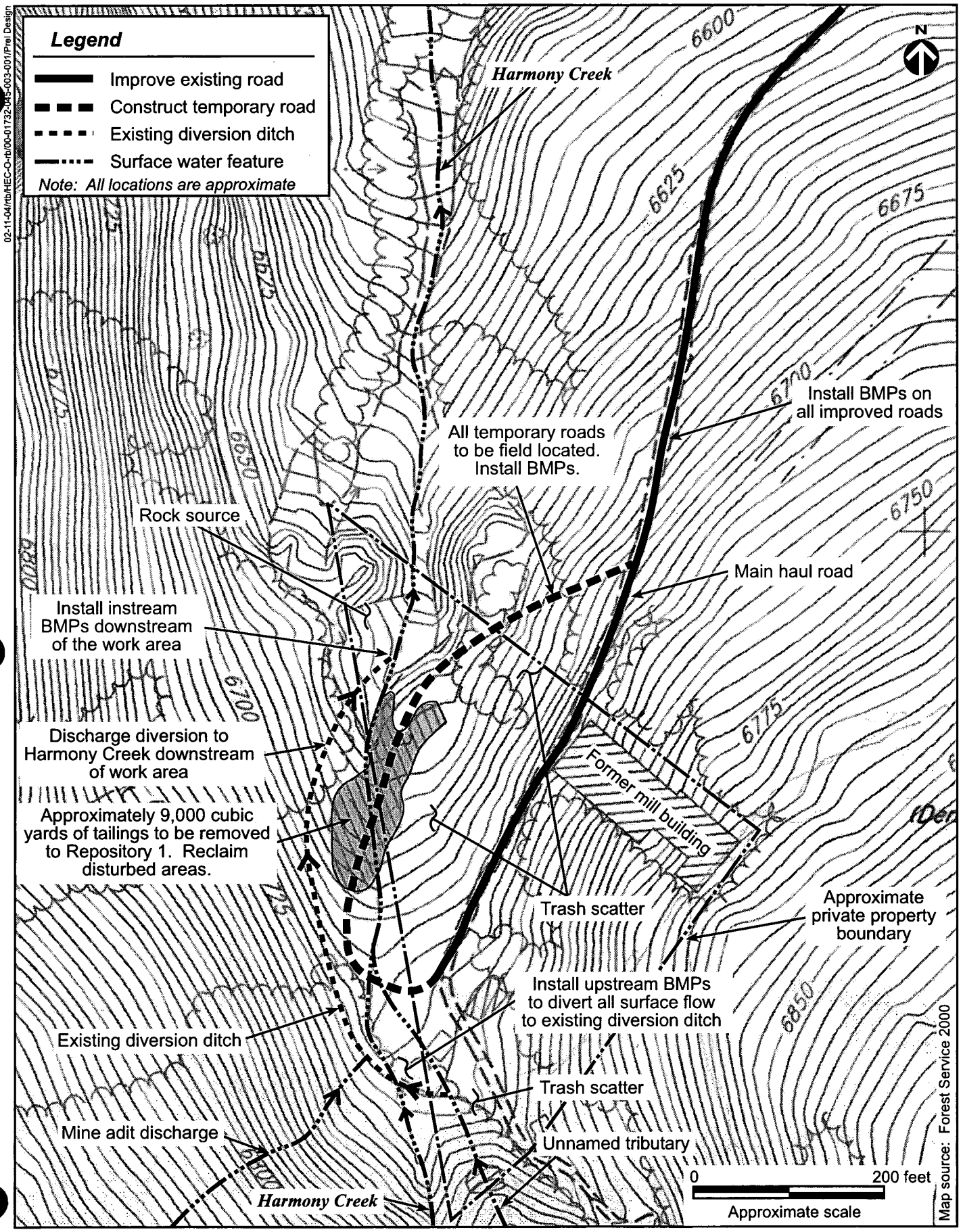


Figure 3. Proposed actions at the Harmony Mine site near Salmon, Idaho.

Previous Investigations

During 1994, the Idaho Geological Survey conducted an extensive review of inactive or abandoned mines south of the Salmon River. According to the investigation, copper sulfide tailings were identified at Harmony mine that appeared very unstable. A pH reading of Harmony Creek measured 7.2; no other sampling was conducted. Further assessment was conducted in 1995 by the United States Geological Survey, including surface water, sediment, and tailings material sample collection from within the mill and tailings area. Samples were analyzed for heavy metals and results indicated concentrations of copper in all media at levels of concern (E&E 2000).

The Idaho Department of Environmental Quality (IDEQ) conducted surface water sampling at the mine site in 1998 and 1999. Results indicated dissolved concentrations of copper up to 33 micrograms per liter (µg/L) (IDEQ 1999), which exceeded the Idaho State Freshwater Chronic criteria for aquatic life of 3.5 µg/L, calculated per the Idaho Administrative Code (IDAPA 58.01.02 subsection 210.03).

In 2000, the EPA produced a Preliminary Assessment/Site Inspection report that documented a site visit and sampling conducted during 1999. The tailings pile, estimated at the time as 40,000 CY, was noted in the Harmony Creek channel, downslope of the mill building. Tailings deposits were also observed within Harmony Creek, extending approximately 2.4 miles downstream of the mill area. Sample results indicated several metals detected at significant or elevated concentrations. Copper was detected at up to 5,000 milligrams per kilogram (mg/kg) in the tailings piles, exceeding the EPA Region 9 Preliminary Remediation Goal (PRG) for residential sites of 3,100 mg/kg (EPA 2002). Copper was detected at up to 3,000 mg/kg in Withington Creek sediment, exceeding the National Oceanic and Atmospheric Administration (NOAA) Freshwater Sediment Screening Probable Effect Level (PEL) of 197.0 mg/kg (Buchman 1999). Copper was detected at up to 50.5 µg/L in Harmony Creek, exceeding the Idaho Chronic Criterion Continuous (CCC) concentration of 3.5 µg/L, calculated per IDAPA 58.01.02 subsection 210.03.

Site visits were conducted after forest fires in the area had been extinguished in early September 2003. During the first two weeks of September, the EPA On-Scene Coordinator (OSC), the Forest Service OSC, representatives of the United States Fish and Wildlife Service, START personnel, and ERRS personnel visited the site on multiple days to determine the necessity of a Removal Action. During the initial site visits, three potential repository locations were identified (see Figure 2). The private property did not have an appropriate location to accommodate the estimated volume of tailings in a stable environment within a reasonable haul distance. Adverse haul conditions were a serious consideration, due to the instability of soils, trees, and rock debris on the steep slopes. Therefore, Repository 1 on Forest Service property was selected as the preferred location.

A September 10, 2003 Forest Service survey estimated 9,000 CY of tailings material for planned removal at the site (Henderson 2003b).

Removal Action Objectives and Proposed Actions

Results from the 2000 Preliminary Assessment/Site Inspection concluded that approximately 40,000 CY of contaminated mine waste from historical mine operations was located across approximately 1,120 square feet of the Harmony Mine site. A Forest Service survey conducted prior to Removal Action activities estimated 9,000 CY. In addition, contaminated mine waste was detected and observed in Harmony Creek 2.4 miles downstream of the tailings piles (E&E 2000).

Removal Action objectives were developed in September 2003 using results from the 2000 Preliminary Assessment/Site Inspection and design criteria established during meetings conducted prior to the work between EPA, Forest Service, START, and EPA's ERRS construction contractor (Herrera 2003). The following presents Removal Action objectives and proposed actions for the site.

Removal Action Objectives

Removal Action objectives were intended to guide the selection of proposed actions necessary for the protection of human health and the environment from threats of contaminant releases via pathways established during previous investigations. Proposed activities included:

- Conduct gross removal of tailings material to prevent severe erosion and catastrophic slope failures and subsequent discharge of contaminated material to Harmony Creek
- Construct a repository to accommodate the tailings material with a compacted rock cover to contain the tailings and minimize the bioavailability of copper to the environment
- Provide erosion and sediment control during construction to prevent the discharge of sediments to Harmony Creek using BMPs and other engineering controls
- Reclaim all disturbed areas using BMPs and other engineering controls to minimize erosion and associated slope failures after the work is completed
- Minimize future O&M requirements.

Although surface water treatment was not addressed as part of the Removal Action, surface water quality will benefit from collateral effects of the Removal Action. The availability of source metals contamination will be minimized through removal of contaminated material from areas

with the highest potential for slope failure, with consolidation and containment at a protected location.

Additional Work

Archaeological Oversight

In accordance with the National Historic Preservation Act (NHPA), Section 106, the EPA and Forest Service were required to take into account the effects of the proposed Removal Action on historic properties. The Forest Service assigned an archaeologist to provide technical support and coordinate with the State Historic Preservation Officer (SHPO) regarding the planned Removal Action. Before and during site work, archaeologists from NorthWind, Inc., subcontracted through the ERRS contract, documented historical features including trash scatter in areas that would be disturbed as part of construction activities (Figure 3). Historical preservation documentation and correspondence are provided in Appendix A.

Endangered Species Act Consultation

In accordance with the Endangered Species Act (ESA), Section 7, the EPA and Forest Service coordinated informal emergency consultation with NOAA Fisheries and the U.S. Fish and Wildlife Service to ensure the proposed Removal Action activities would not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of their critical habitat. Documentation of the emergency consultation is provided in Appendix B (EPA 2003).

Proposed Actions

The following proposed actions were developed and identified in the draft Preliminary Design Report prepared by Herrera based on information collected during the September 9, 2003 START site visit, photographs from the EPA and Forest Service OSCs, and the 2003 Forest Service survey (Herrera 2003). The design was field-fit during construction as appropriate. Figures 3 and 4 depict the Harmony Mine with the proposed actions.

Site Wide

- Minimize disturbance to existing vegetation during site work
- Implement erosion and sediment controls before and during site work to minimize the introduction of sediments to Harmony Creek and reduce pollutants and turbidity in stormwater runoff

- Avoid adverse impacts on stream and wildlife habitats and associated species
- Retain all salvaged trees in Harmony Creek and the floodplain to compensate for the long-term loss of large woody debris recruitment potential (place cut trees in the floodplain or instream to provide habitat)
- Field-fit design features during construction, as appropriate
- Improve the existing haul road leading to the tailings piles to accommodate heavy equipment
- Construct a temporary road to access and exit the tailings piles and provide turnarounds
- Provide archaeologist oversight to minimize disturbance to artifacts. The archaeologist to inventory and document historical artifacts, including those in the trash scatter areas indicated on Figure 3, prior to earth moving activities.

Tailings Material Removal

- Remove 9,000 to 40,000 CY of tailings material from approximately 200 linear feet of Harmony Creek, downslope of the mill building
- Excavate tailings to the underlying native material, as determined visually or to the extent practicable (the native material is brown in color, the tailings are yellow)
- Maintain a minimum slope of 4:1 (horizontal to vertical) and a maximum slope of 2.5:1 on both banks of the channel to minimize erosion
- Protect disturbed areas against erosion and dissipate the energy of runoff, surface flow, and debris flows by placing straw mulch, rock, and salvaged woody debris on disturbed areas following removal of tailings material.

Repository

- Clear and grub the proposed repository area, approximately 400 feet long and 150 feet wide
- Compact the ground surface with heavy equipment to prepare the surface
- Salvage woody debris and rock for use as cover materials for erosion control and reclamation efforts

- Transport tailings material to the repository via off-road haul truck and spread with a bulldozer in maximum 1-foot lifts; each lift to be subsequently compacted; material for compaction to be non-saturated and free of wood debris, large rock, and other deleterious objects that could preclude the material from being compacted; compaction to be attained by track equipment passes until the surface is firm and unyielding

- Locate the repository with a minimum 100 foot buffer between the west toe of the slope and Harmony Creek

- Optimize surface water sheet flow to minimize erosion and infiltration by maintaining a minimum slope of 4:1 and a maximum slope of 3:1 on all sides, with the exception of the east side, which may be blended into the east valley slope; slope the top of the repository to drain away from the repository with a minimum slope of 25:1

- If the repository is blended into the east valley slope, construct a wide trench at the top of the repository to provide energy dissipation to minimize erosion from surface water and debris flows originating on the slope; the trench to include large coarse and durable rock (greater than 24-inches) placed on top of the compacted rock cover to provide additional protection

- Isolate tailings placed in the repository beneath a compacted rock cover to minimize the bioavailability of copper and other detected metals by reducing infiltration, preventing erosion by surface water and debris flows, and preventing contact with humans and animals

- Construct the compacted rock cover with a minimum of 24-inches of rock 18-inches or less in size obtained from proposed borrow sources; rock cover material to be moved to the repository by haul truck and spread with a bulldozer in maximum 1-foot lifts; compaction to be attained by track equipment passes until the surface is firm and unyielding.

Erosion and Sediment Control

- Implement erosion and sediment controls before and during site work to minimize the introduction of sediments to Harmony Creek and to reduce pollutants and turbidity in stormwater runoff

- Inspect and maintain all BMPs daily, especially following rainfall events

- Intercepting features such as diversion dikes, coffer dams, check dams, and lined ditches may be constructed with anchored polyethylene (PE) pipe throughout the project area to minimize surface and ground water interaction with the tailings piles

- Divert flow from Harmony Creek, the mine adit discharge, the unnamed creek, and other surface water flow around the tailings removal work area and discharge back to Harmony Creek downstream of the work area to minimize surface water flow in the creek during the work; an energy dissipater to be provided for outlet protection at the point of discharge

- Remove the diversion upon completion of construction work to allow flow back to its original course (a slug of turbidity is anticipated).

Reclamation

- Place certified weed-free straw and Forest Service approved seed mixture as necessary to reduce future erosion from disturbed areas

- Install water bars on access roads as necessary

- Obliterate temporary access roads.

Chronology of Major Events

The following activities were conducted during the Harmony Mine site Removal Action, as documented by START and OSC oversight. Photographic documentation of site features and decision areas before, during, and after Removal Action activities is provided in Appendix C. Daily activities were also documented by EPA Pollution Reports (POLREPS), presented in Appendix D.

Wednesday, September 3, 2003

- START received verbal notice to proceed from the EPA OSC.

Monday, September 8, 2003

- A START engineer mobilized to site.

Tuesday, September 9, 2003

- The START engineer toured the site with the Forest Service OSC and identified three potential locations for the repository.
- Soil samples were collected from Repository 1 and from fines from the proposed source rock for the repository compacted rock cover (Figure 2).
- The START engineer demobilized from the site.

Friday, September 12, 2003

- START received verbal notice to stop work pending coordination between the EPA and Forest Service regarding siting of repository on Forest Service land.

Monday, September 15, 2003

- START received verbal notice to resume work.

Friday, September 19, 2003

- ERRS began mobilizing to the site.

Monday, September 22, 2003

- A START engineer mobilized to the site.

- ERRS began widening and improving the roads at the site to allow 14 feet-wide haul trucks to travel safely.
- Archaeologists from Northwind Environmental completed a four-day effort to survey the site for cultural resources.
- The EPA OSC, Forest Service OSC, ERRS Project Manager, and START engineer reviewed the major elements of the site and discussed priorities.

Tuesday, September 23, 2003

- Heavy equipment crossing the debris flow sank several feet and generated some turbidity in the creek, which was mitigated with silt fencing.

Wednesday, September 24, 2003

- The unnamed tributary located downhill from the switchback was diverted back into its previous channel and material from the debris flow was removed and stockpiled.

Thursday, September 25, 2003

- The IDEQ Regional Administrator and the Forest Service Forest Supervisor were on site.

Saturday, September 27, 2003

- ERRS began to divert the channel of Harmony Creek in the tailings removal area.

Monday, September 29, 2003

- ERRS began to clear and prepare the surface of the repository.

Tuesday, September 30, 2003

- ERRS completed installation of the channel diversion.

Wednesday, October 1, 2003

- ERRS completed road improvements.

Thursday, October 2, 2003

- ERRS began to excavate tailings and compact them into the repository. Tailings and debris were excavated from in front of the old mill building,

while monitored by the archaeologist subcontractor. Straw bale BMPs were installed along the west edge of the repository and in two additional locations down gradient from the repository; a settling basin was graded into the drainage east of the office trailer.

- Approximately ten gallons of hydraulic oil were released on the haul road and in the repository when a hydraulic fitting on a haul truck ruptured. ERRS immediately excavated and segregated contaminated material.

Friday, October 3, 2003

- A ditch was excavated to direct drainage north from the repository, away from the creek.

Saturday, October 4, 2003

- A sedimentation pond was built below the tailings, and a straw bale BMP was installed below the pond.
- The contaminated soil from the hydraulic oil spill was placed in the repository.

Wednesday, October 8, 2003

- A Forest Service fisheries biologist and a reporter from the Idaho Falls Post Register visited the site.

Thursday, October 9, 2003

- START and ERRS located rock sources.
- The excavator tracked tailings material from the repository area to the ditch area. The tracked material was removed by hand with a shovel and disposed of in the repository.

Saturday, October 11, 2003

- ERRS finished hauling tailings and began placing rock at the toe of the repository.
- START and ERRS confirmed the slopes of the repository.
- Forest Service surveyors completed volumetric survey of tailings placed in the repository.

- According to ERRS daily estimations, a total of 15,609 cubic yards of tailings were removed from the tailings piles and deposited in the repository.

Monday, October 13, 2003

- ERRS began placing the first 1-foot lift of the compacted rock cover onto the repository and began general cleanup of the tailings area (placing rock in the channel, widening the channel in the area where tailings were removed, and placing woody debris on disturbed areas).
- START and ERRS confirmed the slopes and dimensions of the repository.

Tuesday, October 14, 2003

- The first one foot lift of the compacted rock cover was completed; ERRS began placement of the second 1-foot lift of compacted rock cover.
- The EPA OSC and START flagged the location for the ditch to the east of the repository.

Wednesday, October 15, 2003

- ERRS completed the placement of the second 1-foot lift of compacted rock cover onto the repository.
- The Forest Service and EPA OSCs requested widening the channel above the area where tailings were removed to enable better flow of water and debris through the channel.
- The completed Forest Service survey determined that the repository contained 9,411 cubic yards of compacted tailings (plus an estimated 260 cubic yards placed in the repository after the survey was completed).

Thursday, October 16, 2003

- ERRS began to place coarse and durable rock and woody debris onto the repository.
- Design of the basin above the stream channel in the vicinity of the tailings piles was discussed and agreed upon.
- ERRS began forming the basin above stream channel.

Friday, October 17, 2003

- ERRS finished placing coarse and durable rock and woody debris onto the repository and completed stream widening, tailings area cleanup, and basin forming.
- ERRS confirmed the final slopes of the repository.
- ERRS began constructing a ditch to the east of the repository, sloping the road, and installing water bars.
- The diversion was removed and flow was directed back into Harmony Creek.

Saturday, October 18, 2003

- ERRS completed the ditches to the east and south of the repository and began seeding and mulching disturbed areas.

Monday, October 20, 2003

- ERRS placed woody debris on the repository access road.
- START obtained final dimensions of the stream and basin in the vicinity of the tailings piles.
- Water flowing in the widened creek channel was not turbid.

Tuesday, October 21, 2003

- START demobilized from the site.

Wednesday, October 22, 2003

- ERRS demobilized all personnel and equipment.

Wednesday, November 5, 2003

- One ERRS contractor returned to the site to complete seeding of disturbed areas.

Onsite Worker Air Quality Monitoring

Real-time onsite worker air quality monitoring for fugitive dust was conducted at the Harmony Mine during Removal Action activities from October 8 to October 15 to protect onsite workers from potential exposure to heavy metals through inhalation. Monitoring was conducted when tailings were disturbed. Fugitive dust monitoring provided a record of exposure to metals-contaminated soils during direct work with contaminated mine waste and allowed construction methods to be adjusted to reduce exposure should the action levels be exceeded.

Three MIE model pDM-3 MiniRAM airborne particulate monitoring instruments were used to measure real-time dust concentrations for three onsite workers during work with contaminated mine waste. The onsite locations were in a worker's breathing zone chosen based on the task with the highest potential exposure hazard, typically operating heavy equipment without an enclosed cab (equipment). The monitoring instruments did not measure concentrations of specific analytes within the dust; therefore, a dust exposure action level at mixture permissible exposure limit (PEL) of 0.364 mg/m^3 was calculated to account for the site-specific constituents associated with dust at the site. When the PEL was exceeded in any monitoring instrument, engineering controls, such as dust control and keeping equipment cab doors and windows closed, were implemented as appropriate. The PEL calculation is provided in Appendix E.

Sample Collection and Results

In accordance with the methodology outlined in the Draft Quality Assurance Project Plan for Removal Program Sampling (Herrera 2002a), Draft Generic Site Specific Sampling Plan for Removal Program Sampling (Herrera 2002b), and Soil Sampling Standard Operating Procedures (Herrera 2002c), confirmation samples were collected as part of this Removal Action. Full sample results are presented in Appendix F.

One soil sample was collected from Repository 1 and one soil sample was collected from the proposed Rock Source 1. Sample collection locations (RP-1 and RS-1) are presented on Figure 2. At the request of the EPA OSC, no further confirmation sampling was completed.

Surface Soil

In order to confirm that the proposed repository location did not contain concentrations of metals, particularly copper, exceeding EPA Region 9 PRG for residential sites, one surface soil sample was collected on September 9, 2003, during the initial site visit at Repository 1 (RP-1) and analyzed for the priority pollutant list of 14 heavy metals. A summary of sample results is presented in Table 1.

Table 1. Analytical results for soil confirmation samples collected from the Harmony Mine site Removal Action.

		Results		Region 9 Preliminary Remediation Goals [a]
Analyte	Units	RP-1	RS-1	Residential Sites
Inorganics				
Antimony	mg/kg	13.1 U	12.5 U	31
Arsenic	mg/kg	**7.47**	**3.24**	0.39
Beryllium	mg/kg	0.521 J	0.351 J	150
Cadmium	mg/kg	1.31 U	1.25 U	37
Chromium	mg/kg	**7.05**	**2.82**	210
Copper	mg/kg	22.4 J	18.3 J	3,100
Lead	mg/kg	**14.2**	**12.3**	400
Mercury	mg/kg	**0.0279**	0.014 J	23
Nickel	mg/kg	**7.77**	**3.25**	1,600
Selenium	mg/kg	13.1 U	12.5 U	390
Silver	mg/kg	2.62 U	2.5 U	390
Thallium	mg/kg	13.1 U	12.5 U	5.2
Zinc	mg/kg	**90.4**	26.3	23,000

Bold values indicate results greater than method detection limits.
mg/kg – milligrams per kilogram.
J – The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quantity control criteria were not met.
U – The material was analyzed for, but was not detected; the associated numerical value is the sample detection limit or the adjusted sample detection limit.
[a] EPA 2002.

Sample RP-1 analytical results indicated that copper was detected at 22.4 mg/kg and arsenic at 7.47 mg/kg. The copper value is an estimated quantity because the reported concentration was less than the required detection limits or quantity control criteria were not met. The proposed repository location soil sample copper concentration was below the PRG soil cleanup level of 3,100 mg/kg (EPA 2002). Although the arsenic concentration of the proposed repository location was above the PRG cleanup level of 0.39 mg/kg, it was below the background arsenic concentration of 8 to 10 mg/kg found at the Blackbird Mine site in Lemhi County, Idaho (Beckvar et al. 1995).

Rock Source

In order to confirm that the proposed rock source for the compacted rock cover did not contain concentrations of metals, particularly copper, exceeding the PRG cleanup level, one fines sample was collected during the initial site visit at sample location Rock Source 1 (RS-1) and analyzed for the priority pollutant list of 14 heavy metals. A summary of sample results is presented in Table 1.

Sample RS-1 analytical results indicated that copper was detected at 18.3 mg/kg and arsenic at 3.24 mg/kg. The copper value is an estimated quantity because the reported concentration was less than the required detection limits or quantity control criteria were not met. The proposed rock cover sample concentration was below the PRG soil cleanup level of 3,100 mg/kg. Although the arsenic concentration of the proposed rock source was above the PRG cleanup level of 0.39 mg/kg, it was below the background arsenic concentration of 8 to 10 mg/kg found at the Blackbird Mine site in Lemhi County, Idaho (Beckvar et al. 1995).

Analytical Methods and Quality Assurance/Quality Control

Both soil samples were collected by START personnel and kept under chain-of-custody and stored on ice until delivered to the laboratory for analysis. A laboratory data validation memorandum is provided in Appendix F. Table 2 presents a summary of laboratory analytical work performed for the Removal Action.

Table 2. Summary of laboratory analytical work performed for the Harmony Mine site Removal Action.

Analysis	Sampled Date	Matrix	Method Number
Severn Trent Laboratories, Inc.			
Priority pollutant metals	September 9, 2003	Soil	EPA 6010/7471

Effectiveness of Removal Action

The Harmony Mine site Removal Action was conducted from September 8, 2003 through October 22, 2003 and achieved all objectives established during the planning phase. The following section summarizes the as-built constructed elements and final details.

Site-wide

Approximately 1.7 miles of the existing Forest Service access road was widened and graded to allow heavy equipment access to the tailings piles (Figure 4). A temporary access road turnaround was constructed to access and exit the tailings piles. Prior to and during earth moving activities, archaeologists surveyed and documented historic features in areas to be disturbed (Figure 5). During Removal Action activities, disturbance to existing vegetation was minimized. BMPs including straw bale check dams, straw mulching, and woody debris sediment traps were installed during site work to control erosion and sediment. BMPs were inspected and maintained daily. Salvaged trees were placed in Harmony Creek and on other disturbed areas. The report prepared by the archaeologists is provided in Appendix A.

Tailings Material Removal

Final construction details for the tailings removal area are depicted on Figure 6. Photographs of the area before, during, and after excavation of the tailings are provided in Figure 7.

Load counting is a method of calculating the amount of material moved by multiplying the number of truck loads moved by the estimated amount of material in a typical load. This value is greater than the amount of material in place because the material swells upon excavation and movement. Based upon load counts, approximately 15,600 CY (loose) of tailings were excavated, ranging from a depth of less than 1 foot to approximately 30 feet, from the tailings piles above approximately 250 linear feet of Harmony Creek (Figure 5). The limits of excavation were determined visually; the tailings were yellow in color, while native soils were brown. Tailings removal was completed to the extent practical, given the expedited schedule of this project and access limitations to portions of the tailings. Isolated pockets of tailings, an estimated 1 to 10 CY, remained in the vicinity of the mill building, downstream of the removal area, and upslope of the removal area where excavation of tailings material would require removal of standing trees. Refer to photographs 122 and 124 in Appendix C for typical areas of tailings left onsite.

Following removal of tailings material, slopes were walked with tracked equipment perpendicular to the slope, which ranged in steepness between 4:1 and 2.5:1. Straw mulch, seed, and salvaged woody debris were placed on disturbed slopes and rock was placed in the channel to protect against erosion and dissipate the energy of runoff (Figure 6).

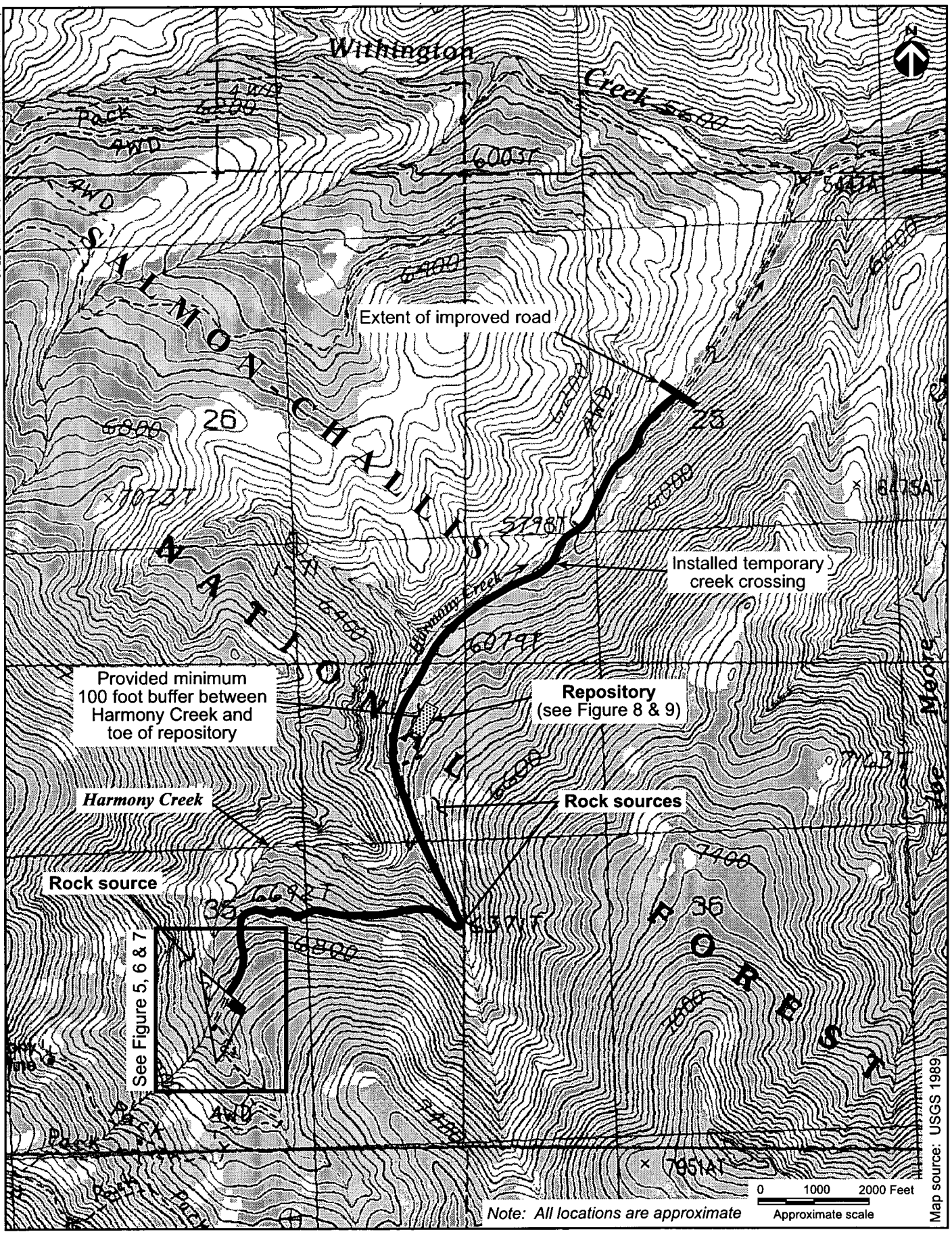


Figure 4. Project area and completed site plan of the Harmony Mine site near Salmon, Idaho.

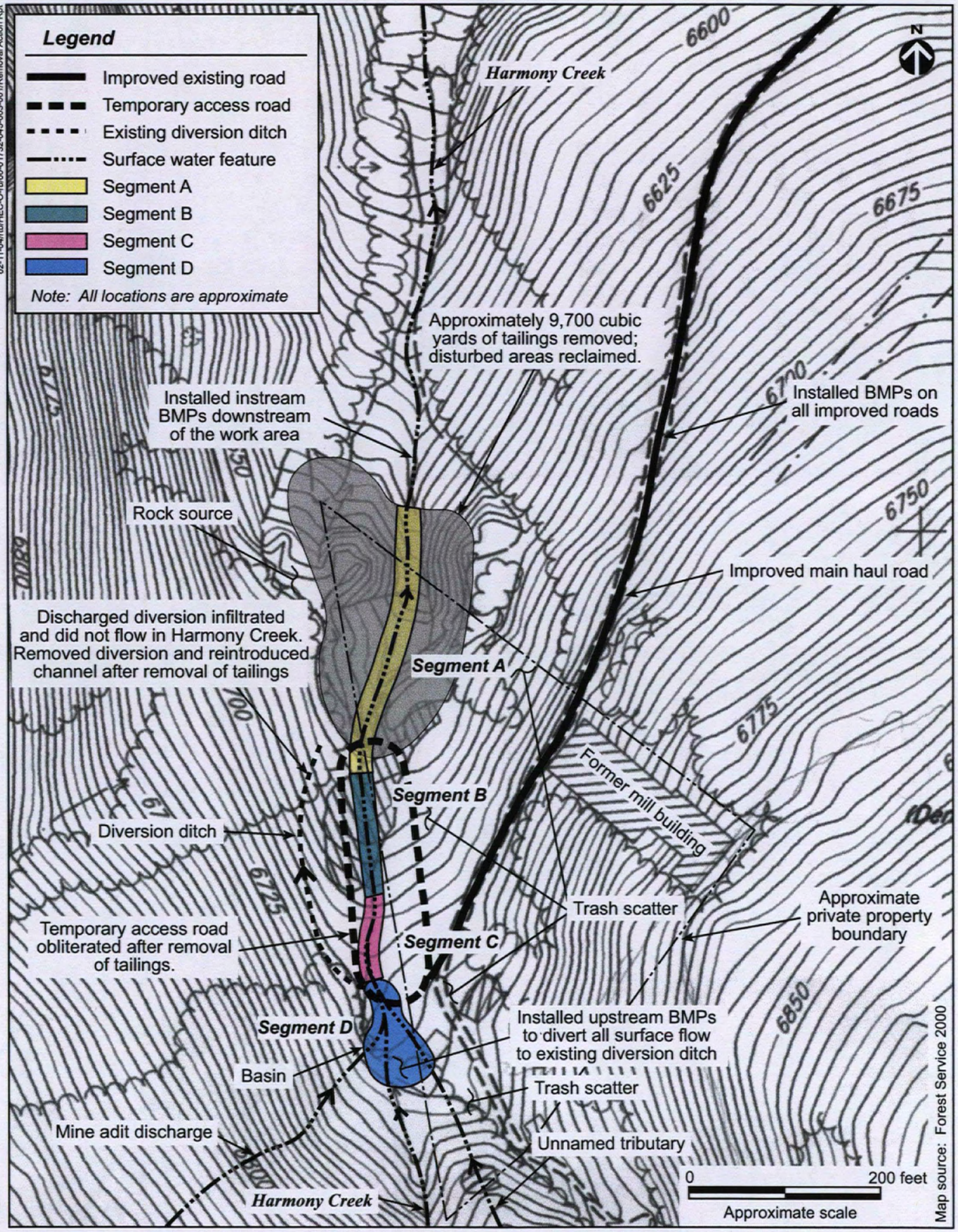


Figure 5. Completed actions at the Harmony Mine site near Salmon, Idaho.

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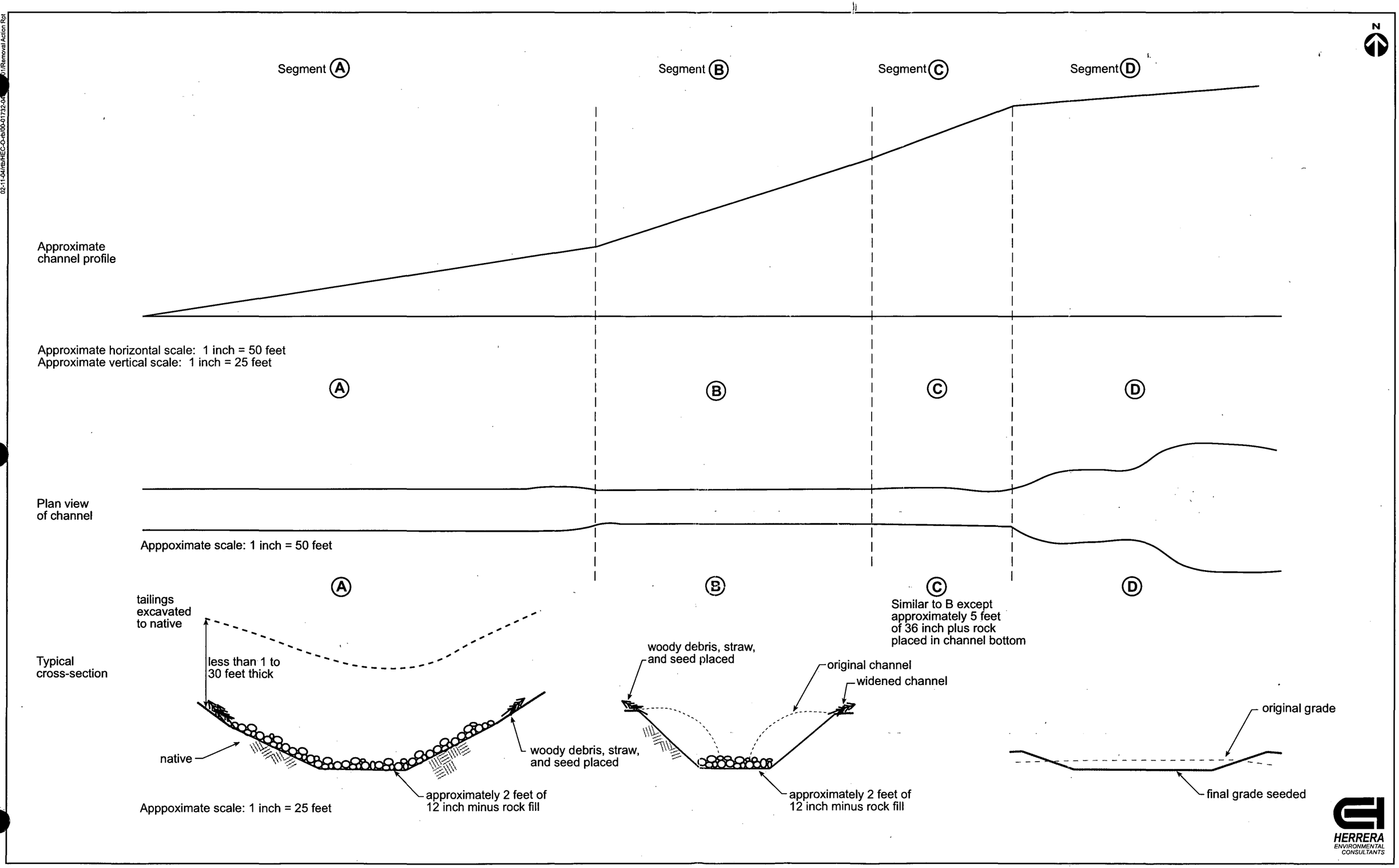


Figure 6. Tailings removal area construction details.

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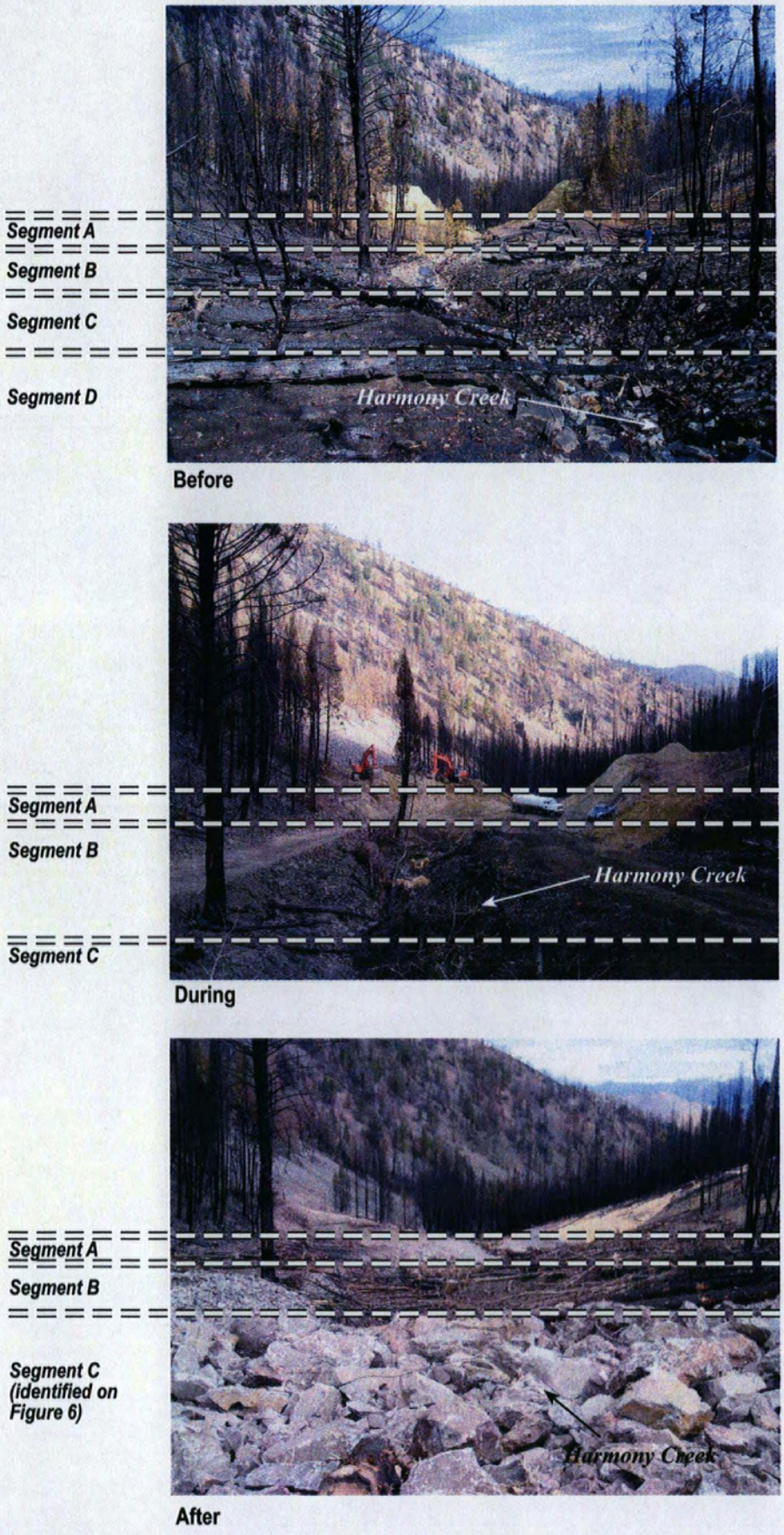


Figure 7. Photographs of tailings piles before, during, and after removal, looking downstream from the basin.

2nd page for color Figure 7

Repository

Final construction details for the repository area are depicted on Figures 8a and 8b. Photographs of the area before, during, and after completion of the repository are provided in Figure 9.

Prior to clearing the chosen repository location (Repository 1), archaeologists inspected the area to ensure no historical artifacts were present. The archaeology report is provided in Appendix A. An area approximately 300 feet by 80 feet was cleared, grubbed, and compacted with heavy equipment to prepare the surface for tailings placement, leaving a minimum 100-foot buffer between the creek and the repository (Figure 8a). Woody debris and rock cleared from the repository site was saved for use as cover.

At the request of the Forest Service OSC, a below grade 2-foot wide, polypropylene fabric-wrapped rock-filled trench was installed on the north and west sides of the repository to collect surface water flow through or over the repository. A 4-inch diameter polyvinyl chloride (PVC) pipe was placed at the northwest corner of the repository, at the intersection of the trenches, as a sampling point for water collected in the trench. A 5-foot wide ditch was constructed to convey surface water and discharge from the pipe downslope from the repository for surface infiltration.

Tailings excavated from the tailings piles were hauled to the repository by haul truck and spread and compacted by a bulldozer in maximum 1-foot lifts (Figure 8b). Materials unsuitable for compaction, such as large rock and wood debris, were removed prior to compaction and stored for use as cover. According to a survey completed on October 11, 2003, by Forest Service surveyors, 9,414 CY (compacted) of tailings were compacted in the repository (Henderson 2003c). ERRS estimated an additional 260 CY (loose) of tailings were placed in the repository after the survey was completed. Side slopes of the repository were graded to approximately 3:1. The top of the repository was sloped down to the west at a grade of approximately 7 percent. The eastern side of the repository was blended into the native east valley slope.

Material for the compacted rock cover was obtained from previously identified sources located west of the tailings piles and near the access road switchback, hauled to the repository by haul truck, and spread and compacted by a bulldozer in maximum 1-foot lifts. A 24-inch compacted rock cover of 8-inch minus rock was placed on the compacted tailings in 1-foot lifts. An additional layer of coarse and durable rock was placed on top of the 24-inch compacted rock cover. Woody debris and large rocks were placed on the repository after completion of compacting the rock to help prevent future human disturbance of the repository and to create a more natural setting. The completed repository was approximately 280 feet long and 140 feet wide.

Two 5 foot wide ditches were constructed upgradient of the repository, 440 feet long to the east and 190 feet long to the south, to channel surface water around the stored tailings.

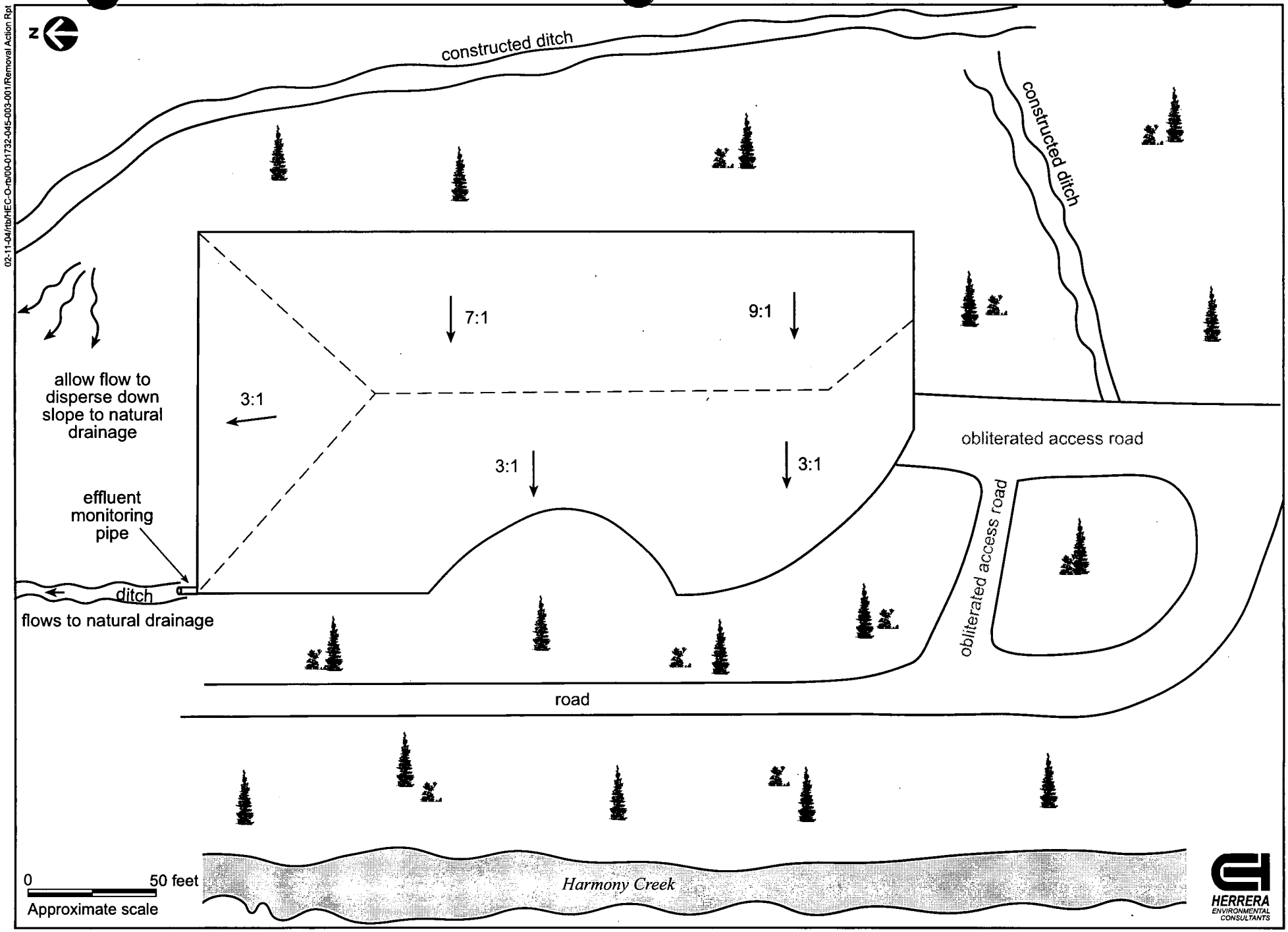


Figure 8a. Repository site plan.

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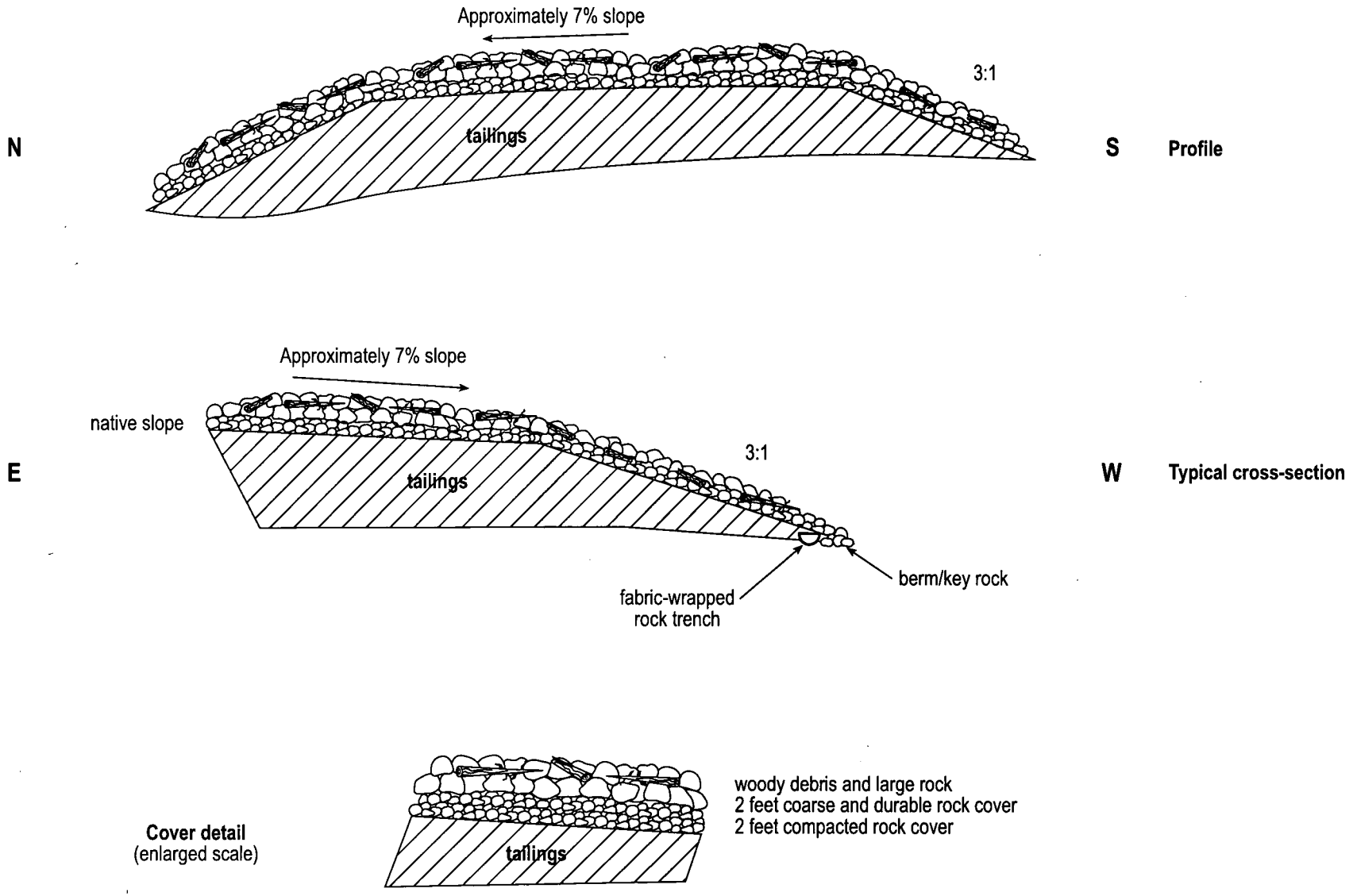


Figure 8b. Repository construction details.

Erosion and Sediment Control

During Removal Action activities, BMPs including straw bale check dams, straw mulching, and woody debris sediment traps were installed to control erosion and sediment transport. The BMPs were inspected and maintained daily. No rainfall events occurred during the Removal Action. Prior to tailings removal, Harmony Creek, the mine adit discharge, the unnamed creek, and other surface water flows were diverted through a 12-inch diameter HDPE pipe around the tailings removal work area. The diversion was discharged onto a talus slope on the west side of Harmony Creek and did not flow in the creek during the work. A sedimentation basin was constructed in Harmony Creek downstream of the tailings piles to settle out contaminated sediments that could enter the channel during and after the Removal Action.

The diversion pipe was removed and the flows re-introduced into the historical creek channel at the completion of work. The flow infiltrated into the creek bed and increased turbidity was not observed in Harmony Creek.

Reclamation

After tailings removal was completed, the channel was widened to allow for increased volumes of water and potential debris flows (Figures 5, 6, and 7). An approximate 75-foot wide by 140-foot long level area was created where Harmony Creek, the mine adit discharge, and the unnamed tributary converge (Segment D). The flow path will widen across the leveled area, reducing energy of the flow and allowing additional sediment to drop out. Below Segment D, an 80-foot long stretch (Segment C) was widened from approximately 3 feet wide to 20 feet wide with approximately 5 feet of 36-inch or greater rock placed in the 160-foot long stretch of channel. Below Segment C, Segment B was similarly widened, with approximately 2 feet of 12-inch or smaller rock placed in a 160-foot long stretch of channel. In the 260-foot long stream stretch where tailings had been removed (Segment A), approximately 2 feet of 12-inch or smaller rock fill was placed. Woody debris, certified weed-free straw mulch, and seed were placed on the disturbed banks of Harmony Creek.

Across the site, certified weed-free straw mulch and seed (seed label provided in Appendix G) was placed on disturbed areas to protect from future erosion. The widened haul road was narrowed, and water bars were added, as necessary, to encourage flow across the roadway. Temporary access roads to the repository were covered with wood debris and large rock to discourage future access and disturbance to the repository.

Disposal

No hazardous waste was generated during Removal Action activities other than disposable personal protective equipment. The ERRS construction contractor was responsible for characterizing, packaging, labeling, storing, and disposing of any generated waste.

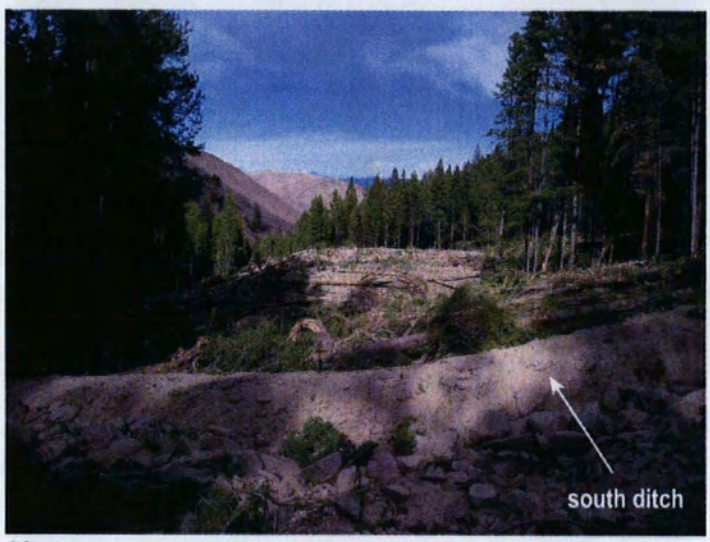
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Before



During



After

Figure 9. Photographs of repository after clearing, during placement of tailings, and after completion, looking north from the south temporary access road to the repository.

2nd page for color Figure 9

Cost Summary

Estimated project costs up to and including January 9, 2004, are summarized in Table 3:

Table 3. Summary of estimated project costs to date for the Harmony Mine site Removal Action.

	Estimated Cost	Project Ceiling
ERRS contractor	$494,000	$720,000
START contractor	$71,500	$85,000
EPA	$16,300	$25,000
TOTAL Project Costs	$581,800	$830,000

The cost estimate is based on figures known at the time of this written report and does not represent an exact figure the government may claim for cost recovery.

The Forest Service provided funding to the EPA and in-kind services in support of the project equal to one-third of the extramural project cost (commensurate with the portion of property administered by the Forest Service). In-kind services provided by the Forest Service included use of Forest Service land to site the repository, a topographical site survey, archeological expertise, biological expertise, and coordination of Endangered Species Act (ESA) consultation with the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) and U.S. Fish and Wildlife Service (EPA 2003).

Difficulties Encountered

This time-critical Removal Action was completed on an expedited schedule due to the start time requested by EPA in order to complete the project prior to the beginning of winter. During the initial planning period, START was temporarily requested to stop work until the EPA and Forest Service coordinated siting the repository on Forest Service land.

EPA requested a START engineer on site for the duration of the construction to assist in final construction design. Many of the final construction design elements for the project were determined in the field with coordination between the EPA and Forest Service OSCs, ERRS contractor, and START site engineer.

A high level of coordination between all involved agencies was required to complete this time-critical project in an effective manner. During and upon completion of the project, START and the EPA and Forest Service OSCs received several positive comments from agency representatives and community citizens noting the timely coordination between EPA and Forest Service and its importance to the successful completion of the Removal Action.

Historic debris flows from microbursts of rain were observed in the valley above the tailings removal area, indicating the removal area may be subject to future debris flows. The area surrounding the construction footprint remains unstable and susceptible to future slope failures, debris flows, and surface water erosion due to the loss of vegetation caused by recent forest fires and native slopes approaching 45 percent.

Steps were taken during this Removal Action to minimize future erosion and slope instability of disturbed areas. Disturbed areas including roads, the tailings removal area, and the repository were covered with woody debris and straw mulch and seeded. However, the seed was planted late in the fall season and is not likely to have germinated prior to snow fall. In an attempt to mitigate localized instability, slopes within and adjacent to tailings removal areas were adjusted to provide a maximum 2.5:1 slope in transition to native slopes. The graded slopes were tracked perpendicular to the slope to minimize sheet flow and rilling. It was unsafe and beyond the scope of authorized work to regrade native slopes beyond the removal area.

Conclusions

On September 22, 2003, the EPA and ERRS contractors mobilized to Lemhi County, Idaho, to conduct Removal Action activities at the Harmony Mine site. START contractors mobilized to the site on September 8, 2003, and START work was conducted from September 8, 2003 through October 20, 2003, which included documentation in logbooks and with a digital camera, engineering design and construction support, health and safety monitoring, and environmental sample collection for confirmation laboratory analysis.

Project activities included excavating approximately 9,700 CY of tailings material, constructing and placing excavated tailings into a repository with a compacted rock cover, and reclaiming the project area to minimize future erosion of areas disturbed as part of this Removal Action.

No further action is anticipated at the Harmony Mine site.

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APPENDIX A

National Historic Preservation Act Documentation

United States Department of Agriculture | Forest Service | Salmon-Challis National Forest | Headquarters Bldg 50 HWY 93 S. Salmon, ID 83467

File Code: 2360

Date: 29 September, 2003

Alan Stanfill
Advisory Council on Historic Preservation
Western Office
12136 West Bayaud Avenue, Suite 330
Lakewood, Colorado 80228

Dear Mr. Stanfill:

Enclosed is a copy of the signed Programmatic Agreement for the Harmony Mine Emergency Reclamation Project. The Salmon-Challis National Forest appreciates the quick turn-around on this project and your invaluable informal comments.

I will send you a copy of the results once the project is completed. If you have any questions, please contact me by phone at (208) 756-5116 or email at smatz@fs.fed.us.

Sincerely;

STEPHAN E. MATZ
Forest Archaeologist

PROGRAMMATIC AGREEMENT (PA)

BETWEEN SALMON-CHALLIS NF, USDA FOREST SERVICE

AND THE IDAHO STATE HISTORIC PRESERVATION OFFICER

REGARDING THE HARMONY MINE EMERGENCY

RECLAMATION PROJECT

WHEREAS, Forest Service (FS) in partnership with the Environmental Protection Agency (EPA) under Superfund Technical Assessment and Response Team (Start) contract is planning the time-critical Removal Action of tailings within the fire-effected Harmony Mine site (SC-34) to protect water quality and habitat within the Salmon-Challis National Forest (see Figures 1, 2 and 3), and

WHEREAS, the FS has determined that The Harmony Mine Reclamation Project may have an effect on properties eligible for inclusion in the National Register of Historic Places (NRHP) and has consulted with the Idaho State Historic Preservation Officer (SHPO) pursuant to Section 800.12(b)(2) of the regulations (36 CFR Part 800) implementing Section 106 of the National Historic Preservation Act (16 USC Section 470f) for emergency situations in which the agency official has declared an immediate threat to property; and

WHEREAS, in accordance with 36 CFR Section 800.6(a)(1), FS has notified the Advisory Council on Historic Preservation (Council) and provided it documentation of its intent to execute this agreement with the SHPO, specifying the manner in which the phased identification and evaluation efforts will be completed, and the Council has chosen not to participate in the consultation pursuant to 36 CFR Section 800.6(a)(1)(iii);

NOW, THEREFORE, FS and the Idaho SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the potential effect of the undertaking on historic properties.

STIPULATIONS

FS shall ensure that the following measures are carried out:

I. **STANDARDS AND GUIDELINES.** All Section 106 activities will conform to the standards outlined in the "Salmon National Forest Research Design Methodology" (Salmon National Forest Report SL-94-1034), except as specifically amended below or by negotiation between the Salmon-Challis NF and Idaho State Historic Preservation Office. All inventory, evaluation and results activities described in stipulations II-IV carried out under this PA will be directly supervised by a "Contract Archaeologist"

meeting the Secretary of the Interior's Standards and Guidelines Professional Qualifications Standards for Historic Archaeology.

II. **INVENTORY.** Cultural resource inventories will be consistent with the Secretary of Interior's Standards and Guidelines. Where ground disturbing activities will occur (See Figures 2 and 3) inventory spacing will be at no greater than 30 meter intervals. These areas include, but are not limited to:

1. Staging areas;
2. Road construction or reconstruction areas;
3. Repositories;
4. Rock sources;
5. Existing tailings areas slated to be removed; and
6. Any immediately adjacent areas of archaeological potential that may directly or indirectly be impacted by project construction or use.

III. **EVALUATE HISTORIC SIGNIFICANCE.** Historic significance shall be evaluated against the National Register criteria (36 CFR part 63) by the Contract Archaeologist in consultation with the Forest Archaeologist.

1. Given that all the structures within SC-34 were destroyed by the Withington Creek Fire, leaving only archaeological features and artifacts that may have significant information potential for understanding the function and socio-cultural practices of a ca. 1916-1932 hard rock mine, the site is recommended as eligible to the National Register under Criterion D.
2. All other previously undocumented cultural properties found within the disturbance areas will be treated as eligible to the National Register of Historic Places, unless the Forest Service provides documentation for a finding that a property is noneligible to the SHPO for review. The SHPO will have 24 hours to review the documentation and provide comments. If comments are not received in 24 hours of notification the Forest Service may assume consensus.

IV. **RESULTS OF IDENTIFICATION AND EVALUATION.** The Forest Service will apply the Criteria of Adverse Effect, and if unable to avoid a historic property, will apply appropriate measures to mitigate the effect through data recovery using standards supplied in the stipulations 1-2, below. If the standard mitigation measures listed below cannot be applied the Forest Service will consult with the SHPO by phone to develop appropriate measures.

1. Prior to any ground disturbance activities the Contract Archaeologist will undertake the following:
    a. All avoidance areas will be flagged or identified by appropriate means for protection;
    b. Any highly significant artifact(s) (i.e., artifacts with individual potential to add to our knowledge of site chronology, technology, function, or cultural history) found on the surface will be mapped, cataloged, photographed and collected;
    c. Any discreet highly significant archaeological feature(s) (i.e., features with sufficient integrity to answer research questions regarding the

Harmony Mine's chronology, technology, function, or cultural history) within ground disturbance areas will be mapped, photographed and described. If the feature cannot be avoided by project design sufficient archaeological excavation will be conducted in order to document its research potential.

2. During construction activities the Contract Archaeologist will undertake the following:
    a. All active construction areas with the potential for highly significant artifact(s) or discreet features will be monitored by the contract Archaeologist;
    b. If unanticipated heritage resources are discovered during implementation, all work within the immediate vicinity of the discovery and the Contract Archaeologist will notify the Forest Archaeologist of the Salmon-Challis NF within 24 hours of the discovery.
    c. If significant heritage resources are discovered, their preservation in place of the resource will be the preferred alternative, but data recovery may be required if the discovery materials cannot be avoided. Avoidance, mitigation, or data recovery plans will be developed by the Contract Archaeologist in consultation with the Forest Archaeologist. In general the following data collection measures will be undertaken:
        i. Any highly significant artifact(s) located during construction activities will be mapped, cataloged, photographed and collected;
        ii. Any discreet highly significant archaeological feature(s) found in subsurface deposits will be avoided or excavated by the quickest means possible that preserves appropriate archaeological information potential;
    d. The plan will then be implemented and the SHPO informed of the results within 24 hours of assessment. If changes to the plan are requested by the SHPO they will be accommodated to the extent feasible given the time sensitive nature of the undertaking.
3. Within 60 days of the conclusion of field work the Contract Archaeologist will provide four copies of a Report of Investigations to the Salmon-Challis National Forest Archaeologist, including the following exceptions to the "Salmon National Forest Research Design Methodology":
    a. Background research will be conducted by the Salmon-Challis National Forest to include the notes and plats for MS No. 3121 A&B for the Harmony Mines Co., "History of the Harmony Mine" by Victoria E. Mitchell, 2003 inventory notes and photos of Camille Sayer for the mill site, and any other geological survey reports or notes housed at the Salmon-Challis NF Headquarters or Lemhi County Historical Society. The results of the background research will be summarized by the Contract Archaeologist for the report and site form and if not previously published, attached to the site form as an appendix;
    b. All photographic prints used to formally document archaeological resources in site forms will be at least equivalent to 35 mm quality, reproduced in black and white and provided on archival quality paper.

Other photographs used in the narrative report or for additional illustrative purposes may be reproduced in color with at least 600 dpi quality;

c. The Idaho State Site Form will be provided for each recorded site, instead of the IMACS format;
d. The final report will be formatted using the standards outlined in the "Reports" section on page 51-54 of the "Salmon National Forest Research Design Methodology".

4. Within 30 days of acceptance of the final report one copy will be submitted by the Salmon-Challis National Forest to the Council and two copies will be submitted to the SHPO for their records.

V. **DURATION.** Project implementation and report submissions are expected to be completed by January 31, 2003. This agreement will be null and void if its terms are not carried out within one (1) year from the date of its execution. Prior to such time, FS shall consult with the other signatories to reconsider the terms of the agreement and if necessary amend in accordance with Stipulation VII below.

VI. **DISPUTE RESOLUTION.** Should any party to this agreement object at any time to any actions proposed or the manner in which the terms of this PA are implemented, FS shall consult with the objecting party(ies) to resolve the objection. If FS determines that such objection(s) cannot be resolved, FS will:

a) Forward all documentation relevant to the dispute to the Council in accordance with 36 CFR Section 800.2(b)(2). Upon receipt of adequate documentation, the Council shall review and advise FS on the resolution of the objection within 24 hours. Any comment provided by the Council, and all comments from the parties to the PA, will be taken into account by FS in reaching a final decision regarding the dispute.
b) If the Council does not provide comments regarding the dispute within 24 hours after receipt of adequate documentation, FS may render a decision regarding the dispute. In reaching its decision, FS will take into account all comments regarding the dispute from the parties to the PA.
c) FS's responsibility to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged. FS will notify all parties of its decision in writing before implementing that portion of the Undertaking subject to dispute under this stipulation. FS's decision will be final.

VIII. **AMENDMENTS AND NONCOMPLIANCE.** If any signatory to this PA determines that its terms will not or cannot be carried out or that an amendment to its terms must be made, that party shall immediately consult with the other parties to develop an amendment to this PA pursuant to 36 CFR Section 800.6(c)(7) and 800.6(c)(8). The amendment will be effective on the date a copy signed by all of the original signatories is filed with the Council. If the signatories cannot agree to appropriate terms to amend the PA, any signatory may terminate the agreement in accordance with Stipulation IX, below.

IX. **TERMINATION.** If an PA is not amended following the consultation set out in Stipulation VIII, it may be terminated by any signatory. Within 30 days following termination, the FS shall notify the signatories if it will initiate consultation to execute an PA with the signatories under 36 CFR Section 800.6(b)(1)(iv) prior to FS's approval of this undertaking, and implementation of its terms evidence that FS has taken into account the effect of this undertaking on historic properties and afforded the Council an opportunity to comment.

Execution of this PA by FS and Idaho SHPO, the submission of documentation and filing of this Memorandum of Agreement with the Council pursuant to 36 CFR Section 800.6(b)(1)(iv) prior to FS's approval of this undertaking, and implementation of its terms shall serve as evidence that FS has taken into account the effects of this undertaking on historic properties and afforded the Council an opportunity to comment.

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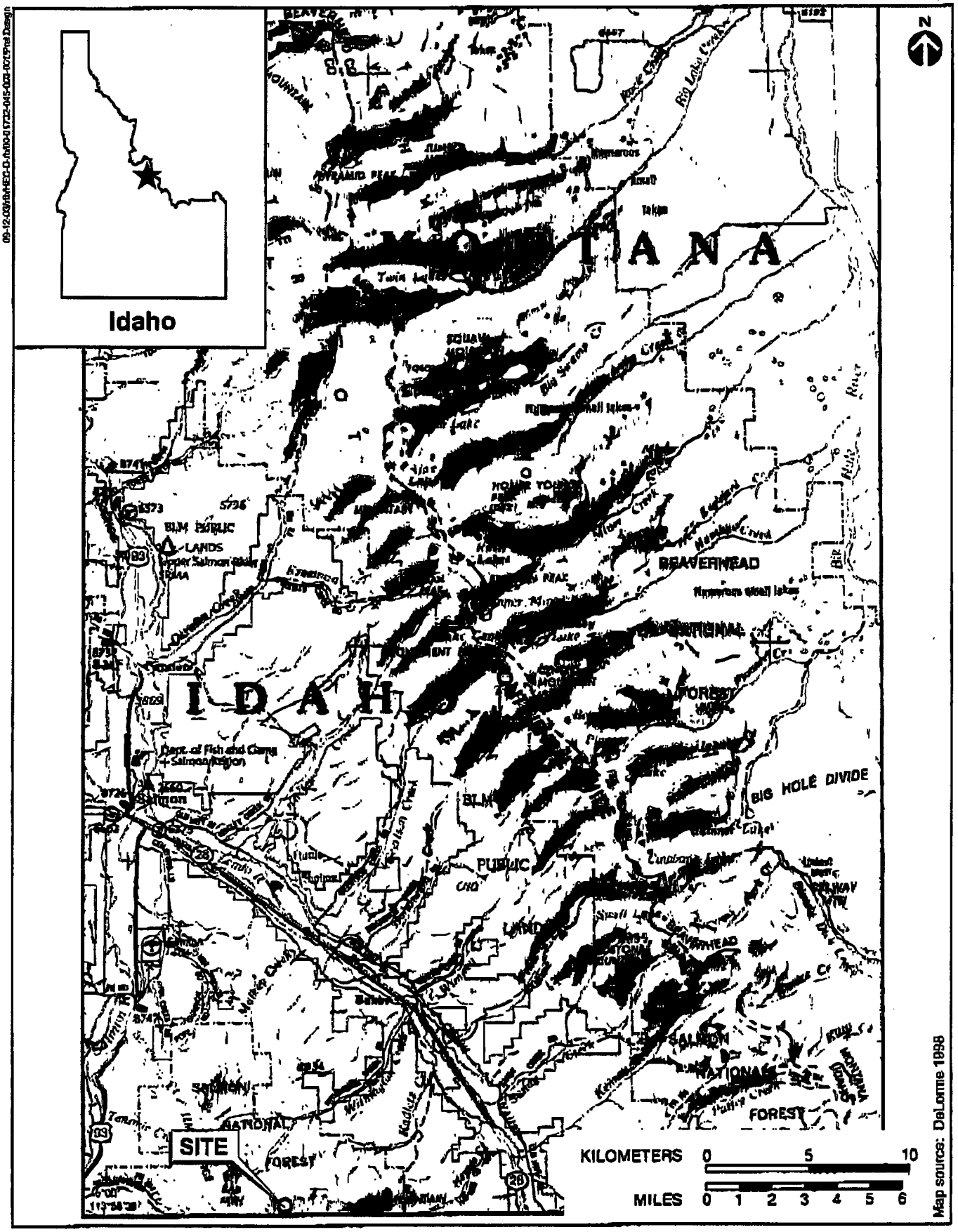


Figure 1. Vicinity map of the Harmony Mine site near Salmon, Idaho.

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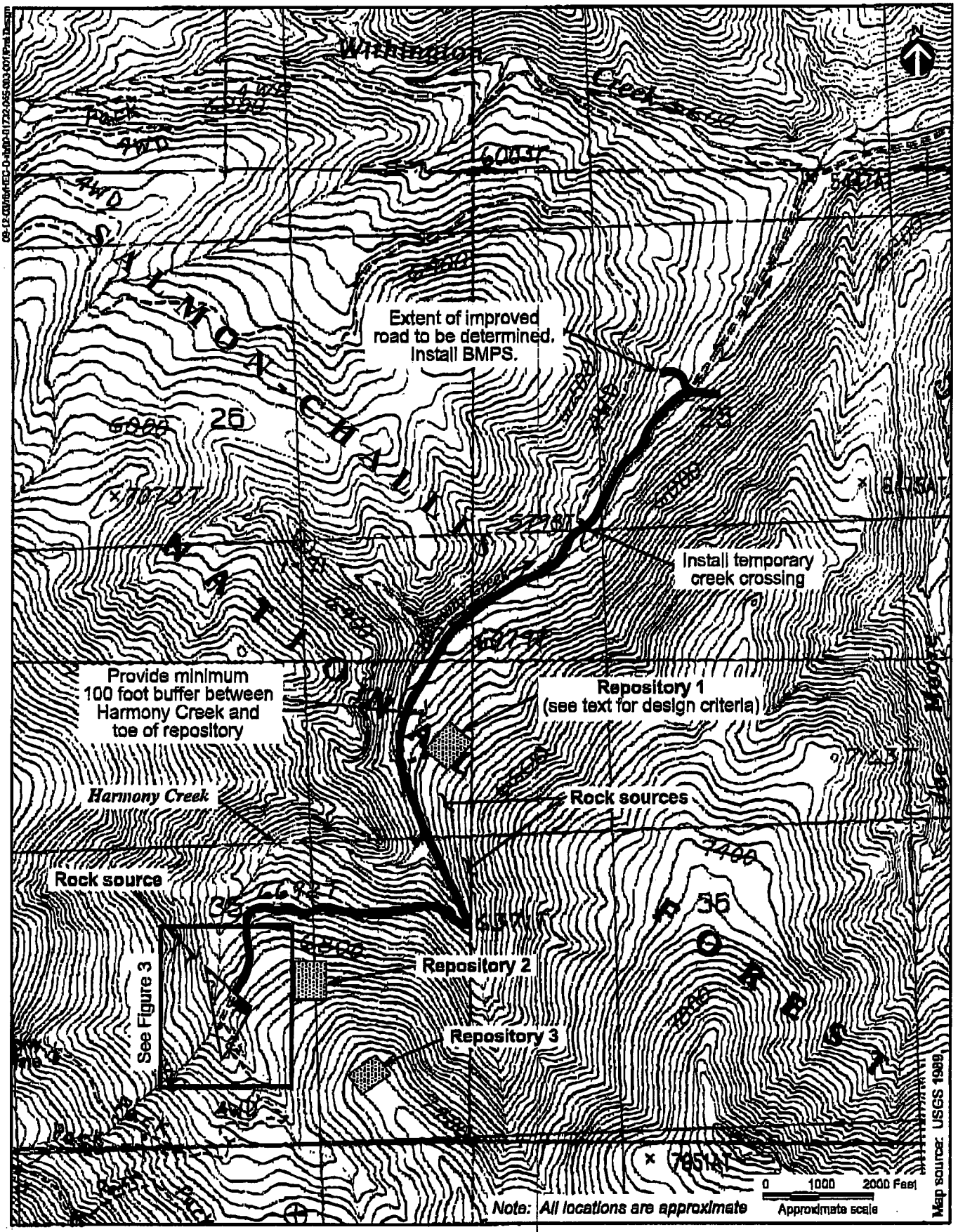


Figure 2. Site plan, Harmony Mine site near Salmon, Idaho.

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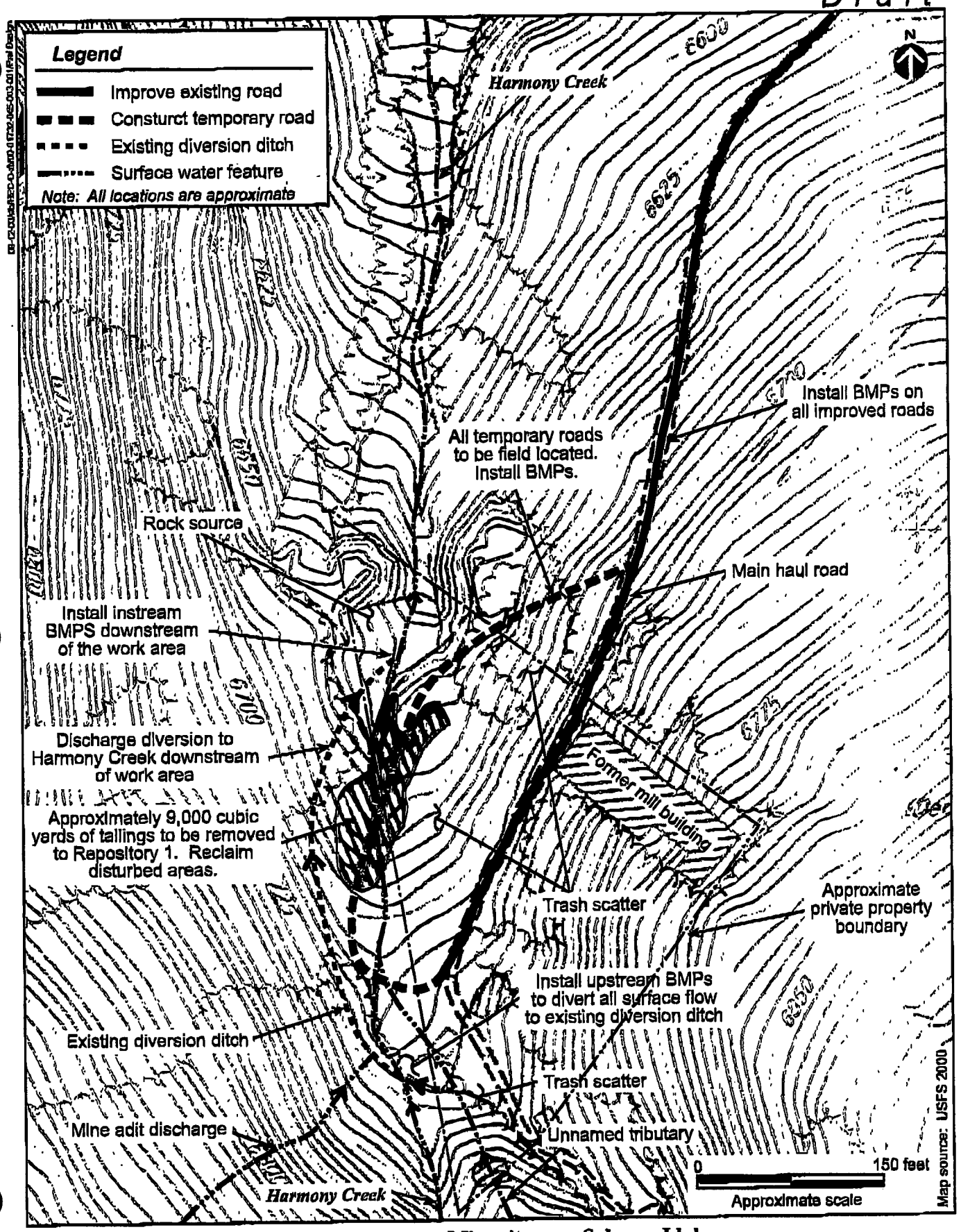


Figure 3. Proposed actions at the Harmony Mine site near Salmon, Idaho.

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IDAHO OPERATIONS OFFICE
FEB 23 2004

AN INTENSIVE SURVEY AND MONITOR OF THE HARMONY MILL AREA, SALMON-CHALLIS NATIONAL FOREST LEMHI COUNTY, IDAHO

PREPARED FOR:
ENVIRONMENTAL QUALITY MANAGEMENT, INC.
LYNNWOOD, WASHINGTON

PREPARED BY:
NORTH WIND, INC
IDAHO FALLS, IDAHO
Document Control No. NW-ID-2003-099

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AN INTENSIVE SURVEY AND MONITOR OF THE HARMONY MILL AREA, SALMON-CHALLIS NATIONAL FOREST, LEMHI COUNTY, IDAHO

Prepared for

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Lynnwood, Washington

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NW Project 3207.001

January, 2004

ABSTRACT

This report details the results of the intensive inventory and monitoring of the Harmony Mine area for Environmental Quality Management, Inc. The Withington Creek Fire destroyed the mill and surrounding environs during the summer of 2003. This was followed by a flash flood that washed out the dams across Harmony Creek that contained contaminated tailings. Because the tailings began washing toward the Lemhi River, a decision was made among the Salmon-Challis National Forest, in partnership with the Environmental Protection Agency and the Idaho State Historic Preservation Officer to remove the tailings to a repository. North Wind, Inc. was contacted to conduct intensive archaeological inventory of the proposed tailings repository, borrow sources, two proposed access roads, and the mill and its vicinity. Because of the urgency to remove the tailings prior to the arrival of winter, it was agreed that the cultural resource inventory would focus on those areas that may be impacted by activities associated with the removal of the tailings. The investigation entailed recording the mill and associated features, inventory of one parcel of land for use as a tailings repository and three potential rock (borrow) sources, and inventory of the main road and the location of two proposed ancillary roads. Thirty features were identified. In addition, several thousand artifacts were recorded during the investigation. A total of 146.3 acres was inventoried as a result of this project.

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1.0 INTRODUCTION

This report details the results of a Class III cultural resource inventory and monitor conducted by North Wind, Inc. (North Wind) for Environmental Quality Management, Inc. (EQM) in conjunction with the Harmony Mine Tailings Removal Project in Lemhi County. The Withington Creek Fire that swept through the area in the summer of 2003 destroyed the, then extant, Harmony Creek Mill and denuded the surrounding area of vegetation. An ensuing flash flood washed out two dams that spanned Harmony Creek that secured contaminated tailings. As the tailings began washing toward the Lemhi River, a decision among the Salmon-Challis National Forest, in partnership with the Environmental Protection Agency and the Idaho State Historic Preservation Officer was made to remove the tailings to a repository located downstream. North Wind, Inc. (North Wind) was contracted to conduct intensive archaeological inventory of the proposed tailings repository, borrow sources, access roads, and the mill and its vicinity.

William Harding served as principal investigator, and William Harding and John Boughton (field director) conducted initial inventory, site recording, and other fieldwork from September 18 to September 22, 2003. Thor Olmanson conducted monitoring and ancillary fieldwork from September 27 to October 2, 2003. A total of 146.8 acres of road and parcels were inventoried as a result of this project. All fieldnotes, original field forms, and photographs are on file at the Salmon-Challis Forest Service Office in Salmon, Idaho.

1.1 PROJECT LOCATION

The project is located in east-central Idaho, 11.5 air miles (18.5 km) south-southeast of Salmon on Withington Creek (Table 1.1; Figure 1.1). The area is located almost entirely on public land administered by the Salmon-Challis National Forest (FS) except for a small, triangular portion that surrounds the mill and tailings area, which is private. Table 1.2 lists the acreages inventoried for the project.

Table 1.1 Legal Locations of Project Area.

Township	Range	Section	Aliquots
20N	22E	25	NESWSW, SWSWSW ENENE, SWNENE, NESENE, SESENE, SESENE,
20N	22E	35	NNSE, WNWSE, SENENESW, ESENESW, ENESESW, NWSWSE
20N	22E	36	NWNWSW, NESWNWSW

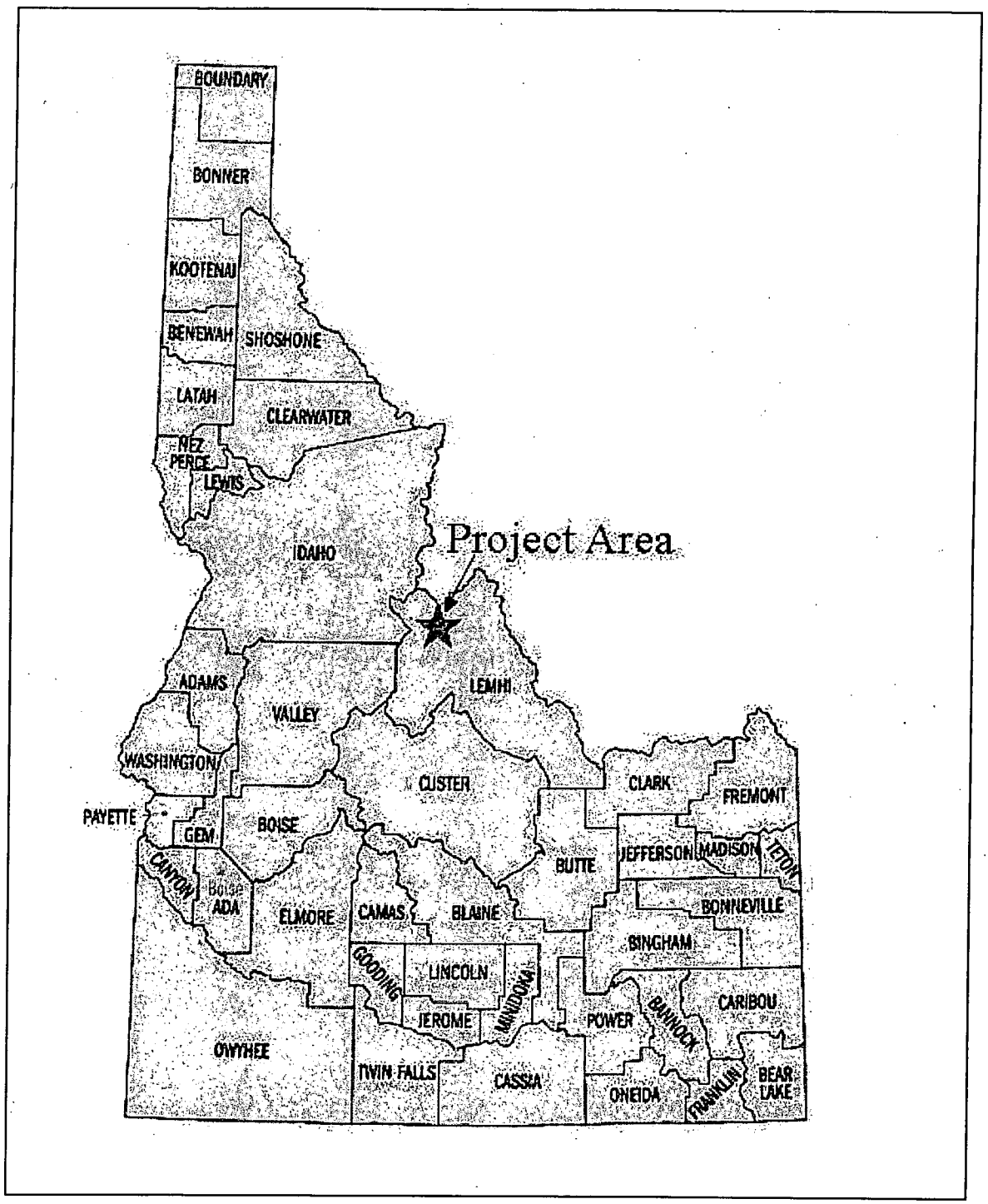


Figure 1.1 Location of Project Area.

Table 1.2 Acreages Inventoried for Harmony Mill Tailings Clean-up Project.

Parcel Description	Acreage
Roads	51.79
Repository	21.35
Lower Rock Source	18.97
Tailings Rock Source and Area	22.96
Repository Rock Source	0.6
Mill Area	31.13
Total	**146.28**

1.2 PROJECT DESCRIPTION

The Withington Fire burned perimeter encompasses 10,500 acres. Part of the burn occurred in the headwaters of Mulkey and Withington Creeks where the burn intensity was severe, killing most of the trees. The soils are volcanic and prone to erosion when disturbed. During the Withington Fire, which started August 11, 2003, the mill and several buildings associated with the Harmony Mine were burned. Subsequent to the fire denuding the area of vegetation, high intensity thunderstorms occurred on July 25 and August 5, 2003; these thunderstorms dropped ca 0.8 inches (2.03 cm) of rain each within a 15 minute period. The storms caused large-scale mud and debris slides that washed out the tailings settling pond and dams associated with the Harmony Mill. As a result of the washout, tailings contaminated with heavy metals entered Harmony Creek and were being washed downstream toward the Lemhi River.

Under the Superfund Act, Salmon-Challis National Forest, in partnership with the Environmental Protection Agency (EPA) and the Idaho State Historic Preservation Officer (ISHPO) contracted Herrara Environmental Consultants, who, in turn, subcontracted EQM to initiate clean up of the tailings. Because of the urgency to remove the tailings prior to the arrival of winter, it was agreed that the cultural resource inventory would focus on those areas that may be impacted by activities associated with the removal of the tailings. Potential effects that could occur to the site as a result of the tailings clean-up include impacts to site features from road construction/improvements, the removal of the tailings themselves (that are part of the site), impacts from heavy equipment during the tailings clean up, removal of burned lumber, and additional erosion that may occur as a result of the clean-up. The inventory included an existing two-track road located between the mill area and the proposed tailings repository, two proposed ancillary road locations between the existing two-track road and the tailings (to facilitate removal of the tailings), a repository for the tailings, three potential rock sources (borrow areas) located on talus slopes, the mill remains, the area west and southwest of the mill remains and the area surrounding the tailings (Figure 1.2). Prior to clean up, gates were installed at the Forest Boundary on the Withington Creek Road (Forest Road # 031).

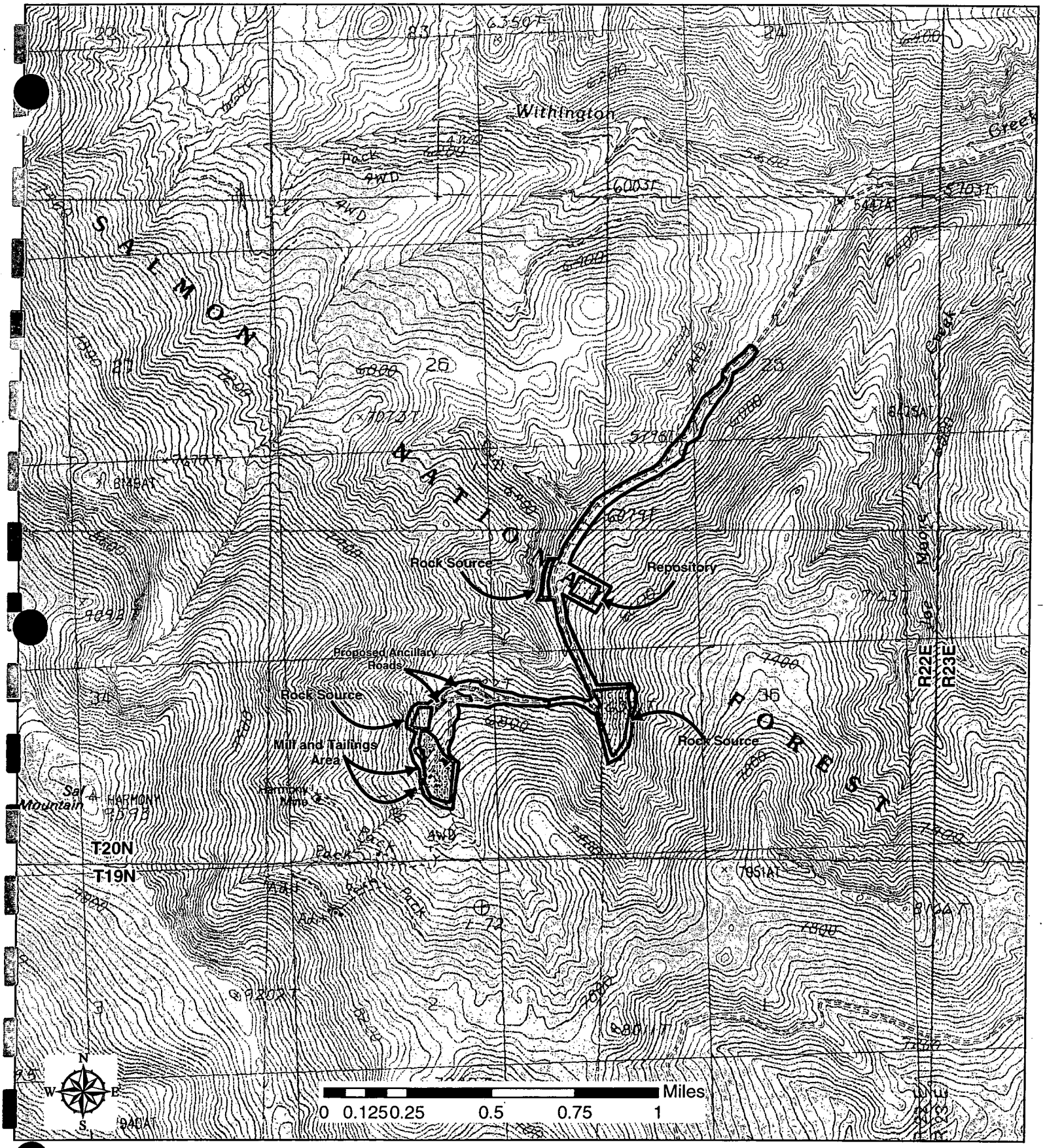


Figure 1.2 Inventoried Areas

1.3 STRUCTURE OF THIS REPORT

Section 2.0 presents the background information of the project area, including the modern environment and culture history. Section 3.0 presents the methods employed during the project. Section 4.0 presents the results of the inventory and monitor. Section 5.0 details the management and National Register of Historic Places (NRHP) recommendations. Section 6.0 lists the references cited in this report. The updated site form for the Harmony Mine is included as Appendix A. Appendix B is the curriculum vitae of the key personnel who worked on this project.

2.0 BACKGROUND INFORMATION

Section 2.1 presents the environmental setting of the project area and Section 2.2 presents the culture history of the area.

2.1 ENVIRONMENTAL SETTING

The project area is located in east-central Idaho in the Lemhi Range of the Northern Rocky Mountain physiographic province (Fenneman 1931:183). The Northern Rocky Mountain province is bordered by the Snake River Plain to the south, the Great Plains to the east, and the Columbia Plateau to the west (Fenneman 1931:184). Fenneman (1931:183) states that the separation of mountains in this province is indefinite and that the separate units may have any shape and that most of the mountains are not arranged in lines; therefore, they have no trend or dominating crest. The project area is in the northern portion of the Lemhi Range, with the Lemhi River to the east and the main fork of the Salmon River to the west. Their confluence occurs at the town of Salmon, Idaho. The Lemhi Range trends generally northwest to southeast (Knoll 1977:8).

The topography of the project area is relatively rugged and is characterized by steep, high mountains and deeply incised perennial and intermittent drainages. The topography of the region is the result of volcanic eruptions during the Eocene Period about 50 millions years B.P. (Alt and Hyndman 1995:213). The crest of the Lemhi Range exhibits a mean elevation of 10,006 ft (3,050 m) for most of its length (Knoll 1977:8). A dendritic system of deep canyons with steep gradients is carved into the Lemhi Range and is oriented perpendicular to the range crest. The canyons were initially deepened by stream erosion, but were later modified by glaciation and mass wastage (Knoll 1977:8). Most canyons head in cirques. Down the canyons from the cirques are glacial erratics, lateral moraines, and outwash terraces; these lie adjacent to truncated rock spurs and, in some locations, hanging valleys. At the canyon mouths, end moraines, kettles, erratic boulders, and outwash terraces occur (Knoll 1977:8). Elevations within the project area range from 5,840 ft (1,780 m) to 6,960 ft (2,121 m) over the course of 1.2 mi (1.907 km) for a gradient of 17.9 percent.

The project area is located within the Withington Creek Caldera (Alt and Hyndman 1995:210), on Withington and Harmony Creeks. The Lemhi Range is composed of folded and faulted Precambrian, Paleozoic, and Mesozoic sedimentary rock that was deformed during the northern Rocky Mountain orogeny. Triassic sedimentary rocks overlie the Precambrian sedimentary formations. The Triassic formations are present in the Lemhi River Valley, while the Precambrian formations outcrop near the crest of the Lemhi Range. The Lemhi Valley is a block of the northern Rock Mountain overthrust belt that dropped along Basin and Range faults during the last several million years, while the mountain blocks on either side continued to rise (Alt and Hyndman 1995:212). The Lemhi Valley accumulated deep deposits of desert valley-fill sediments during the Pliocene, when the climate was so dry that no streams drained the region. The Lemhi River did not begin to flow until the Pleistocene Period, when it incised the erosional

valley deeply into those deposits, leaving remnants of the original basin fill surface on the high benches that line the valley walls (Alt and Hyndman 1995:213).

Challis volcanic rocks covered large areas of older rocks about 50 million years ago. The volcanics consist predominantly of pale rhyolitic ash. The topography created by the volcanic rocks is composed of closely spaced small streams incised into the mountains into an intricately dissected landscape (Alt and Hyndman 1995:213).

The Leadore 2 weather station (Station No. 105177) is located 36.3 mi (58.4 km) from the project area and is the closest weather station to the project area. Information from the Leadore 2 weather station suggests the project area receives a mean of 0.21 inches of precipitation (0.5 cm) during February and up to a mean of 1.42 inches (3.6 cm) during May. The area receives a total average of 8.45 inches (21.5 cm) of precipitation per year, including approximately 18.3 inches (46.5 cm) of snowfall. Temperatures in the region range from an average daily minimum of 3.7°F (-15.7°C) during January to an average daily maximum of 83.9°F (28.3°C) during July. The extreme temperature can range from a low of –40°F (-40°C) to a high of 102°F (38.8°C) (Abromovich et al. 1998:102).

The project area is located in a coniferous mountain forest with a predominantly lodgepole pine association. Other tree species include subalpine fir, Englemann spruce, aspen, and Douglas fir. Transitional woody shrubs include various species of sagebrush, currant, and wild rose. The area was completely burned by the Withington Creek Fire; however, the climax community likely consisted of the following species: serviceberry, kinnikinnik, chokecherry, yarrow, strawberry, woolly mullein, various species of fescue, and relatively fewer species of bluegrass.

Game species in the area include mule deer, elk, black bear, cottontail rabbit, cougar, ruffed grouse, and blue grouse. Other animal species includes chipmunks, squirrels, beaver, coyote, wolf, bobcat, and other small mammals and birds. Bison were present in the Lemhi Valley prehistorically.

2.2 REGIONAL CULTURE HISTORICAL CHRONOLOGY

The sequence of prehistoric occupation in this portion of Idaho is usually treated as transitional to the Great Plains, Great Basin, and Columbia Plateau; however, because this project focuses on the Harmony Mine, and no prehistoric sites or isolated finds were observed during the inventory, no prehistoric discussion is presented. The historic theme of mining, focusing on the Harmony Mine and mining in the adjacent areas is discussed below.

The Harmony Mine is located in the McDevitt Mining District near the head of Withington Creek (Mitchell 1995:1). It is approximately 8 mi from Baker, Idaho, which was located on the Gilmore and Pittsburg Railroad. Ore was initially discovered in this vicinity about 1870, but little work or development was done until 1916, when the operations and property were acquired by the Harmony Mines Company (Gardner 1930).

The 1926 mineral survey plat is presented as Figure 2.1.

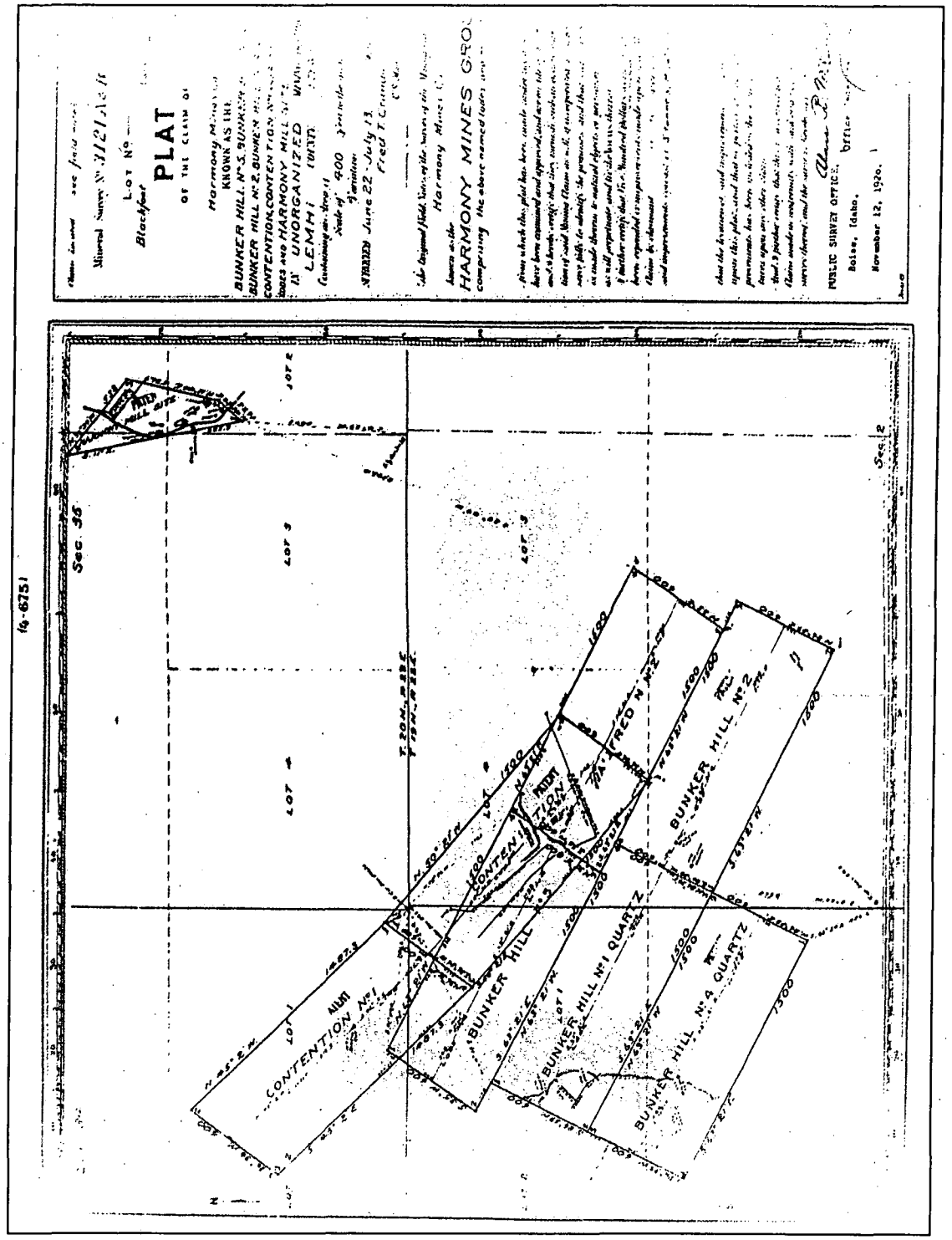


Figure 2.1 1926 Mineral Survey Plat of the Harmony Mines Group of Claims.

Mitchell (1995:1) states that copper ore was shipped in 1916 and 1917; therefore, there was likely extensive development prior to its acquisition by the Harmony Mines Company since mines generally go through a development stage prior to actual production (U.S Bureau of Mines 2003).

The 1926 field notes for Mineral Survey 3121 A & B give the dates of location (Table 2.1). The purpose of the inventory was preparatory for patenting the claims and mill site.

Table 2.1 Dates of Location for Claims, Harmony Mine and Mill.

Claim Title	Date
Bunker Hill No. 1 Quartz Lode	July 11, 1907
Bunker Hill No. 4 Quartz Lode	July 24, 1907
Bunker Hill No. 5 Lode	August 20, 1908
Bunker Hill No. 2 Lode	June 22, 1915
Alfred N. No. 2 Lode	July 28, 1916
Contention Lode	May 20, 1918
Harmony Mill Site	September 3, 1919

The 1917 Idaho Inspector of Mines (Bell 1917:71-72) report states that the Harmony Mines Company took over the Anderson Group of claims, which were composed of the Contention, Contention No. 2, the Bunker Hill Nos. 1-7, the Alfred No. 2, and the Income Nos. 1-7 for a total of 17 claims. Ross (1925:Plate V) locates the Anderson Workings on the Bunker Hill No. 1 claim, so it is likely that the Bunker Hill claims were the original Anderson group, especially since the Contention claims are superimposed on them. In 1916, the Idaho Mine Inspector's Report (IMIR) (in Mitchell 1995) stated that the mine was equipped with an air compressor plant and an aerial tramway that was a mile long. They shipped 10 carloads of crude ore during the last quarter of 1916, which yielded 6-12% copper as well as "a little gold and silver per ton" (Bell 1917:71-72). The same report states that the ore was shipped from the 100-ft level, but that a new cross-cut tunnel was driven for 850 ft to extend the depth to 400 ft. Figure 2.2 shows the claims as they appeared in 1924.

In 1918, an additional 700 ft of drifting was accomplished and several shipments of copper sulfide ore were transported (Bell 1918:77). According to Mitchell (1995:5), 1919 witnessed an additional 1,176 ft of drifting and additional ore shipments. Mitchell states that during this year most of the work was locating and blocking out ore because the ore needed to be milled prior to it being shipped. In November 1919, construction on the 100-ton mill was begun; it was completed in 1920 (Mitchell 1995:5-6). Bell (1919:100) noted that O. B. Offstrand, a "competent metallurgist and construction engineer of Salt Lake City", designed the mill. He also noted that the mill contained a "rock breaker Hardinge mill, Dorr classifiers, and six Wilfey tables". At this point, underground development in the mines totaled approximately 5,000 ft.

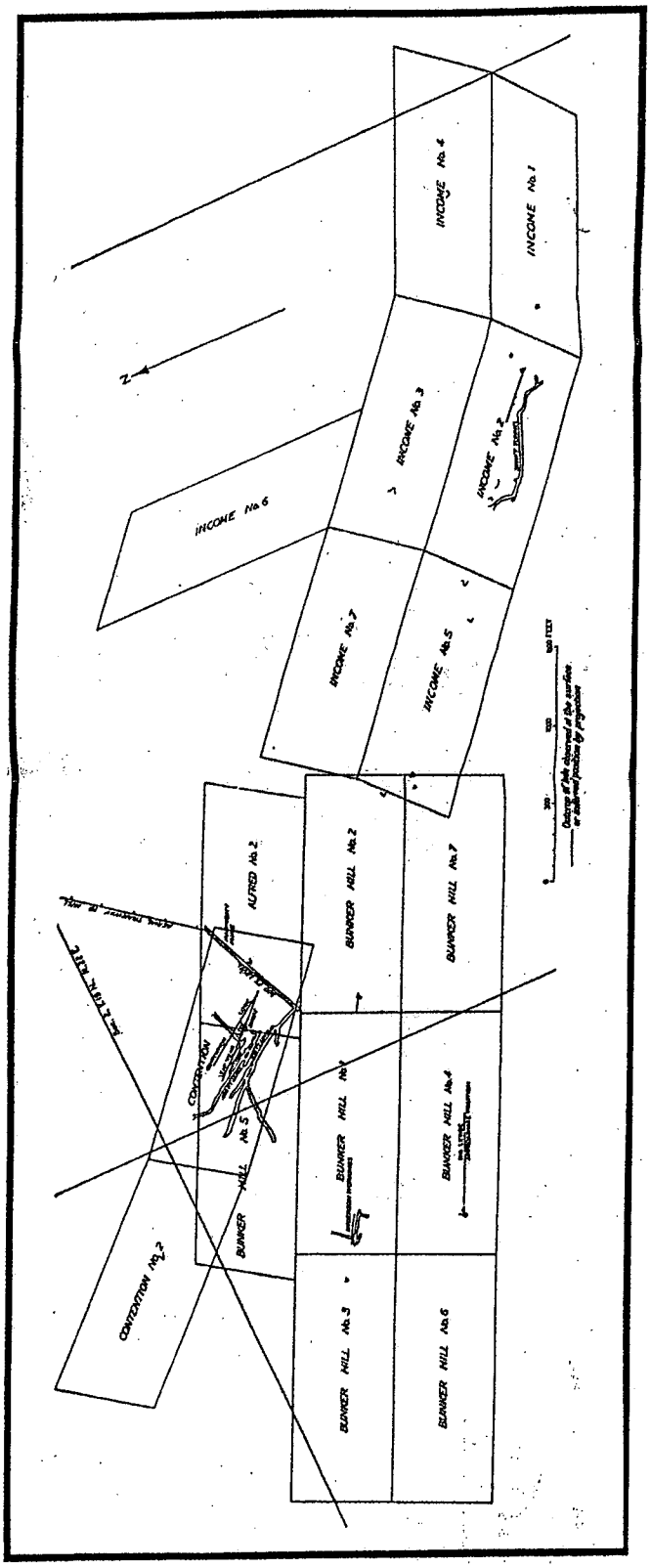


Figure 2.2 Map of Claims, Lodes, and Mine Workings at the Harmony Mine (Ross 1925:Plate V).

Because of low copper prices, the mine was closed during 1921 but reopened early in 1922 (Mitchell 1995:6). During 1921, the mill was upgraded to 150 tons per day and oil flotation cells were added, which (the company professed), increased the recovery rate to 90 percent. In 1922, the mine was the largest copper producer in Lemhi County. Over 1,000 tons of copper concentrate were shipped and it was estimated the mine had reserves of 45,000 tons of ore. At this point, the underground workings totaled about 6,000 ft that included five tunnels, six shafts, one raise, four crosscuts, and four drifts. Equipment at the mine included two Chicago-Pneumatic electrically driven compressors with a capacity of 550 cubic feet, two B & B wire rope aerial tramways between the mine and the mill, 30 mine cars, and 14 rock drills. The rope aerial tramways were 2,400 ft and 2,800 ft long. Mules performed the haulage. The mill had both primary and secondary crushers, the ball mill, two Dorr classifiers, 10 Wilfey tables, two K & K flotation cells including a 12-ft and a 6-ft, and two Aikens classifiers. According to the company, this configuration gave the mill a capacity of 175 tons per day (Mitchell 1995:7).

The Harmony Mine produced and shipped a large amount of ore, which consisted of chalcopyrite, chalcocite, and pyrite, in 1923 (Mitchell 1995:7). The ore was transported to Salmon, Idaho and then to the smelter at International, Utah. Concomitantly, lower tunnel development work was performed; a third compressor was also added. The mine added approximately 3,890 ft of linear workings and had a total of 602,743 cubic ft of stopes above the 300-ft level. According to Ross (1925), the main workings of the Harmony Mine occurred on the Contention Claim, but additional portals and adits were being excavated on the Anderson and Income Claims. The principle tunnel on the Income Claim was the Swift Tunnel.

Between 1916 and 1922, the Harmony Mine shipped 842 tons of crude ore and 1,502 tons of concentrate. The crude ore contained 0.68 ounces of gold, 130 ounces of silver, and 132,297 pounds of copper. The concentrate was obtained by milling 16,408 tons of ore and contained 915 ounces of gold, 793 ounces of silver, and 621,655 pounds of copper. Smelter returns for ore shipped in 1923 revealed that the concentrate averaged 22.7% copper with 1.58 ounces of silver and 0.01 ounces of gold per ton as well as 19.8% silica, 25.4% iron, and 24.7% sulfur (Ross 1925:38). Ross (1925:37) reported that the mill was able to treat a maximum of 200 tons of ore per day. He noted that the principal underground operations were on the Contention Claim and the 100-ft, 200-ft, and 300-ft levels. On the 100-ft level, there is a crosscut tunnel that measured 265 ft long and a drift that measured 160 ft long with a stope above it. The portal of the 200-ft level is 78 vertical feet further down the mountain than the 100-ft level and it contained 1,000 ft of drifts and crosscuts. The 300-ft level was the haulage level of the mine and its portal was 95 vertical feet below the 200-ft level portal. Stopes and raises connected the 200 and 300-ft levels.

Ross (1925:38) described the other workings at the mine as the Anderson and Income workings. The portal of the Anderson workings was 2,000 ft west of and 425 ft above the 300-ft level portal; it contained about 510 ft of drifts and crosscuts, with stopes above—one that extended about 100 ft to the surface. The primary tunnel on the Income Group was the Swift Tunnel that was located at roughly the same elevation and about

3,100 ft southeast of the 300-ft level portal. The Swift Tunnel was 900 ft long and contained shallow shafts and short tunnels above it.

Ross (1925:39) stated that the two lodes on the Harmony Mine are the Leapyear and Contention veins. Other workings located on property owned by the company included two lodes in the Anderson workings, another working referred to as the "big ledge" that was near the crest of the mountain, an exposed lode on the Bunker Hill No. 2 Claim, and at least one lode on the Income Claim. Other workings may also have existed.

The Harmony Mine only operated for a limited period of time in 1924. Several hundred tons of copper concentrate were shipped to the smelter at International, Utah. Total output, however, was only about 14% that of 1923. During this time, the company was attempting to develop the lowest level of the mine; however, a lack of capital resulted in a cessation of operations (Mitchell 1995:8). Figure 2.3 is a profile of the mill, showing the configuration of the machines.

Although mine development continued in 1925, no production occurred. The Idaho Mine Inspector (from Mitchell 1995:10) noted that financial considerations were concluded and the mine began driving a 1700 ft cross-cut in June. This cross-cut would intersect the vein 600 ft below the lowest level of the mine. In September, the tunnel had progressed 950 ft and had intersected mineral rich ore.

Approximately 950 ft of developmental work was conducted on cross cuts and drifts in 1926 even though the mine was still not operated during this year. A single lot of copper concentrates from former operations was shipped to the smelter at International, Utah. The majority of the work during 1926 was performed on the lowest level of the mine; the discovery earlier in the year of a large body of ore 600 ft below the older lower level was investigated. Nineteen twenty-six also witnessed the installation of a 10-ton storage battery locomotive, and the relocation of the tramway to a new tunnel. In December, production and milling of the ore started (Mitchell 1995:10). The locomotive replaced mules for haulage (Gardner 1930a:5). Mitchell (1995:10) states that by 1926 the company had the following pieces of equipment: An 800 cubic ft Ingersoll-Rand air compressor, a 350 cubic ft Chicago-Pneumatic air compressor, a 210 cubic ft Chicago-Pneumatic air compressor, a 6-ton Mancha storage battery locomotive, 15 2.5-ton ore cars, and two aerial tramways. Company reports listed the tramways as 1,800 and 1,900 ft long; however, published reports stated that the 1,800 ft tramway was 800 feet.

According to Mitchell (1995:10), seven of the claims were patented in 1926; however, a search of patent information lists the patent dates for the claims as October 5, 1928 under accession number 1019652 (the Bunker Hill No. 4). A total of 126.668 acres was patented from the land office in Blackfoot, Idaho under the July 26, 1866 Mineral Patent Lode (15 Stat. 251). Perhaps the patents were applied for in 1926, rather than issued, at the time of the mineral survey.

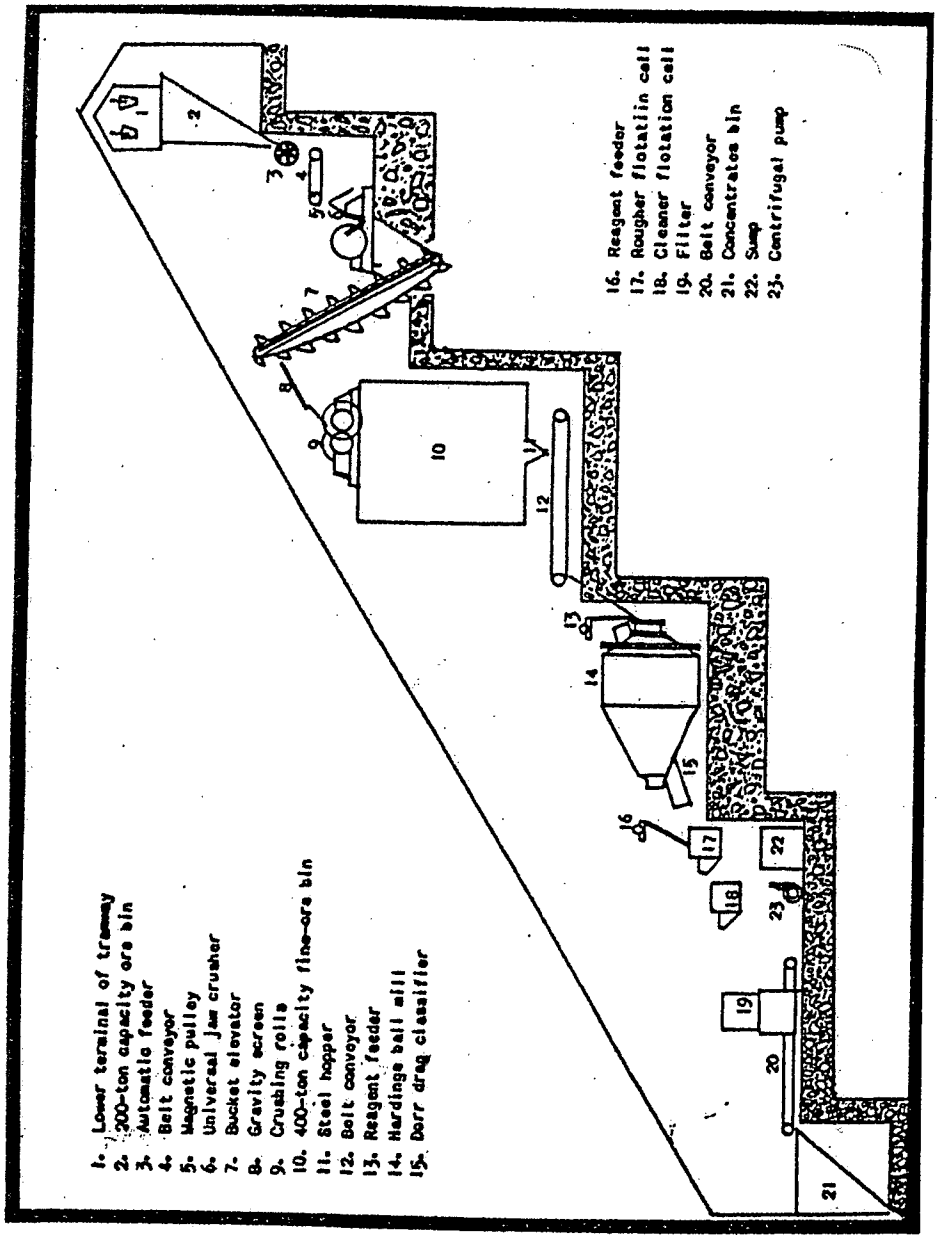


Figure 2.3 Profile of Mill (From Gardner 1930b:Figure 2).

Investigation of 15 Stat. 251 revealed it was an act that granted right of way to ditch and canal owners over public lands and for other purposes. This act declared that all mineral lands of the public domain are open to exploration and occupation. Upon a showing of an expenditure of not less than $1,000 in improvements upon such lode, a patent could be purchased for $5 per acre. No locator may hold more than one claim on each lode and each claim is limited to 200 ft along the lode or vein. It is interesting that the claims were not patented under the 1872 mining law.

The mine was active in 1927 for three months. Improvements included the construction of a new aerial tramway and the addition of new ore-bins and a sorting plant. Although a limited amount of ore was mined, milled and marketed, work was again suspended while the company attempted to raise additional capital (Mitchell 1995:10).

A total of 900 tons of ore was produced in 1928. One carload of copper concentrate was shipped to Utah for smelting. About 600 ft of underground development work was accomplished and the mill was reconfigured. The reconfiguration enabled a finer feed to be sent to the ball mill. The installation of a filter to dewater the concentrates and other non-specified changes increased production about 50% (Mitchell 1995:10).

In 1929, the mine was worked continuously and the mill operated for four months. A total of 187,822 pounds of copper was recovered from over 4,800 tons of copper ore, the equivalent of one pound of copper for every 51 pounds of ore. An additional 620 ft of underground development , mostly on the 900-ft level and sinking to the 1000-ft level, was accomplished. Mining focused on the 800 and 900-ft levels. A transmission line was installed that ran to a 450 horsepower diesel generator at Baker, Idaho, 8 mi away. (Mitchell 1995:10). The 1929 IMIR report (from Mitchell 1995:10) stated that this "property is one of the most completely equipped mines in Lemhi County. Its 1929 expenditure was one of the largest in southern Idaho".

For a detailed discussion of mining and milling practices at the Harmony Mine and the costs associated with these activities, please refer to *Mining Practices at Harmony Mines Co., Baker, Idaho* (Gardner 1930a) and *Milling Methods and Cost at Harmony Mines, Baker, Idaho* (Gardner 1930b). In general, the ore body was generally mined by shrinkage stoping and the ore transported to the tram (Gardner 1930a). Because the work was contracted, mixed results were often obtained. For example, Gardner (1930a:7) discussed how contract prices in stopes are related to the amount of ore that is broken; this resulted in contractors breaking into the walls of the stopes to increase their tonnage.

Gardner (1930a:6) notes that wages in the mine ranged from $5.50 to $6.60 per day. Miners and muckers in dry places were paid $6.00; a similar wage was paid to timbermen helpers, motormen, skip tenders, and hoistmen. Head timbermen, miners in wet places, and winzemen were paid $6.50. The range for contract rates was $5.00 to $8.00 per foot for drifts, $2.50 to $5.00 for raises, and $12.00 to $15.00 per foot for winzes. Contract price determinants included the size of the face, distance the rock had to be trammed, and the amount of water that makes at the working face. Although contact rates varied, the average rate was 25% above the average wage, with the benefit to the company as speed, rather than in any other savings or costs (Gardner 1930a:7).

Gardner provided a breakdown of costs for the mine (Table 2.2). A plan view of the mill is provided as Figure 2.4.

Three of Gardner's accounting totals contain errors and the costs are actually $0.10 higher per ton than he figured; therefore, the operation may not have been cost-effective.

Table 2.2 Summary of Costs at the Harmony Mine (from Gardner 1930a:8).

	Underground Costs Per Ton*							
	Labor	**Supervision**	**Air Drills and Steels**	**Power**	**Timber**	**Explosives**	**Other Supplies**	**Total**
Development	$0.32	$0.19	$0.03	$0.02	$0.05	$0.09	$0.05	*$0.67*
Mining	$0.65	$0.30	$0.27	$0.16	$0.18	$0.27	$0.22	$2.05
Transportation	$0.15			$0.03			$0.03	$0.21
General	$0.16			$0.01			$0.06	$0.23
Total	$1.28	*$0.39*	$0.30	$0.22	$0.23	$0.36	$0.36	*$3.14*

*Numbers in italics denote addition errors by Gardner; total cost per ton is actually $3.24

Summary of costs in Units of Labor, Power, and Supplies

		Man-hours per ton	
A. Labor			
	Breaking (drilling and blasting)	$1.19	
	Mucking	$0.06	
	Haulage	$0.04	
	Supervising	$0.26	
	General	$0.31	
	Total Labor Underground	*$1.70*	$1.86 (corrected)
	Average Tons per Shift	4.72	
	Labor, Percentage of Total Cost	*53.20%*	
B. Power and Supplies			
	Explosives (lbs. Per Ton)	$2.05	
	Total Power (Kw.-h. Per Ton)	$10.10	
	Other Supplies in percentage of Total Supplies and Power	$24.50	
	Supplies and Power, Percentage of Total Cost	46.80%	

NOTE: Mining and development charges were not kept separate during period covered by report.

The mine operated for only about five months in 1930. The mill was operated for only 14 days and treated 736 tons of copper ore, that contained chalcopyrite and pyrite, during this short period. The ore yielded 34,564 pounds of copper from the concentrate. An additional 150 ft of development work was performed at the mine prior to its closing. Figure 2.5 presents a cross-section of the mine from the 900-ft level to the surface.

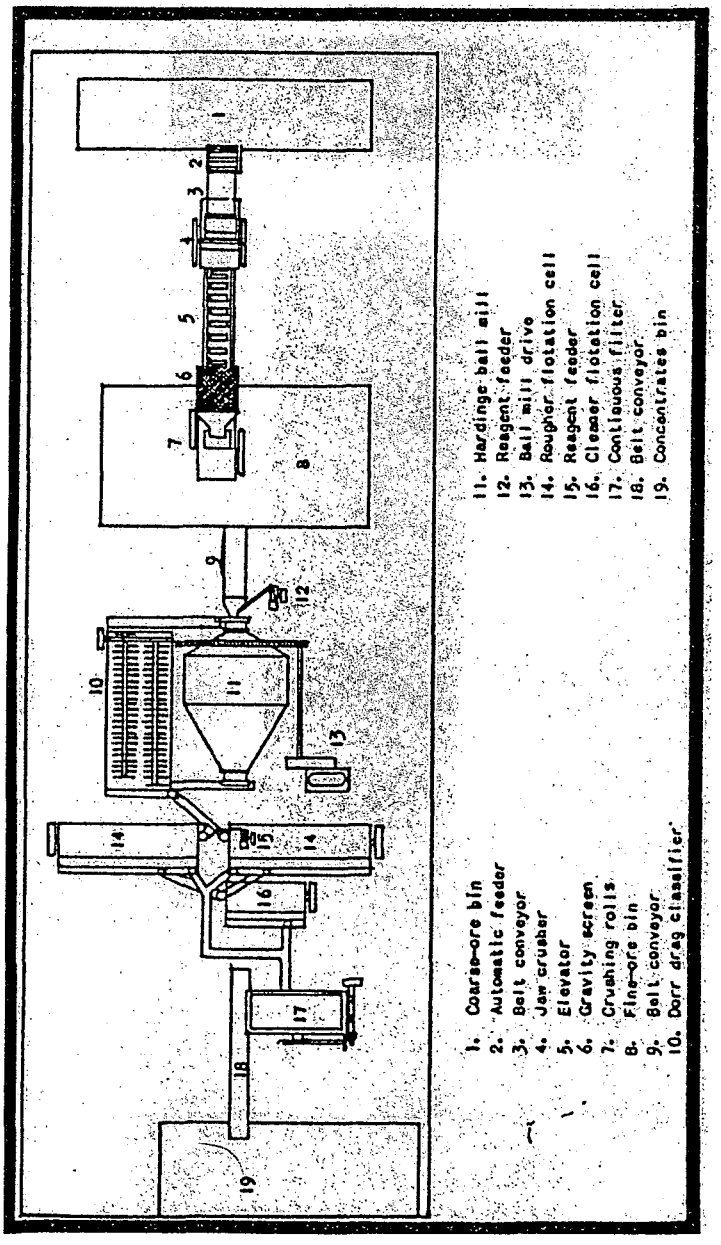


Figure 2.4 Plan View of Mill Showing Configuration of Machines (Gardner 1930b:Figure 3).

Gardner (1930b:5) stated that the aerial tramway that carried the ore from the mine tunnel to the mill measured 1,800 ft long. It was constructed from a 1 1/4 inch traction cable and a 7/8-inch draw cable; the cables were supported by three towers. The tramway was outfitted with 14, 8 cubic foot capacity buckets. Power was generated by a 10 horsepower motor located at the upper terminal; the motor also served as a brake. At capacity, the tram obtained a speed of 600 ft per minute and averaged greater than 200 tons of ore transported in an eight hour period.

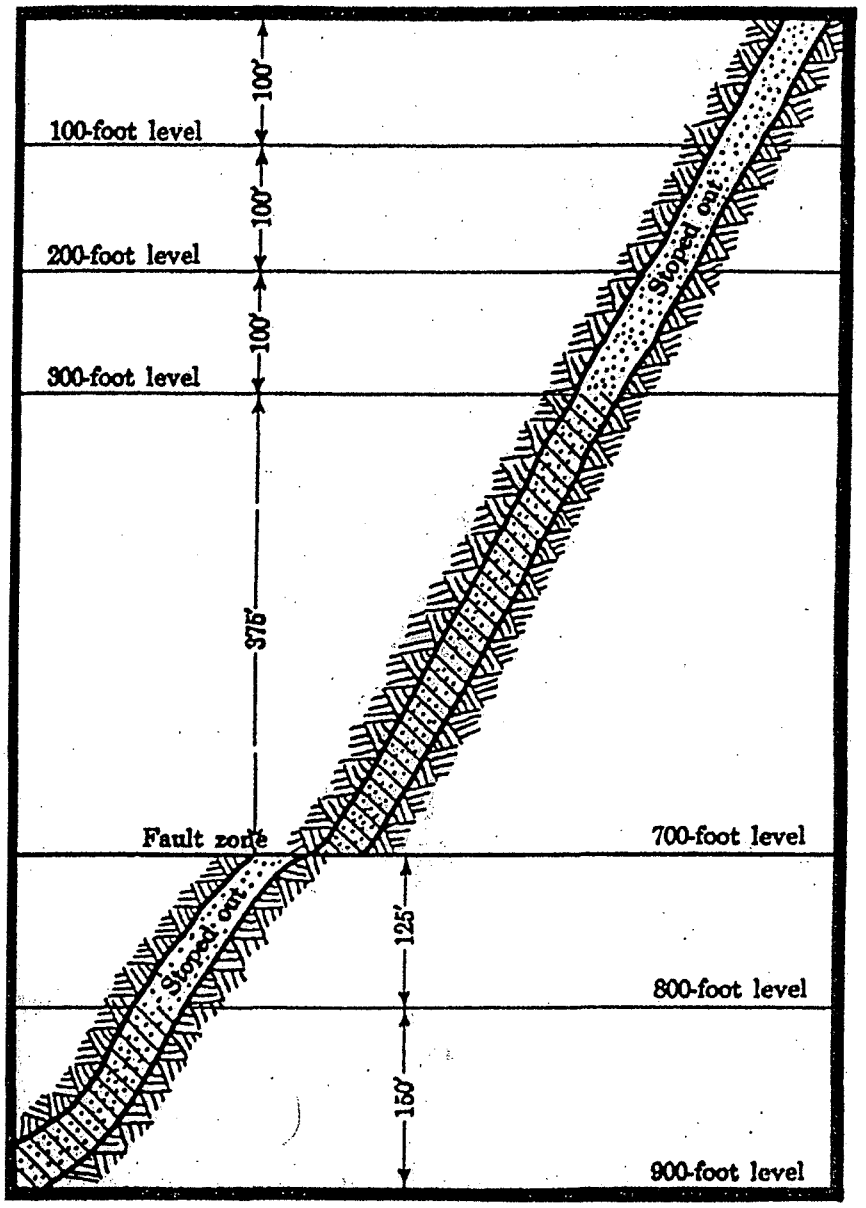


Figure 2.5 Cross-section of the Harmony Mine from the 900-foot level to the Surface (Gardner 1930a: Figure 1).

The ore bin at the lower end of the tramway had a 200 ton capacity. A 26 inch wide by 36 inch high opening in the chute allowed the movement of ore; this was regulated by an automatic feeder (Gardner 1930b:5). Subsequent to milling, the tailings were disposed of in the settling pond. Tailings from the rougher flotation cell were run by launders to two cone-type classifiers at the lower end of the tailings pond. The resulting slurry, which contained 18% moisture, moved through the classifier spigot and gradually resulting in the construction of a dam across the tailings dump. The tailings were distributed across the dam by a truck that ran along a broad track. The track was supported by scaffolding

constructed on the bottom of the drainage. As the scaffolding was gradually buried by the tailings, new scaffolding was constructed above it. The classifiers remained at a single level until the tailings had built up to the spigot. As the dam increased in height, it continued to hold more tailings (Gardner 1930b:14).

Overflow from the classifiers ran to a location 20 ft behind the dam and accumulated into the pond (Gardner 1930b:14). Sedimentation occurred in the pond and the clear water was carried under the dam by a trough; the intake was at the back of the dam with the discharge on the drainage floor at the base of the dam.

Using a Portland continuous 8 by 8 ft filter, a portion of the tailings was filtered and the water reclaimed during the winter months Gardner. The filter was operated by the same vacuum system that operated the concentrates filter in the mill; the operator would send a portion of the tailings to the filter and open the vacuum check valve. The Harmony Mill's vacuum system had sufficient capacity to manage both the tailings and the concentrates filters. Filtered tailings were transported from the filter to the tailings dump by a 60 ft long conveyor belt (1930b:14).

One car of copper concentrate left from former milling operations was shipped by lessees who worked the mine in 1931. By this time, the mine contained about 10,485 ft of workings that consisted of 555 ft of shafts, 525 ft of raises, and 9,045 ft of tunnels, crosscuts, and drifts. The mine had seven tunnels, six shafts, five raises, seven crosscuts, and 10 drifts (Mitchell 1995:11). Table 2.3 summarizes the length of several of the tunnels and shafts.

Table 2.3 Length of Tunnels and Shafts in 1931, Harmony Mine (from Mitchell 1925:11).

Tunnel No.	Feet below Surface	Length
1	825	2650
2	300	1325
3		890
4		260
5		220
6		1000
Shafts		**Depth**
Principle Shaft		130
Principal Winze	825	135

In 1932, copper prices hit a low of 6.3 cents per pound; the IMIR (from Mitchell 1995:11) referred to newspaper reports that noted the diesel engine and electric generator were disassemble and moved from the property. The mine was never reopened after this occurred.

Between 1916 and 1931, production from the Harmony Mine was 47,826 tons of ore, which included 38 ounces of gold, 2,050 ounces of silver, and 1,815,353 pounds of copper (Mitchell 1995:11).

Renewed interest in the Harmony Mine occurred in 1991 when Noranda Exploration conducted a geochemistry and geophysics program and submitted a plan of operation to drill one core hole. The results of Noranda Explorations investigations are unknown (Mitchell 1995:11).

Table 2.4 lists the equipment that was present at the Harmony Mine and Mill and what year it was added and/or removed.

Table 2.4 Equipment At Harmony Mill and Mine.

Year	Equipment Present
1917	Air Compressor
	Aerial Tramway
1919	Mill
	Hardinge Ball Mill
	Dorr Classifiers
	Six Wilfey Tables
1921	Oil Flotation Cells
	Two Chicago-Pneumatic Air Compressors
	Two B & B Rope Aerial Tramways
	30 Mine Cars
	14 Rock Drills
	Mules for haulage
	Primary Crushers
	Secondary Crushers
	10 Wilfey Tables
	Two K & K Flotation Cells
	Two Aikens Classifiers
1923	Ingersoll-Rand Air Compressor
1926	10-Ton Storage Battery Locomotive for Haulage
	15 2.5-ton ore cars
	Additional Aerial Tramway
1928	Filter to Dewater Concentrates
1929	450-Horsepower Diesel Generator
	8 mi of Copper Transmission Line
	New (unspecified) Mill Equipment
	Suction Fan
1932	Diesel Engine and Generator Removed

Figure 2.6 provides an example of a flow sheet of the Balm Creek Mill in southeast Oregon while Figure 2.7 shows the flow sheet of the Harmony Mill. This was the final

flowsheet for the Harmony Mill before it was closed and shows the ultimate configuration of the machines. Flow sheets, or design sheets, were an important element of the milling process. Both mills were designed for copper in the 1920s, although the Balm Creek Mill was ultimately used for gold.

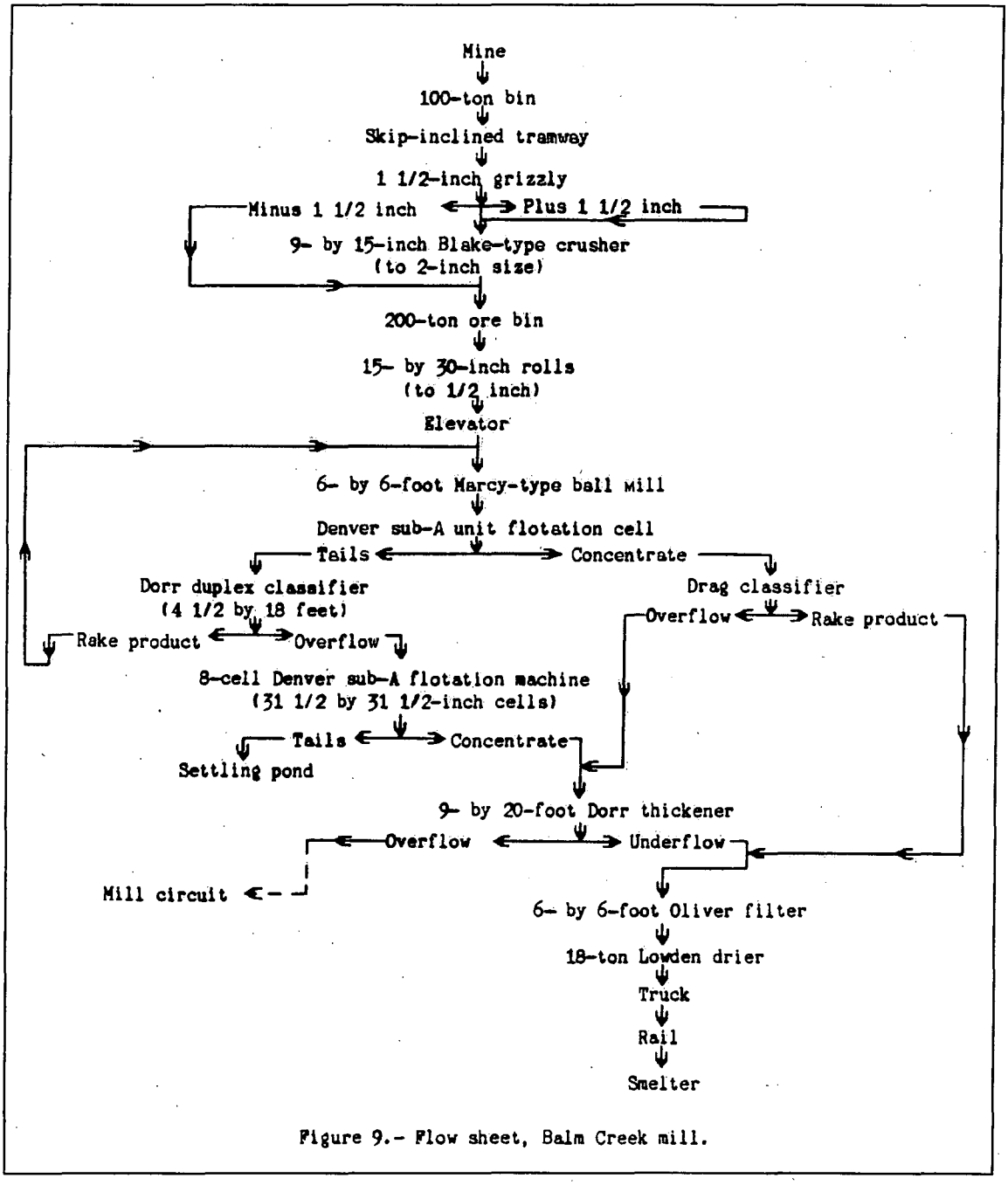


Figure 9.- Flow sheet, Balm Creek mill.

Figure 2.6 Flow Chart of the Balm Creek Mill, Oregon (From Lorain 1938:31).

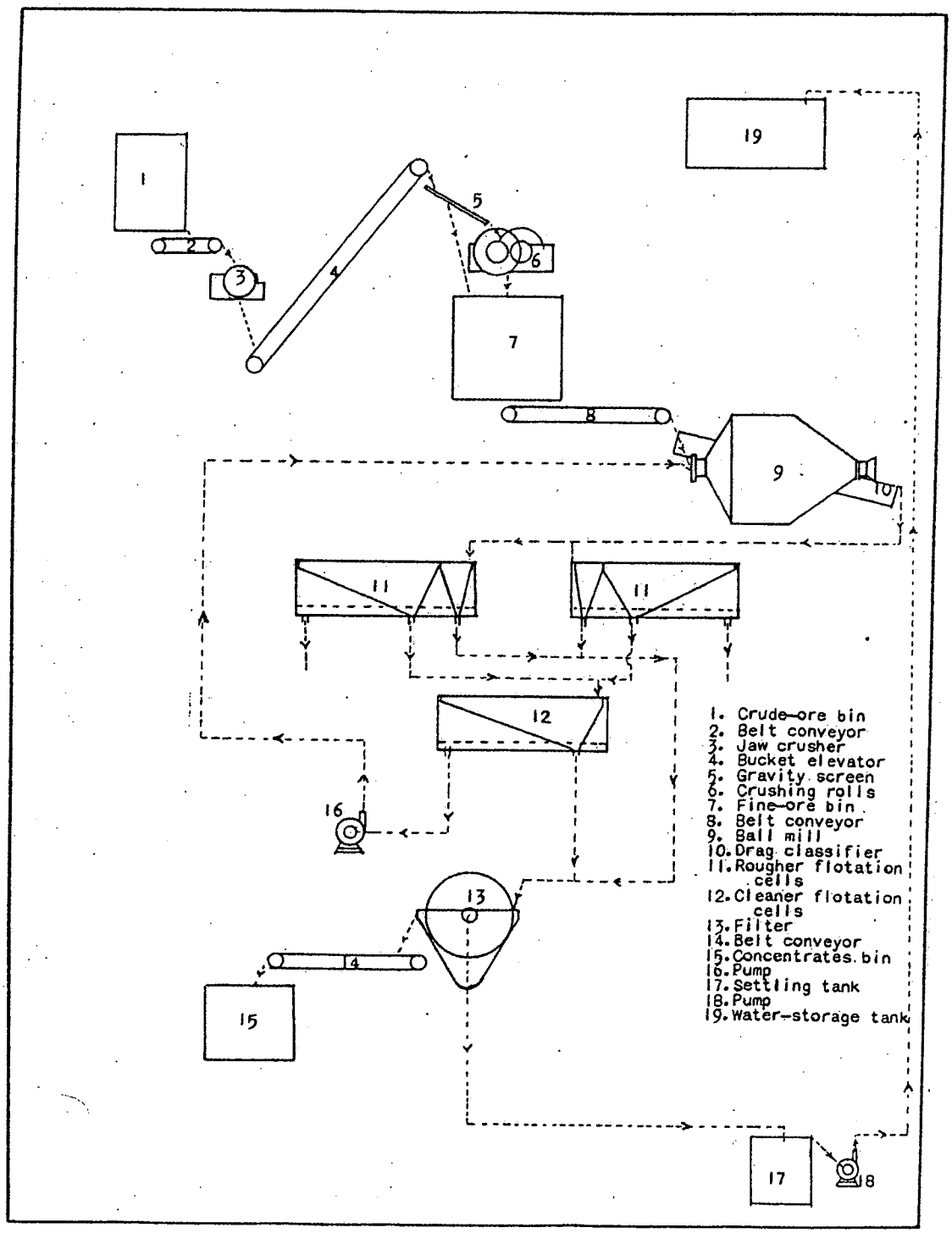


Figure 2.7 Harmony Mill Flowsheet (From Gardner 1930b: Figure 1).

3.0 METHODS

Standard archaeological methods were followed throughout the project. Maps were provided to North Wind that showed the location of the project area and the parcels that required inventory. Steve Matz, archaeologist with the Salmon-Challis National Forest, Joe Ficek, Senior Project Manager for EQM, and Ray Henderson, forest engineer for the Salmon-Challis National Forest accompanied North Wind personnel to the field. The areas that were planned for disturbance were shown to North Wind archaeologists (Figure 1.2).

The rock (borrow) areas and repository were inventoried by two archaeologists. The repository was inventoried using transects spaced no more than 20 m (66 ft) apart using northwest to southeast oriented transects. The repository measured 640 by 560 ft (195 x 171 m), but the actual area surveyed, following the request from EQM, was 1600 ft (northeast to southwest) by 1400 ft for a total of approximately 21 acres. A total of 22 transects were walked on this parcel with negative results.

The first rock (borrow) source (lower and eastern rock source) was roughly triangular in shape. EQM designated the boundaries for this parcel, which contained approximately 18.97 acres. Twenty-three north-south transects were walked across the face of the talus slope with negative results.

The second rock source (tailings rock source) was rectangular in shape and contained 22.96 acres. It was located below the tailings on a talus slope. Eleven north-to-south transects were walked on this parcel with negative results.

A third potential rock source was located west of the repository and was rectangular in shape. This rock source measured just over 2 acres in size, though a larger area was inventoried to ensure no cultural resources were near the rock source. Four transects were walked in a north-south direction; no sites or artifacts were observed.

Approximately 52 acres of road were inventoried. The roads included the main haul road, and two potential locations for ancillary roads from the base of the tailings to a curve in the main haul road. The potential ancillary roads were inventoried between clusters of historic can artifact scatters to allow EQM to operate around the scatters without disturbing them. The roads were inventoried up to 100 ft (30 m) on each side of the roads. The centerline of the two proposed ancillary roads were marked with pin-flags by North Wind as a guide to EQM operators.

Approximately 31 acres were inventoried around the millsite and the tailings. Because of the short distances between features, transect interval was generally less than 5 m (16 ft). All features were photographed and/or drawn to scale. The entire ground surface was examined for evidence of artifacts and features. When an artifact or feature was observed, it was assigned a feature number, photographed and/or drawn, then described. It was plotted using a Trimble GeoExplorer 3 using Version 1.2 software and the 1983 North American Datum (NAD) for Universal Transverse Mercator (UTM) Zone 12.

Rough locations were hand plotted on a field map for reference. A photograph log was maintained throughout the project.

Collected artifacts were bagged by feature number and their location recorded with a GPS unit. All artifacts were transported to North Wind's Idaho Falls Laboratory for analysis. The GPS receiver was transferred to North Wind's GIS specialists and the data was corrected and projected on a 1:24,000 scale topographic Digital Raster Graphic (DRG) map.

4.0 RESULTS

This section presents the results of the inventory and monitoring. The results of the inventory are subsumed under Section 4.1, while the results of the monitoring are described under Section 4.2.

4.1 INVENTORY RESULTS

4.1.1 Site SC-34

Site Type: Mill
Temporal Period: 1907 to 1932
Legal Locations: SW 1/4 Section 25, SE 1/4 Section 26 and E1/2 Section 35, T20N, R22E
UTMs: Zone 12, 277787 m E. 4988460 m. N (NE corner of Feature 6, mill remains)
Landowners: Private and Salmon-Challis National Forest.
Landform: Northwest-facing slope of ridge overlooking Harmony Creek

Site Description: The impending arrival of winter necessitated that the cultural resource inventory would focus on those areas that may be impacted by activities associated with the removal of the tailings. For this reason, only selected areas of the entire site were inventoried. This included recording the mill and associated features within the area of potential impact, the inventory of the tailings area, the inventory of a parcel of land to be used as a tailings repository, three rock (borrow) sources, and inventory of the main road and the location of two proposed ancillary roads (Figure 1.2).

Thirty features, some of which were broken into sub-features, were identified and recorded during the project (Figure 4.1). The features comprise 11 foundations, three can dumps, three depressions, two roads/grades, two ditches, two dams, the mill remains, a corduroyed section of a road, corral remains, a car body, mill tailings, a collapsed adit, and a powerline. Figure 4.2 is a plan map of the Feature 1 area that provides a detailed view. Figure 4.3 is a plan map that presents a more detailed view of features identified in the mill and tailings area than that presented in Figure 4.1.

Feature 1 consists of a series of seven tin can concentrations located east of the main road (Feature 4) that leads to the mill (Figures 4.1-4.2; Figure 4.4). The concentrations vary in size from 21 by 25 ft to 120 by 130 ft and contain from 76 (Concentration 4) to approximately 2,383 (Concentration 6) artifacts; the seven can concentrations appear to contain a total of at least 3,918 artifacts—predominantly hole-in-cap tin cans, but also numerous sanitary and other cans. Glass fragments are also present and consist predominantly of clear glass with very little brown glass or other colors. Whiteware ceramics, indicative of boarding houses or institutions, are also apparent. The average size of the concentrations is 57 by 70 ft.

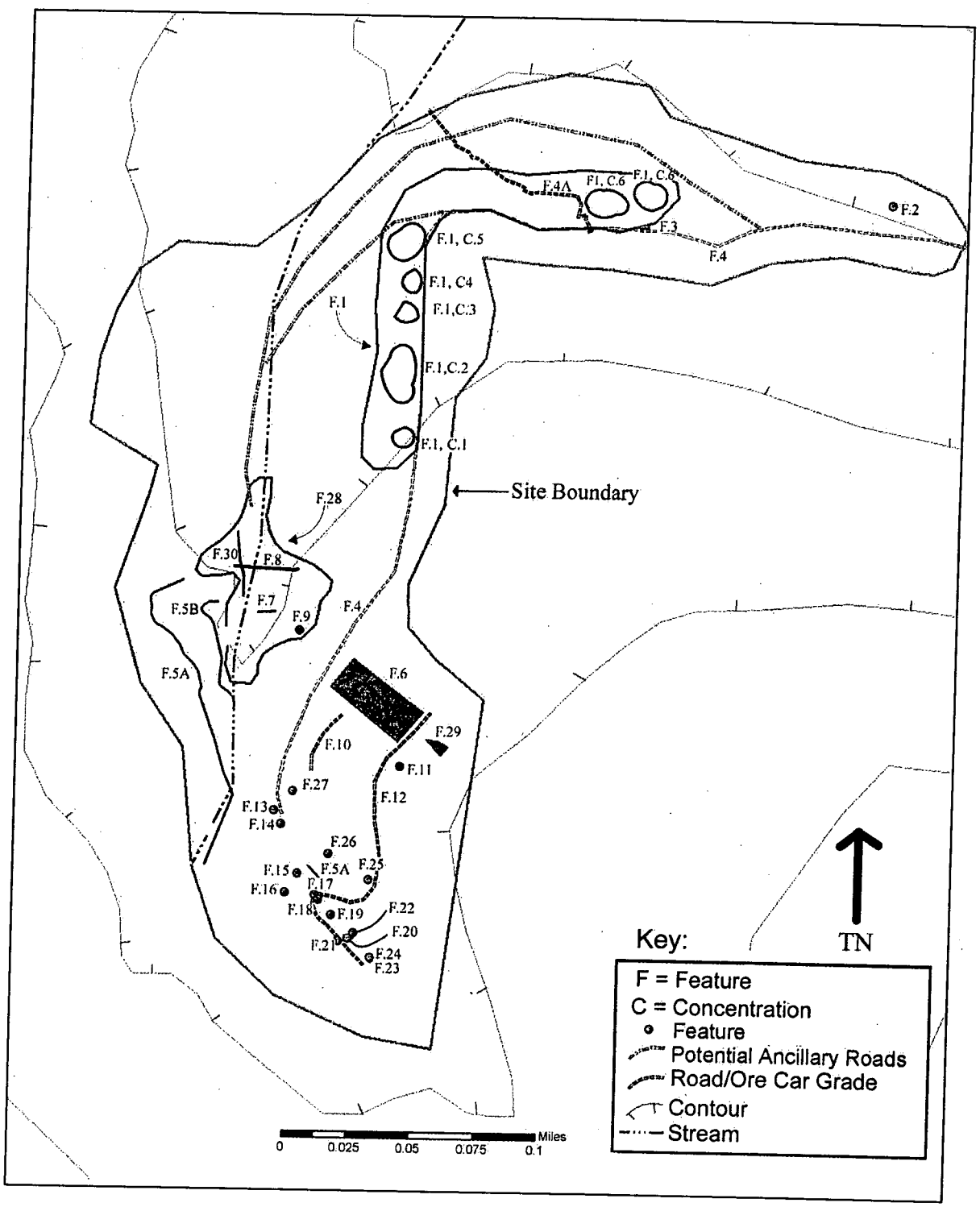


Figure 4.1 Identified Features

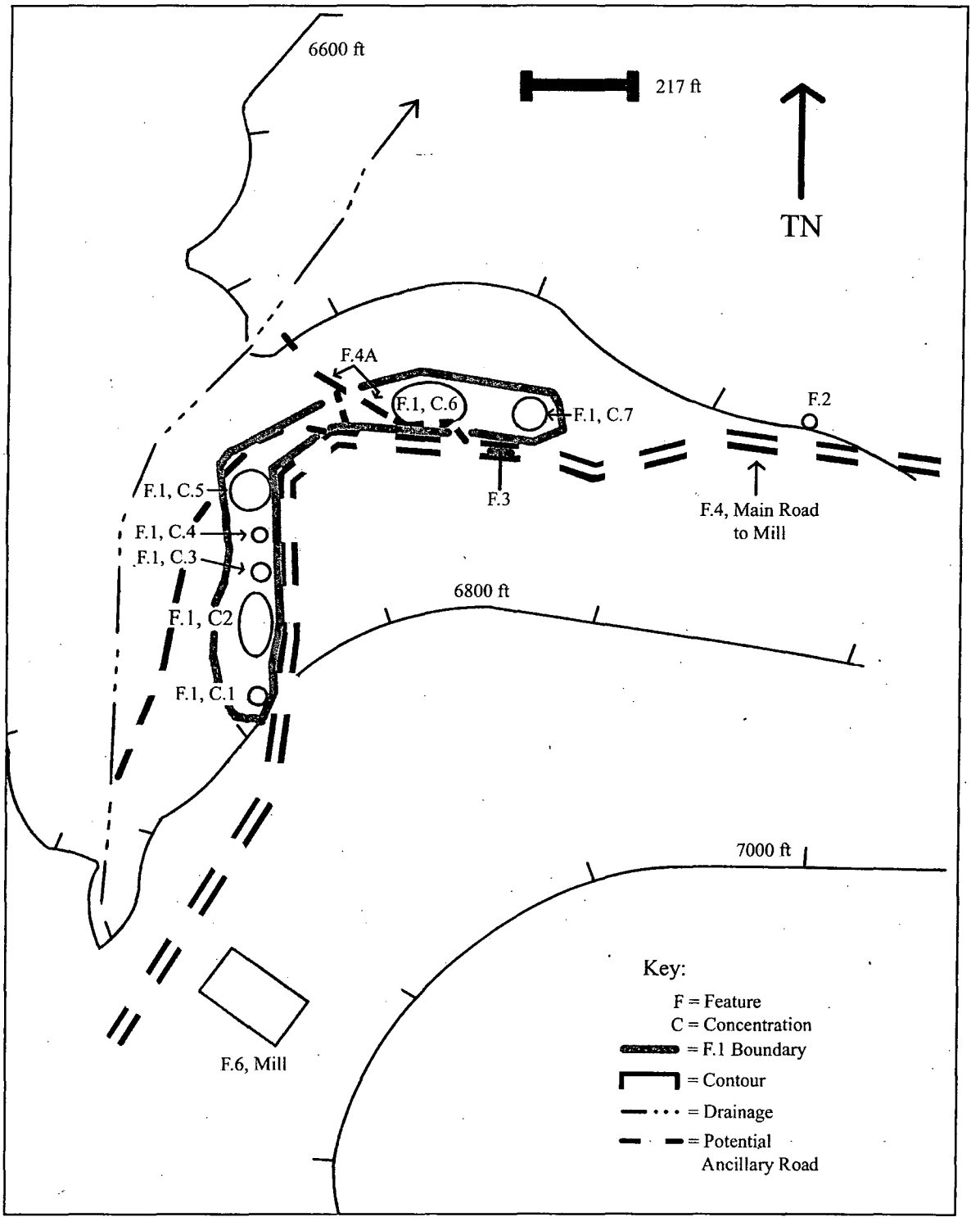


Figure 4.2 Plan Map of Feature 1 and Other Nearby Features

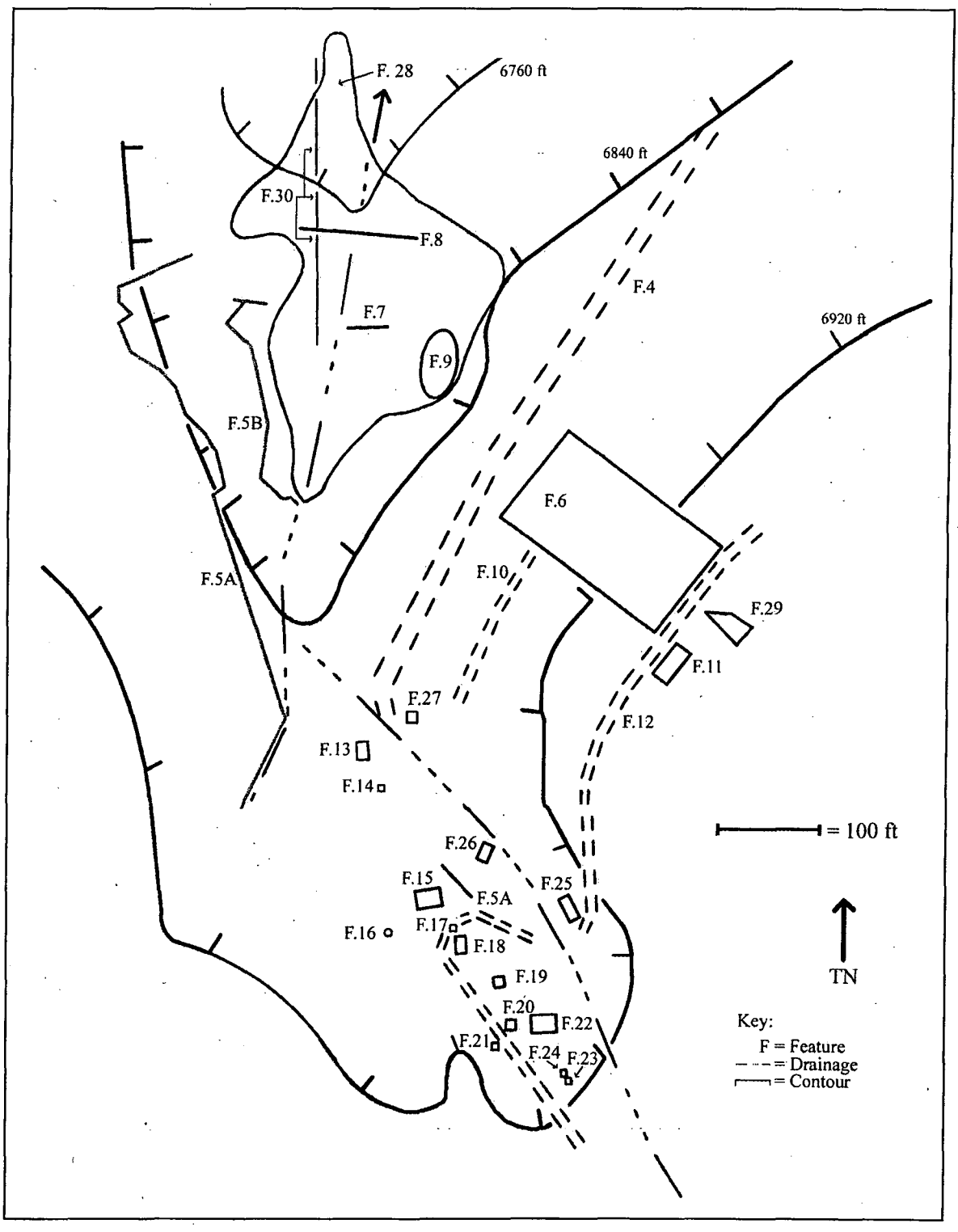


Figure 4.3 Plan Map of Features Identified in the Mill and Tailings Area

Feature 2 is a can concentration (Figure 4.1-4.2). This feature measures 25 by 25 ft and contains 56 artifacts similar to those identified in Feature 1. Table 4.1 summarizes the concentrations associated with Feature 1 and Feature 2. Tables 4.2-4.9 detail the artifacts located within each concentration.



Figure 4.4 Overview of Feature 1, Can Concentration. Harmony Mine (Site SC-34). View to the North.

Table 4.1 Dimensions of Feature 1 Concentrations and Feature 2, Site SC-34.

	Width	Length	No. Artifacts	Sq. Ft	Artifacts/Sq.ft.
Feature 1C1	30	33	165	990	6
Feature 1C2	60	114	599	6840	11
Feature 1C3	30	45	336	1350	4
Feature 1C4	21	25	76	525	7
Feature 1C5	75	80	192	6000	31
Feature 1C6	120	130	2383	15600	7
Feature 1C7	60	60	169	3600	21
Feature 2	25	25	56	625	11

C# = Concentration Number.

Feature 3 consists of a 17.0 ft long section of corduroy laid on the main road that leads to the mill (Feature 4) (Figures 4.1-4.2, Figure 4.5). Approximately 2.0 ft of the corduroy is

visible and deposits on the road obfuscate the rest; however, the corduroy likely extended across the road. The visible portion is on the downslope side of the road. The corduroy is made from planed timbers that measure from 5.0 to 7.0 inches wide; thickness is indeterminable as the timbers are mostly buried below the ground surface.

Table 4.2 Artifacts at Feature 1, Concentration 1, Site SC-34.

Artifact	**Height**	**Diameter/Width**	**Seam/Thickness**	**No.**	**Shape**	Comments
Hole-in-Top	4 4/16	3	C	73		
	4 11/16	4	C	12		
Sanitary	4 10/16	4		30		
	6	?		1		
Sardines	4 4/16	3 4/16	14/16	15		
Tobacco	4 6/16	2 14/16	15/16	1		
Vegetable or Fruit	6 14/16	6 2/16		16		
Spice Can	4	2 8/16	1 13/16	1		
Total Cans				149		
Clear Glass						
Bottle Glass				1	Rectangular	"-ORIN CO. BRAND REG. U.S. PAT. OFFICE" on side panel
Bottle Glass				1	cylindrical	Wide-mouth jar, with bubbles and seeds
Chemical Glass				11		
Brown Glass				1	Body and Neck	"-oppes No. 9"
Total Glass				14		
Ceramics						
Whiteware	fine white paste and glaze			1		
Paper		1 1/4		1	paper seal	
Total Artifacts				**165**		

Table 4.3 Artifacts at Feature 1, Concentration 2, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.	Shape	Comment	
CANS								
Hole-in-Top	Type I	4 4/16	3	C	79			
	Type II	4 11/16	4	C	47			
Sanitary	Type IS	4 10/16	4		109			
		6 14/16	6 2/16		62		"Without Sugar Added Second"	
		9	6 4/16		1			
Shorty Sanitary		4 2/16	2 9/16		7			
Tobacco		4 6/16	2 14/16	15/16	3			
Spice Can		4	2 8/16	1 13/16	1			
Spice Can		4 13/16	4 12/16	3 5/16	1			
Wire-handled rectangular		11 8/16	6 2/16	4	2		Syrup?	
Log Cabin					1			
Coffee/Baking Soda		5 2/16	3 12/16		3		External Friction Lid	
Texaco/Kerosene		13 9/16	9 6/16	9 6/16	1		Corner Spout, Star on Bottom	
Can Lid					1		"Sanitary" embossed on it	
Hole and Cap		4 12/16	3 7/16	1 6/16	1			
Un ID can Frags					187			
Total Cans					**506**			
Clear Glass								
Neck and Lip					1			
Bottle Base					1	cylindrical		Embossed horseshoe
Chemical Glass					11			
Un ID Frags					43		includes 3 3-2/16 tall fragments,	
Catsup Bottles					2		Six Fragments	
Bottle Fragments					1			embossed on base
Brown Glass					1		Threaded neck Fragment, seam all the way up, 1 inch wide	
Total Glass					**60**			

Artifact		Height	Diameter/Width	Seam/Thickness	No.	Shape	Comment	
Ceramics								
Whiteware	fine white paste and glaze				20			
Whiteware	cup fragment				1			
Total Ceramics					**21**			
Metal Artifacts								
Strapping		1	1/16		2			
Brass pocket watch rim					1			
Galvanized Wash tub					1		no bottom, 2 ft 8-inches wide	
Total Metal Artifacts					**4**			
Cartridges								
.25 Remington WRA co. 25 REM					3			
Total Cartridges					**3**			
Misc Artifacts								
Modern Herring tin					1			
Telephone/electrical wire					4		10-80 ft	
Total Misc. Artifacts					**5**			
Total Artifacts					**599**			

Table 4.4 Artifacts at Feature 1, Concentration 3, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comment	
CANS								
Hole-in-Top	Type I	4 4/16	3	C	57			
Sanitary	Type IS	4 10/16	4		43			
Sardines		4 4/16	3 4/16	14/16	7			
Spice Can		4	2 8/16	1 13/16	3			
Tall Sanitary		7 8/16	5 4/16		2		Cut-around	
Paint-Gallon					1			
Sanitary		4	3 8/16		1		Embossed wheel on top	
Baking Powder Lid			5 2/16		1			
Total Cans					**115**			
Clear Glass								
Square bottle frag					1		"A1" embossed on side 1-10/16	
Bottle Base					1		Horseshoe-embossed	
Neck and lip					1		15/16 wide	
Square bottle base frag					1		1-11/6, small diamond embossed on bottom	
Catsup Bottles Frags					1			
Window glass Frags					30			
Total Glass					**35**			
Ceramics								
Whiteware	fine white paste and glaze				150			
Crockery Lid					1		Maybe brown, too burned to tell	
Total Ceramics					**151**			

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comment	
Metal Artifacts								
Draft horseshoe					1			
Total Metal Artifacts					**1**			
Misc Artifacts								
Insulators cross wrapped with cloth and metal posts					30			
Strapping		24	1 3/16	1/16	3			
Tail pipe frag					1			
Total Misc. Artifacts					**34**			
Total Artifacts					**336**			

Table 4.5 Artifacts at Feature 1, Concentration 4, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comment
CANS							
Hole-in-Top	Type I	4 4/16	3	C	42		
Sanitary	Type IS	4 10/16	4		14		"SANITARY" stamped on lid, cut around
		6 14/16	6 2/16		16		
Olive oil		4 8/16	3 4/16	?	1		POMPEIAN Virgin Olive Oil--small rectangular with corner spout
Tall Rectangular		11 8/16	6 1/16	2 7/16	1		corner spout
Paint-Gallon					1		
Total Cans					**75**		
Clear Glass							
Cylindrical bottle base					1		"HJ HEINZ CO" on top "186" in center "Pat°" on bottom
Total Glass					**1**		
Total Artifacts					**76**		

Table 4.6 Artifacts at Feature 1, Concentration 5, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comments
CANS							
Hole-in-Top	Type I	4 4/16	3	C	73		
Sanitary	Type IS	4 10/16	4		17		
		6 14/16	6 2/16		11		
Rectangular Can Lid					1		"HERSHEY COCO_ _ _"
Hole and Cap		4 12/16	3 7/16	1 6/16	3		
Kerosene Can Lid					1		
Baking Powder Lid			4 5/16		1		"PERFECTLY MADE, DR. PRICES CREAM BAKING SODE 2 1/2 lbs FULL WEIGHT"
Total Cans					**107**		
Clear Glass							
Catsup Bottles					1		Octagonal variety?
Green Glass Insulator Frags					50		"BROOKFIELD, NEW YORK" embossed on body
Brown Glass							
Total Glass					**51**		
Ceramics							
Whiteware	fine white paste and glaze				30		
Brown Insulator Frags					1		3 small nubs as feet
Total Ceramics					**31**		
Metal Artifacts							
Door knob escutcheon					1		1-14/16 W x T9/16
Bar		18	2	4/16	1		
Total Metal Artifacts					**2**		

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comments
Misc Artifacts							
Telephone/electrical wire					1		100 ft strand
Total Misc. Artifacts					**1**		
Total Artifacts					**192**		

Table 4.7 Artifacts at Feature 1, Concentration 6, Site SC-34.

Artifacts		Height	Diameter/Width	Seam/Thickness	No.		Comments
CANS							
Hole-in-Top	Type I	4 4/16	3	C	793		
	Type II	4 11/16	4	C	487		
Sanitary	Type IS	4 10/16	4		463		
	Fruit	6 14/16	6 2/16		142		
Sardines		4 4/16	3 4/16	14/16	56		
Tobacco		4 6/16	2 14/16	15/16	7		
Oval Herring can		6 9/16	4 4/16	1 8/16	7		Cut-around with a star in a circle and "QUALITY MADE" embossed around the star
Spice Can		4	2 8/16	1 13/16	12		
Baking Powder Can		4 13/16	4 12/16	3 5/16	18		External friction lid
Log Cabin					1		
Texaco/Kerosene		13 9/16	9 6/16	9 6/16	18		
Hole and Cap		4 12/16	3 7/16	1 6/16	8		
Paint-Gallon					2		
Baking Powder Lid			5 8/16		1		5 lbs
Total Cans					**2015**		
Clear Glass							
Neck and Lip					1		15/16 D
Fluted drinking glass frag					1		
Bottle Fragments					200	plus	
Window Glass Fragments					2		
Total Glass					**204**		
Ceramics							

Artifacts		Height	Diameter/Width	Seam/Thickness	No.		Comments
Whiteware	fine white paste and glaze				130		
Piping frags, white	cup fragment				15		
Crockery fragments					1		Sugar-glazed lid fragment
Total Ceramics					**146**		
Metal Artifacts							
Strapping		1	1/16		1		
Barrel Hoop					1		
Flattened aluminum bowl					1		
Pie Tin					1		
Total Metal Artifacts					**4**		
Misc Artifacts							
Boot heel					1		
Rubber canning jar seal					1		
Light bulb fragments					2		
Fork					1		
Cast Iron Stove Frags					5		"8 INCH WITH CENTER" One is a griddle fragment
Metal insulator arm					1		Threaded end and two holes
Total Misc. Artifacts					**11**		
Bone					**3**		Bovine Saw-cut

Artifacts		Height	Diameter/Width	Seam/Thickness	No.		Comments
Total Artifacts					**2383**		

Table 4.8 Artifacts at Feature 1, Concentration 7, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.			Comment	
CANS									
Hole-in-Top	Type I	4 4/16	3	C	107				
Sanitary	Type IS	4 10/16	4		36		21 w/o embossing	15 w/"SANITARY" embossing,	
	Fruit	6 14/16	6 2/16		15				
		7	5 8/16		1		SANITARY embossed on lid and cut around (coffee?)		
Turpentine		5 2/16	3 4/16	2 1/16	1		?		
Texaco/Kerosene		13 9/16	9 6/16	9 6/16	3				
Texaco Can Lid					1				
Fruit					1		1/2 side cut away, but bottom intact, scoop-like		
Total Cans					**165**				
Metal Artifacts									
Strapping		1	1/16		2				
Cast iron stove door					1		23	25	1/16
Stove vent frag					1				
Total Metal Artifacts					**4**				
Total Artifacts					**169**				

Table 4.9 Artifacts at Feature 2, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comment
CANS							
Hole-in-Top	Type I	4 4/16	3	C	29		
Sanitary	Type IS	4 10/16	4		10		
	Fruit	6 14/16	6 2/16		14		
Rectangular		3 15/16	3 12/16	2 10/16	1		Icepick open, but with punch out top
Paint-Gallon Colander					1		
Total Cans					**55**		
Clear Glass							
Catsup Bottles base frag					1		10-sided embossed on bottom: "'PACKED BY CAL. PACK CORP
Total Glass					**1**		
Metal Artifacts							
Galvanized Wash tub					1		no bottom, 2 ft 8-inches wide
Total Metal Artifacts					**1**		
Misc Artifacts							
Telephone/electrical wire					1		10-80 ft
Total Misc. Artifacts					**1**		
Total Artifacts					**58**		



Figure 4.5 Overview of Feature 3, Corduroy. Harmony Mine (Site SC-34). View to the West.

Feature 4 is the main road to the mill (Figure 4.1-4.3; Figure 4.6). The inventoried portion of the road measures 2.8 miles in length and is approximately 9.0 ft wide on average. The road is in very poor condition and is cut into the slope. No reinforcement or rock embankments were observed. Feature 3, the corduroy section, is a feature within the road.

Immediately west of Feature 3 and near the east end of Feature 1 is Feature 4A, a road cut that leads from Feature 4 to the bottom of the drainage to the northwest (Figures 4.1-4.2). Feature 4A measures 7-9 ft wide. No reinforcement is apparent with this roadcut. The southern portion of Feature 4A cuts through Concentration 6 of Feature 1.

Features 5A and 5B are ditches located across the drainage (north) from the mill (Figure 4.1; Figure 4.3). The ditches are constructed parallel to each other. Two segments of Feature 5A were identified. The northern segment of Feature 5A is located approximately 60.0 ft upslope from Feature 5B. It is an north-south trending earthen ditch that appears to have undergone considerable siltation. It measures 700 ft long by 7 ft wide by 1 ft deep (as a result of siltation) at its south end. At its northern end, where no water is presently flowing, the feature is less silted and appears to display more of the original attributes. The ditch is excavated through talus and it exhibits little siltation. At this point, it measures 3 ft 6 inches deep by 10 ft wide from the eastern (exterior) shoulder to the hill cut. The east shoulder (berm) measures 8 ft wide and is 2 ft above the

surrounding slope. The northern segment of this ditch was breached about 210 ft from its southern terminus. At the northern terminus, the ditch turns 90° east and runs down the slope, below the tailings. Another ditch segment that may be associated with Feature 5A was identified on the west side of the drainage where features 25 and 26 are located. This segment is tenuously associated with Feature 5A based on its construction style; neither of the walls of this ditch segment display any reinforcement, such as the walls of Feature 5B. The description of the southern ditch segment mirrors that provided above for the northern segment of Feature 5A; however, the southern segment measures 50 ft long.



Figure 4.6 Overview of Feature 4, Road to Harmony Mine (Site SC-34). View to the West.

Feature 5B is approximately 240 ft long and begins about 100 ft north of the southern terminus of Feature 5A. Presently, Feature 5B carries no water. This feature measures 9 ft wide, from its east shoulder to the west slope, and is 3 ft deep. The initial southern 60 ft of the ditch was excavated through a talus slope and exhibits no reinforcement. The succeeding 140 ft of this feature exhibits the same measurements as the southern portion, but the east wall has been lined with the talus rock, creating an embankment/retaining wall that measure 1 ft 8 inches to 2 ft tall (Figure 4.7). The northern 40 ft portion exhibits no human modification, although natural talus may have served as a retaining wall. At its northern terminus, it turns east almost 90° and dumps onto the lower (northern portion) of the tailings.

An artifact was located downslope of this feature, on the east bank of Harmony Creek. The artifact consists of a screen constructed of light gauge rails, such as ore cart rails. It

is composed of 26 rails that were cut to form a screen 4 ft high by 3 ft 6 inches wide. The rails are spaced approximately 6 inches apart.



Figure 4.7 Rock-lining in Feature 5B, Site SC-34. Harmony Mine (Site SC-34). View to the North.

Feature 6 consists of the mill remains (Figure 4.1-4.3; Figure 4.8). This feature was divided into subfeatures (Features 6A to 6I) for ease of recording. The mill appears to have measured 190 ft long (northwest-southeast) and from 49 to 79 ft wide (northeast-southwest). The mill is roughly rectangular in plan view, with various extensions along its southwest side. Literally thousands of various sizes of wire nails, bolts, joiner plates and pipes were located within and surrounding the mill. Several footings and the remains of a ball mill were observed in the ashes. Figures 4.9-4.12 provide a view of the mill prior to it burning and Figure 4.13 is a photo of the mill at the time of the inventory.

The footings of the mill were assigned separate subfeature designations based on elevation. The mill was oriented northwest-southeast along its length and northeast-southwest along its width, with the southeast end highest up the slope. Approximately 108 ft from the southeast corner of the mill is an extension that measures 31 ft (northwest-southeast) by 28 ft 6 inches. Ten, 10 inch wide by 25 ft long timber impressions are visible on the south side of the extension; the timbers were completely burned by the fire. In the northern portion of the extension, approximately 1 ft south of

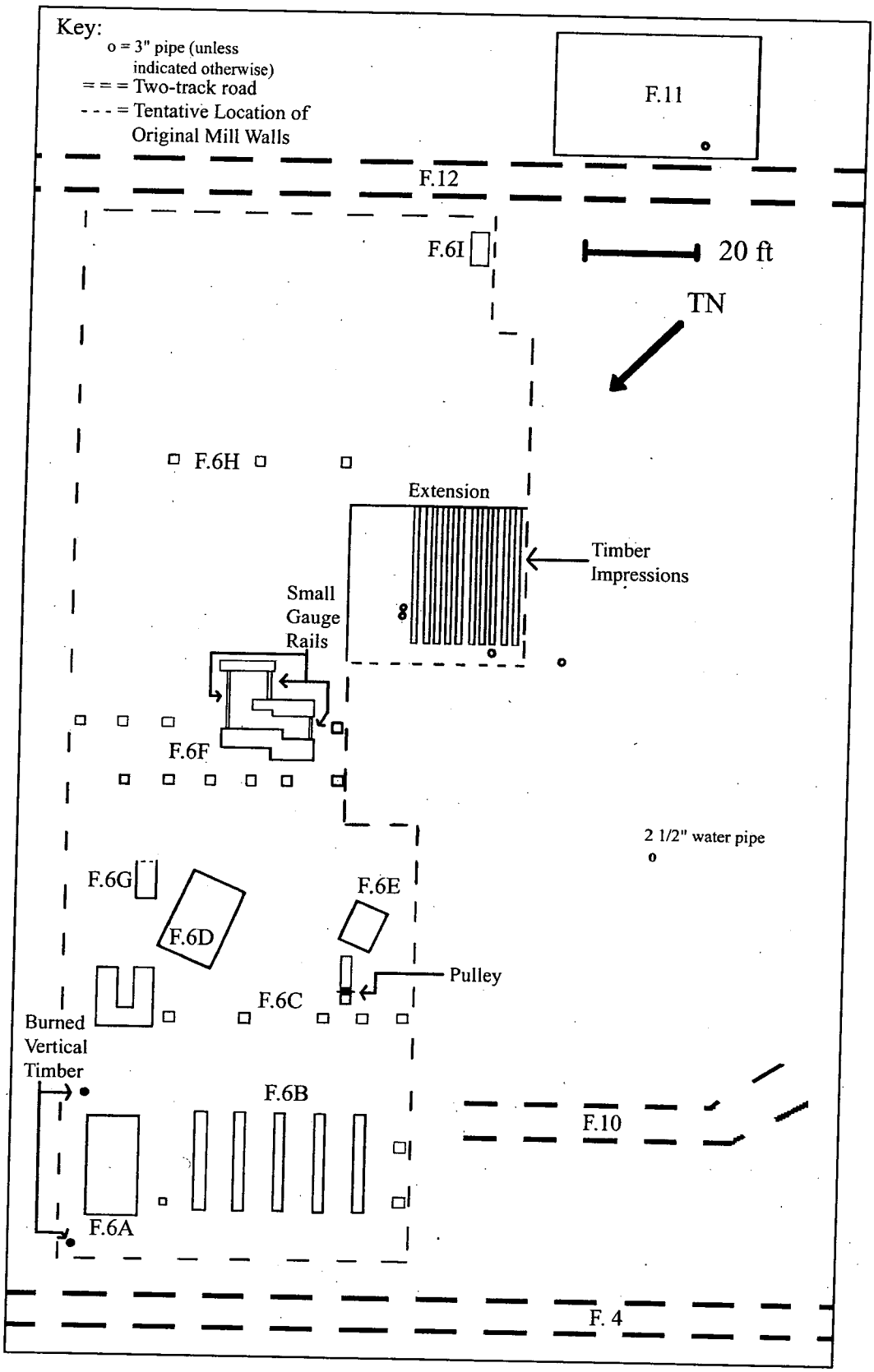


Figure 4.8 Plan Map of Feature 6, Harmony Mill.

the last visible timber impression, two 3 inch diameter steel pipes project from the ground. Another 3 inch steel pipe projects from the ground in the northwest portion of the extension,. Another 3 inch diameter steel pipe is located outside the extension, also near



Figure 4.9 Overview of Feature 6, Mill, prior to burning. Harmony Mine (Site SC-34). View to the East.



Figure 4.10 Overview of Feature 6, Mill, prior to burning. Harmony Mine (Site SC-34). View to the Southeast.

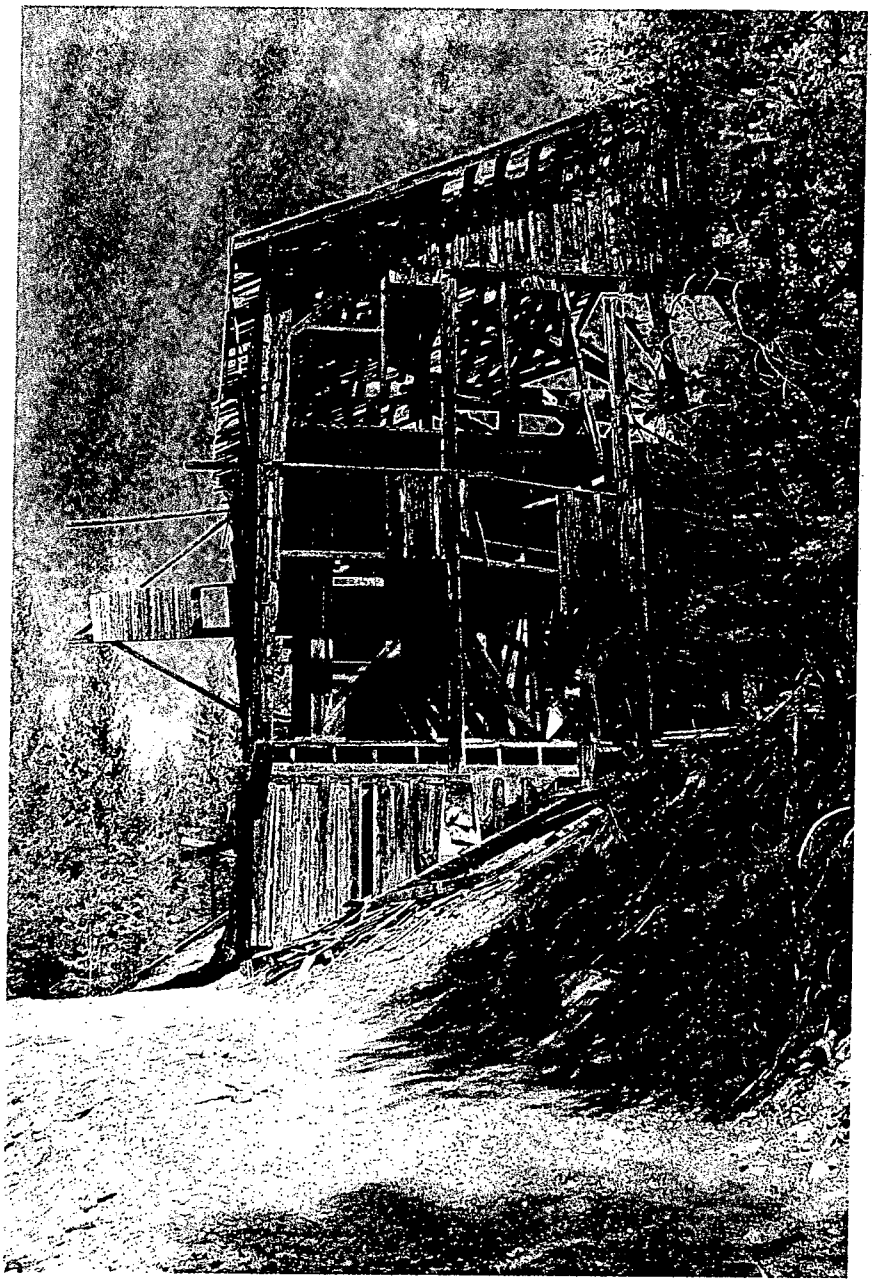


Figure 4.11 Overview of Feature 6, Mill, prior to burning. Harmony Mine (Site SC-34). View to the Northeast.

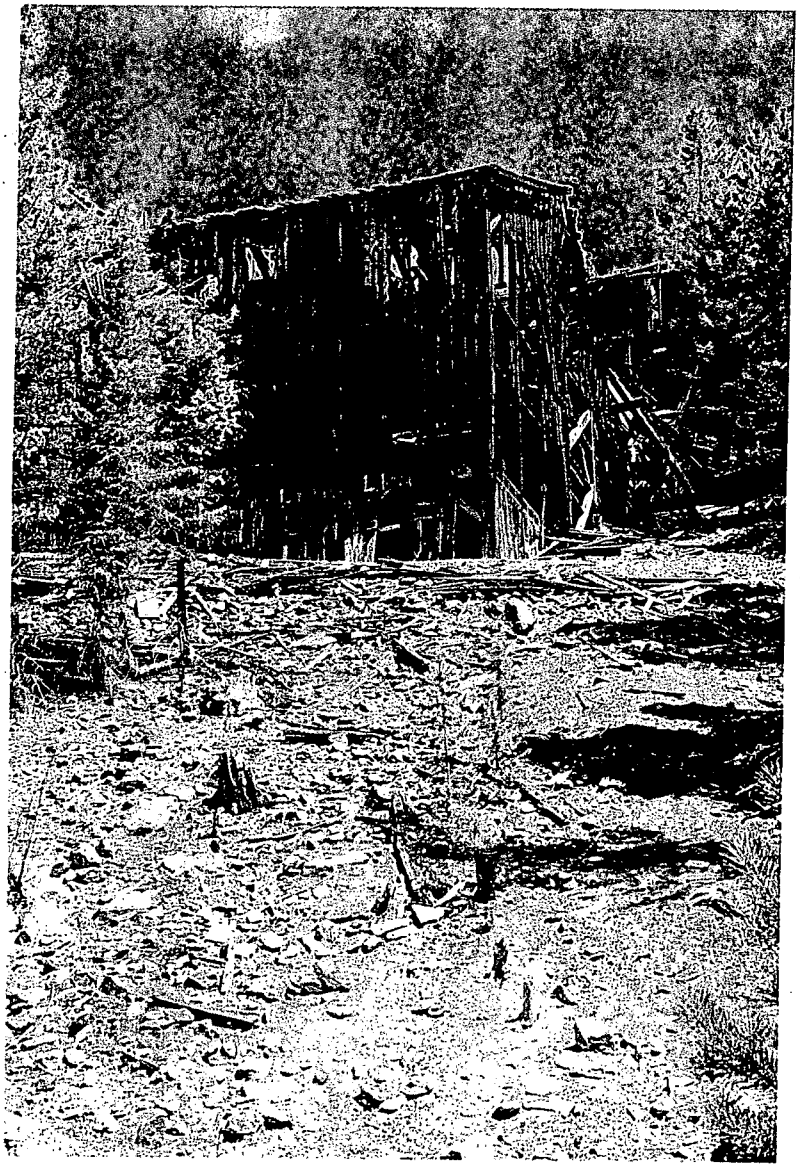


Figure 4.12 Overview of Feature 6, Mill, prior to burning. Harmony Mine (Site SC-34). View to the South

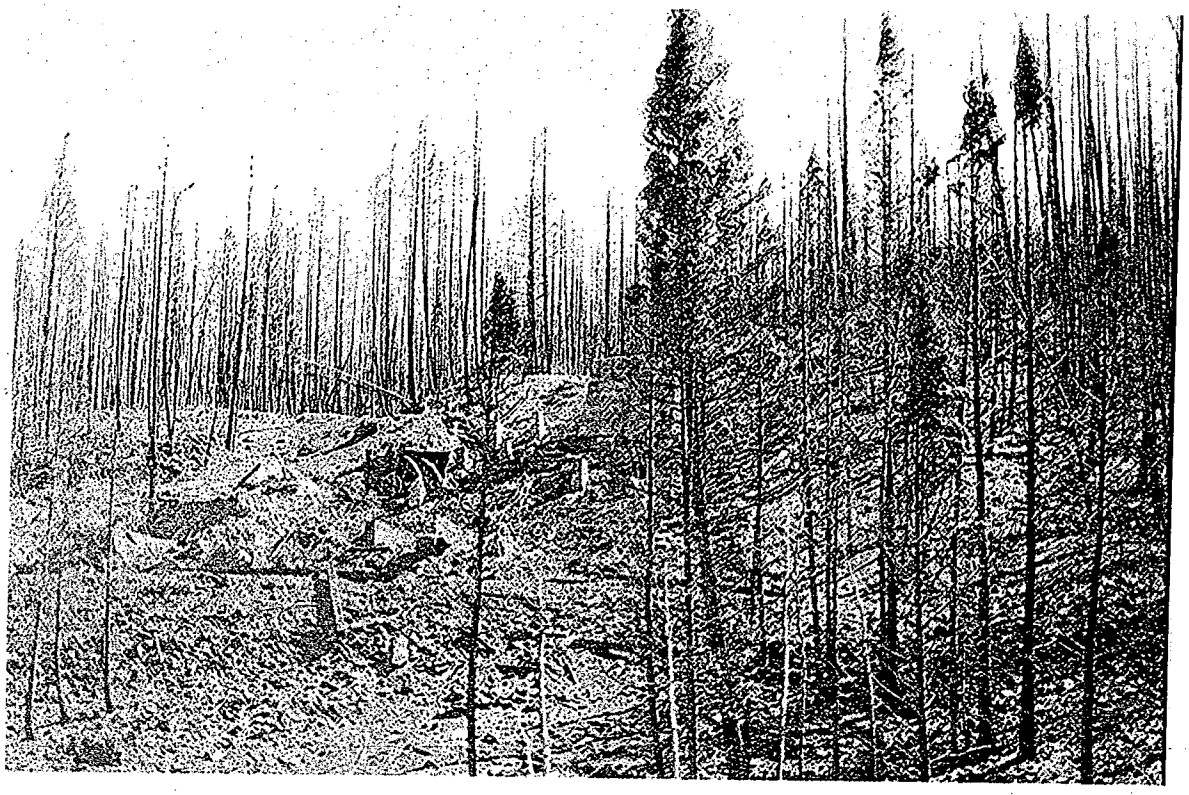


Figure 4.13 Overview of Mill Remains (Feature 6). Harmony Mine (Site SC-34). View to the East

Feature 6A consist of the partial remains of a furnace or kiln located in the northeast corner of the mill (Figure 4.8; Figure 4.14). It measures 8 ft 7 inches wide (northeast-southwest) and 18 ft long (northwest-southeast). It is constructed of rock, brick, and concrete. No reinforcement bars, or other reinforcements, are apparent. The rock used in the construction of Feature 6A varies in size from 8 inches to 2 ft while the brick measures a uniform 8 by 2 1/2 by 4 inches. The bricks displayed no maker's marks. A 16 by 16 inch opening is located on the northwest elevation of the feature and appears be the location where the furnace was either fed or cleaned out. Because of the fire, this feature was in poor condition. The actual function of this feature is unknown. It was not mentioned by Gardner (1930) or depicted in his flow sheets.

Feature 6B consists of a series of concrete footing on the lowest tier at the northwest end of the mill (Figure 4.8). The footings are three different sizes, although prior to the fire, there may have been only two sizes. One footing is square and measures 16 by 16 inches and is 14 inches tall. It is located southeast of the furnace/kiln. Further southeast are five long, linear, footings. They measure 18 ft long by 2 ft wide by 2 ft 6 inches to 5 ft 10 inches tall (dependant on the amount of burned debris around them). Four 12/16 inch by 14 inch tall rebar and one 3/4 inch by 6 1/2 inch rebar protrude vertically from the northwest end of the five footings. Wood timbers appear to have originally framed the footings. Further to the southeast, in the south corner of the mill, are two additional

square footings. They measure 2 ft by 2 ft and are 2 ft 6 inches and 2 ft high—again dependant on the amount of burned debris. These two footings also appear to have been lined with wood.

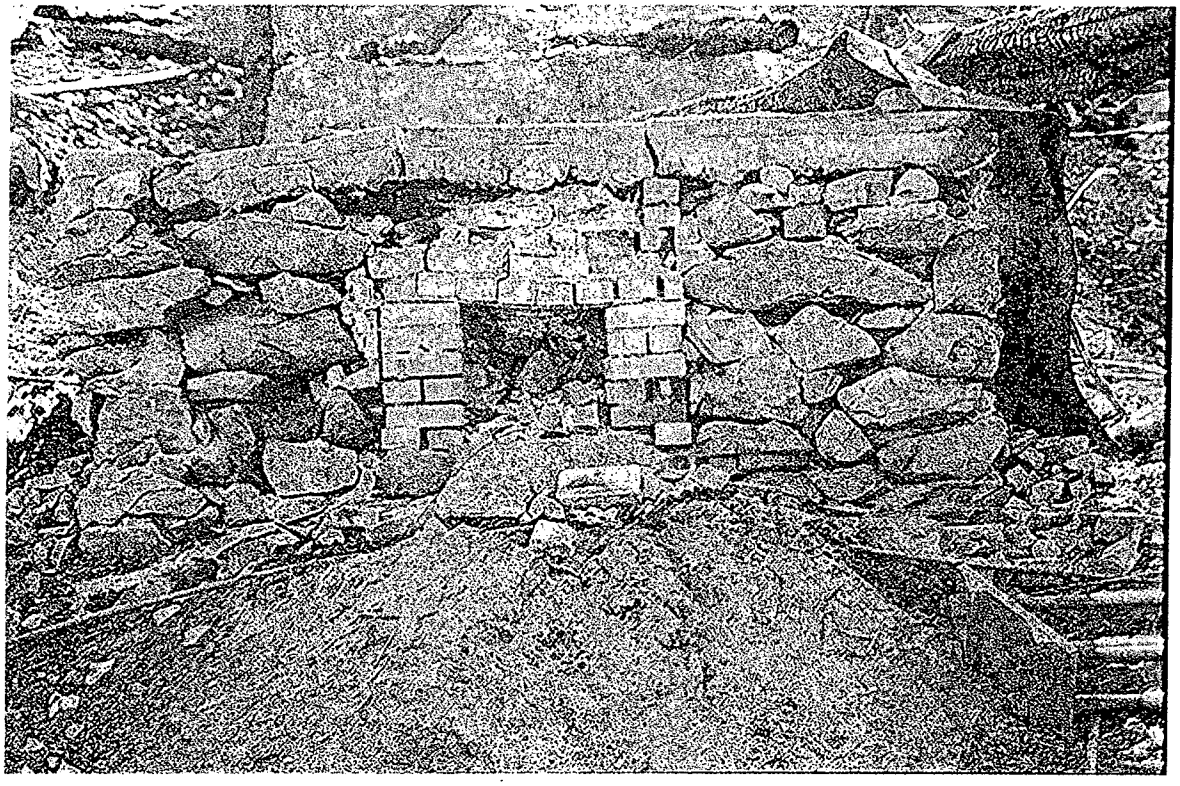


Figure 4.14 Feature 6A, Furnace/Kiln. Harmony Mill (Site SC-34). View to the Northeast.

Feature 6C consists of a series of concrete footings located on the next highest tier of the mill (Figure 4.8). They are located about 16 ft southeast of, and upslope from, Feature 6B. Feature 6C is composed of seven footings of various sizes. The largest footing in this cluster is "U"-shaped and measures 10 ft 6 inches wide (northwest-southeast) by 11 ft long (northeast-southwest) and is 2 ft 3 inches high. A 7 ft by 2 ft 6 inch section of the southeast end of the footing has been left open. Rebar that measures 1 inch in diameter protrudes 5 1/2 inches vertically from the top of the footing. This footing is located on the north side of the mill and is in poor condition. The remaining footings associated with Feature 6C extend toward the south.

The next series of footings associated with Feature 6C consist of five 2 ft square footings, that extend to the south side of the mill. These footings vary in height from 1 ft 6 inches tall to 3 ft tall, depending on the amount of burned debris around them. One 3/4 inch rebar protrudes 5 inches from the top of the best-preserved footings. The final footing is linear and is about 1 ft southeast of the third and fourth footing in the abovementioned series of five footings. This footing is about 11 ft north of the south side of the mill. It measures 2 ft wide (northeast-southwest) by 8 ft long (northwest-southeast) and is 1 ft

tall. A pulley that measures 1 ft 7 inches in diameter by 1 ft 1 inch wide is located near the northwest end of this feature. A 2 inch diameter axle protrudes from both sides of the pulley, which is aligned with the footing. The pulley and footing are part of a belt conveyor that carried material to the concentrates bin (Gardner 1930).

Feature 6D and 6E are parts of the ball mill (Figure 4.8). Gardner (1930) referred to this as a Hardinge Ball Mill. The ball mill is in several pieces, likely a result of the fire. Feature 6D measures approximately 9 ft long by 16 ft in diameter. An unidentifiable equipment fragment southeast of Feature 6D is embossed with "KROCH MFG Co. SF CAL". Feature 6E is south of Feature 6D; it measures approximately 8 ft by 6 ft. It was originally conical and is one end of the mill. A steel strut/reinforcement is embossed "COLORADO". Both features exhibit riveted construction. Figure 4.15 is an example of an intact Hardinge Ball Mill; arrows on the photograph indicate the portions that are represented by features 6D and 6E at the Harmony Mill. Figures 4.16 and 4.17 show the ball mill (features 6D and 6E) at the site.

Feature 6F consists of a series of 13 footings on the next higher tier of the mill, approximately 15 ft southeast of Feature 6D (Figure 4.8). Six of the footings are square and measure 1 ft 8 inches on each side and are approximately 3 ft 6 inches tall. These six footings are placed in a row across the width of the mill and are equidistant from each other (about 5 ft apart). Southeast of these footings are four footings with the same measurements. The northeastern-most of these footings exhibits a 3/4 inch diameter rebar that projects 5 inches from the footing. The other square footings may have displayed similar reinforcement, but because of their poor condition, it is no longer apparent. Three of the four footing are on the north half of the mill and one is on the far east half of the mill; between the two northern footings are three large irregularly shaped footings made of concrete. The northeastern-most of the three large footings measures 16 ft (northeast-southwest) by 6 ft wide (northwest-southeast) and 12 ft high; it may have originally been taller, but the fire exacerbated the disintegration of the concrete. In plan view, this footing appears as two slightly offset rectangles. Two 1 inch rebar project vertically from the top of this footing. Additionally, two 12 inch wide by 10 inch high recesses are located on the southeast elevation of this footing, near its north side. The recesses are approximately 6 ft above the surrounding debris and appear to represent timbers that the concrete was originally poured around, but which burned during the fire. Two parallel small gauge rails project horizontally from the southeast elevation of this footing; these appear to have served as reinforcements.

Approximately 3.0 ft southeast of the above described 12 ft tall footing is an "L" shaped footing. This footing measures11 ft 6 inches long (northwest-southeast) and 3 ft 6 inches wide northeast-southwest), and is 6 ft tall. Two wrapped dual strand wires project from both the northwest and southeast elevations. Four 3/4 inch and two 1 inch rebar project vertically from the top of the footing. The 3/4 inch rebar project 5 inches while the 1 inch rebar project 3 ft but are bent down due to the fire. Two small gauge, horizontal, rails that are located 3 ft above the ground connect to the southwest corner of the irregularly shaped footing.

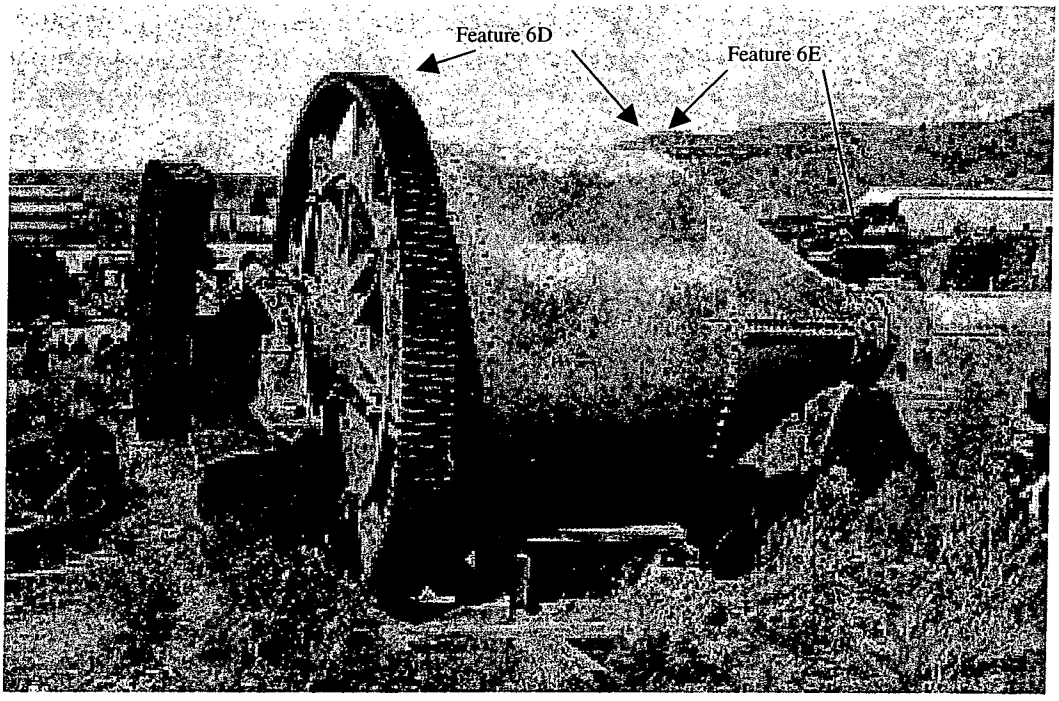


Figure 4.15 Example of Intact Hardinge Ball Mill.



Figure 4.16 Feature 6D, Hardinge Ball Mill. Harmony Mine (Site SC-34). View to the Northeast.



Figure 4.17 Ball Mill Fragment, Harmony Mine (Site SC-34).

The final footing in this series (Feature 6F) is a rectangular footing that measures 9 ft long (northwest-southeast) by 2 ft wide (northeast-southwest) by 6 ft tall (Figure 4.8). Two 12 inch wide by 10 inch tall recesses are apparent in the northwest elevation and appear to match the recesses in the irregularly shaped 6 ft tall footing that is 10 ft to the northwest. Both recesses are located near the northwest corner of this footing. The recesses represent the anchor locations for timbers that connected this footing with the 6 ft tall footing to the northwest. The timbers were completely incinerated by the fire. Figure 4.18 provides a view of the burned out mill remains of Feature 6 showing features 6A-6F.

Feature 6G consists of a concrete footing that is on the same tier of the mill as Feature 6D and Feature 6E, the ball mill parts (Figure 4.8). This footing measures 3 ft 6 inches wide (northeast-southwest) and is 1 ft 3 inches tall. Length is indeterminable because the southeast end of this footing is covered by debris; however, the visible portion is approximately 7 ft long. Four 1 inch diameter rebar extend 3 inches from the corners at the top of this feature.

Feature 6H consists of a series of three square concrete footings on the next highest tier in the southeast portion of the mill, approximately 35 ft southeast of Feature 6F (Figure 4.8). They are severely disintegrated as a result of the fire, but they likely originally measured from 1 ft 10 inches by 1 ft 8 inches to 2 ft by 2 ft. They are presently

approximately 15 inches square and 2 to 3 ft tall and virtually obscured by burned rock and other debris.



Figure 4.18 Overview of Feature 6, Burned out Mill Remains Showing features 6A, 6B, 6C, 6D, 6E, and 6F. View to the East.

Feature 6I is a concrete footing located on the highest tier of the mill, approximately 35 ft south of Feature 6H (Figure 4.8). Feature 6I measures 3 ft wide (northwest-southeast) by 6 ft long (northeast-southwest) and is 2ft 6 inches tall. Three 3/4 inch diameter rebar project 1 ft from the top of this feature.

Feature 7 (Figure 4.1; Figure 4.3; Figure 4.19) consists of the remains of a breached, cribbed rock, dam. It is composed of logs cribbed together (log cabin style) into squares and filled with rock.



Figure 4.19 Feature 7, Cribbed Dam. Harmony Mine (Site SC-34). View to the South.

The dam measures 30 ft long (east-west) by 5 ft wide (north-south), and is presently 5 ft 6 inches tall. The remaining portion of the dam is constructed from 4 to 6 inch axe-cut poles that span the drainage. The parallel, east-to-west, poles are separated into boxes every 3 ft 6 inches to 4 ft by four sets of 4 inch to 6 inch poles that exhibit very shallow saddle notching. The resultant boxes are filled with locally occurring talus rock for reinforcement. The dam may have extended approximately 7 ft further north, however, the poor condition of the dam due to the breach and subsequent flood obfuscates this portion. Two vertical and one horizontal planed (or sawn) 2 by 10 inch boards that form a "U" are located in the stream at the base of the dam. This is the only occurrence of planed/sawn timbers at the dam. This dam is located in the creek at the approximate midpoint of the tailings. Because it is underneath the tailings, it may represent the original tailings containment impound.

Feature 8 consists of a dam and retaining wall located approximately 80 ft north of Feature 7 (Figure 4.1; Figure 4.3). The feature is constructed by non-uniform 6 to 9 by 3 inch horizontal timbers. The length of the timbers is indeterminable because they extend into the tailings on either side of the feature. The horizontal timbers extend east-to-west and span the north-to-south trending drainage. The timbers are held in place by 8 inch diameter wooden posts that are set vertically into the streambed and ground. Only two of the vertical timbers are visible. On each side of the creek on the tailings, and above the retaining wall, one 6 inch diameter post projects vertically from the ground. In addition, two 2 by 6 inch timbers protrude from the tailings on the east side and three timbers protrude from the tailing on the west side of the creek; however, their function is

indeterminable, though they may be part of the retaining wall. One 2 by 10 inch timber was washed down the creek and is resting on the feature.

Feature 9 is a small can dump located below the mill, between the road (Feature 4) and the tailings (Figure 4.1; Figure 4.3). Feature 9 measures 70 ft (north-south) by 40 ft (east-west) and is composed of 31 hole-in-top cans (Type I) that measure 4 4/16 inches high by 3 inches in diameter. They exhibit crimped side sides and lapped end seams. Most of the cans were opened by ice pick, but a few were opened with a knife. In addition, one light bulb (collected) was observed in this feature.

Feature 10 consists of a possible ore-cart grade that measures 7 ft wide (Figure 4.1; Figure 4.3; Figure 4.8). No tracks or ties are present and no reinforcement or bracing was observed. The feature is located 10 ft south of the southwest corner of the mill (Feature 6) and runs in a general north-south to northeast-southwest direction.

Feature 11 is a burned building/structure (Figure 4.1; Figure 4.3; Figure 4.8). This feature is located near the southeast corner of the mill. It measures 21.0 ft (northwest-southeast) by 36 ft (northeast-southwest). Nine, 12 inch timber impressions are visible on the floor of the feature. The timbers were oriented northwest-to-southeast. A 2 1/2 inch and a 1 1/2 inch pipe project from the northwest corner of the feature. The function of this feature is unknown.

Feature 12 is a road or ore cart grade that is located between Feature 11 and the mill; the feature is oriented in a general north-south to northeast-southwest direction (Figure 4.1; Figure 4.3; Figure 4.8). It measures 7 to 9 ft wide. No tracks, ties, or bracing were observed. Approximately 280 ft to the south, in the drainage, is a stacked rock retaining wall that is adjacent to Feature 25. This retaining wall is associated with Feature 12; it supports the road grade as it ascends in elevation toward the mill (Feature 6) from the bottom of the drainage. The rocks used in the construction of the retaining wall are locally occurring and vary in size from 1 to 2 ft. It is constructed in an "L" shape to avoid Feature 25, which suggests that Feature 25 was constructed prior to the road grade. The retaining wall measures 27 ft long by 1 to 5 ft tall.

Feature 13 is a foundation located approximately 200 ft southwest of the mill and adjacent to the upper ditch (Feature 5A) (Figure 4.1; Figure 4.3; Figure 4.20). Because the west and north walls of this feature are indiscernible, only the south and east walls were recorded; the overall feature measurements are based on extrapolation. The feature measures 19 ft (north-south) by 13 ft (east-west). The foundation was constructed from 7 by 7 inch timbers. The east ends of the timbers display notching; however, they are so badly burned that the type is indeterminable. Four timbers are still in place and are oriented east-west; one, possibly two, are visible and oriented north-south. A single 3/4 inch by 3 inch tall rebar projects from the east end of the east-west oriented timbers.

Feature 14 consists of four 4 inch diameter by 5 ft tall wood posts that form a square (Figure 4.1; Figure 4.3). The posts are placed 9-10 ft apart. A single wire nail is located

in the top of each post. This feature is located 10 ft west of the creek and may represent a relatively recent corral constructed by hunters.

Feature 15 is the foundation of a building (Figure 4.1; Figure 4.3). The feature measures 31 ft (east-west) by 20 ft (north-south). The foundation appears to have been made with rock mortared with concrete, and timbers. The feature is heavily burned and in very poor condition. The feature contains approximately 50 whiteware fragments, numerous wire nails, a 50-gallon steel drum, 30 bone fragments (some bovine), three sanitary can fragments, two 1 inch diameter pipes, one clock spring, unidentifiable metal fragments, and five segments of bailing wire. Considering the presence of the numerous wire nails, the foundation likely represents the remains of a frame structure rather than a log cabin. The feature is located on the south end of the site on a small secondary ridge about 400 ft from the southwest corner of the mill.



Figure 4.20 Feature 13, Foundation Remains. Harmony Mine (Site SC-34). View to the Southeast

Feature 16 is a depression that measures 7 ft (northwest-southeast) by 4 ft (northeast-southwest) by 2 ft deep (Figure 4.1; Figure 4.3). The depression may represent the location of a privy. One burned 8 inch by 2 inch timber fragment is located on the

southeast end of the feature. This feature is located about 20 ft southwest of Feature 15. One oil can was located in the southeast corner of the feature (collected).

Feature 17 is a 1910s or 1920s automobile frame (Figure 4.1; Figure 4.3). No maker's mark is apparent; portions of the frame, suspension, engine, and transmission remain. The engine is 4-cylinder. This feature is located approximately 54 ft southeast of Feature 16.

Feature 18 is a burned foundation that measures 19 ft long (north-south) by 14 ft wide (east-west) (Figure 4.1; Figure 4.3). The feature is composed of concrete and wood. One wood timber, that measures approximately 12 by 12 inches, is located on the west wall. Innumerable wire nails, a headboard, footboard, and rails from a steel bed, two hole-in-top cans, one kerosene can, and a flashing for a stovepipe were observed. Because of the numerous wire nails, this feature may represents the remains of a frame structure rather than a log cabin. Feature 18 is located approximately 43 ft southwest of Feature 15.

Feature 19 is a foundation (Figure 4.1; Figure 4.3). The feature measures 7 ft (north-south) by 8 ft (east-west) by 1 to 2 ft deep. It is constructed from rock and concrete. A total of seven external friction lid, wire-hinged, tobacco cans are located just north of the feature. This feature is located approximately 72 ft east-southeast of Feature 18.

Feature 20 is a foundation (Figure 4.1; Figure 4.3). It measures 10 ft (north-south) by 12 ft (east-west) and is about 1 ft deep. The feature is composed of concrete and timber; the timbers are too badly burned to ascertain dimensions. Artifacts associated with this feature include innumerable wire nails, three clear glass bottle top fragments (one with a Hutchinson stopper), one strap hinge, one bottle base (that exhibits an embossed star containing an "S" above an embossed "5") that measures 3 2/16 inches in diameter, three external friction lid tobacco cans, a crushed and distorted sardine can, and numerous bottle fragments that are extremely brittle from the heat of the forest fire. A pipe projects from the ground on the east side of the feature about 1 ft from the foundation. Based on the plethora of wire nails, this feature likely represents the remains of a frame structure. Feature 20 is located approximately 58 ft south of Feature 17.

Feature 21 is a depression that measures 5 ft (north-south) by 4 ft (east-west) by is 6 inches deep (Figure 4.1; Figure 4.3). Numerous locally-occurring, rocks surround the depression. Approximately 2 ft south of the feature are 200 clear glass bottle fragments, one purple-discolored (solarized) glass fragment, four crushed external friction lid tobacco cans, and five modern cartridges. The base of one bottle measures 2 10/16 inches in diameter and has "IPCCO" embossed in a diamond with an embossed "6" below the left end of the diamond. Toulouse (1971:268-269) states that this mark is from the Illinois Pacific Coast Company that was based in San Francisco, California. This plant operated from 1930-1932, when the Owens-Illinois Glass Company took over operations and named it as its West Coast division. The function of Feature 21 is indeterminable. It is located approximately 25 ft northeast of Feature 20.

Feature 22 is a foundation that measures 22 ft (east-west) by 19 ft (north-south) (Figure 4.1; Figure 4.3). It was constructed from timbers and concrete; the timbers were completely burned away but their impressions are still apparent. Associated artifacts include innumerable wire nails, a red-painted latch plate, a metal sheet fragment, two wire barrel hoops, two metal strap barrel hoops, one "TEXACO" 5-gallon square can, two external friction lid tobacco cans, three stovepipe fragments, and a white milk glass fragment. This feature likely represents the remains of a frame structure and is located approximately 21 ft east of Feature 21.

Feature 23 is a depression that measures 11 ft (northwest-southeast) by 8 ft (northeast-southwest) by 4 ft deep (Figure 4.1; Figure 4.3). The northeast wall is lined with stacked unmortared, locally occurring, rock that varies from 3 inches to 1.0 ft in size. The feature contains about 10 clear glass bottle fragments, seven 6 inch wire nails, two 8 inch wire nails, two burned timber fragments (possibly from 2 x 8 inch timbers), one metal heel plate and 10 shell button fragments. This feature may represent a powder magazine. It is located approximately 65 ft southeast of Feature 22.

Feature 24 consists of foundation remains that measure 10 ft (east-west) by 8 ft (east-west) (Figure 4.1; Figure 4.3). It is composed of rock, concrete, and timbers, although all the timbers were burned away, leaving only impressions in the sediments. The feature contains an internal friction lid can fragment and it is located adjacent to Feature 23.

Feature 25 consists of a foundation located in the bottom of the drainage, about 94 ft northeast of Feature 19 (Figure 4.1; Figure 4.3; Figure 4.21). The feature measures 26 ft (northwest-southeast) by 8 ft (northeast-southwest). It is made of rock and timber, although only one burned timber that measures 8 by 8 inches remains. The rocks vary from 6 inches to 2 ft in size. A 1 inch and a 2 inch pipe project vertically from the ground near the southwest corner of the foundation. Artifacts associated with this feature include a milling ball, two cupel fragments, and innumerable wire nails. Approximately 8 ft from the southwest corner along the west wall are the remains of a possible furnace or oven base—the dimensions are indeterminable. It consists of a very friable concrete pad that is very deteriorated. Based on the presence of the cupels and furnace, this feature likely represents an assay office,. It is located adjacent to the road (Feature12) and associated road grade retaining wall that leads from the mill to the bottom of the drainage, approximately 278 feet south of the mill.



Figure 4.21 Feature 25, Possible Assay Office Foundation (foreground) and Road Grade Retaining Wall of Feature 12 (background). Harmony Mine (Site SC-34). View to the Southeast.

Feature 26 is a burned out foundation that measures 19 ft (northeast-southwest) by 12 ft (northwest-southeast) (Figure 4.1; Figure 4.3). It is located in the bottom of the drainage, about 83 ft northwest of Feature 25. This foundation appears to have been constructed solely of rocks that measure 5 inches to 2 ft in size. Associated artifacts comprise green glass insulator fragments, four corrugated metal sheets, white ceramic tube electrical insulator fragments, an exhaust manifold, innumerable wire nails, 10 whiteware fragments, a stove vent fragment, a bedframe, and two sets of bed springs. The insulator fragments tenuously suggest this feature may represent the remains of a powerhouse.

Feature 27 consists of two parallel concrete footings (Figure 4.1; Figure 4.3; Figure 4.22). The west footing measures 13 ft 6 inches long (north-south) by 3 ft 6 inches wide (east-west) and is 1 ft 7 inches tall. The east footing measures 11 ft long (north-south) by 2 ft 6 inches (east-west) by 1 ft 7 inches tall. The footings are separated by 6 ft 6 inches. The footings encompass an area that measures 12 ft wide (east-west) by 13 ft 6 inches long (north-south). Eight 1 inch diameter rebar project 8 inches from the top of the west footing and five 1 inch diameter rebar project 3 1/2 inches from the top of the east

footing. A sixth rebar, which would have been located on the northwest corner of the east footing is missing because that corner has crumbled away. A possible steel stove fragment is located on the south base of the east footing and has likely been dumped there. The footings rest on an irregularly shaped earth and rock pad that measures 35 ft long (north-south) by 28 ft wide (east-west). The pad is situated approximately 2 to 3 ft above the surrounding ground surface. The northeast corner of the pad appears to have had a 10 by 10 inch timber located at its north side, which likely represents foundation remains. The function of the original structure is indeterminable, though it may represent the hoist house for the tram to the mines. The actual measurements of Feature 27 from the southwest corner of the pad are 28 ft to the southeast corner, thence 35 ft to the northeast corner, thence 19 ft to the northwest corner, thence 6 ft south to an interior southeast corner, thence 9 ft west to an additional northwest corner, thence 29 ft south to the southeast corner. This feature is located approximately 202 ft southwest of the mill and 54 ft northeast of Feature 13.



Figure 4.22 Overview of Feature 27, Possible Hoist House Foundation. Harmony Mine (SC-34). View to the Northwest

Feature 28 consists of the mill tailings that are bisected by the creek (Figure 4.1; Figure 4.3; Figure 4.23). The tailings are irregularly shaped and measure approximately 4,280 ft long (north-south) by 2,600 ft wide (east-west). Prior to the breaching of the dam, the tailings were approximately 2,240 ft long. Features 7 and 8—dams and retaining walls, contained the tailings. Additionally, prior to the breaching of the dams, a settling pond was located upstream from the features. The tailings consist of yellowish mill fines that

resulted from the processing of ore at the mill (Feature 6). The tailings are located approximately 170 ft downslope from the mill.



Figure 4.23 Feature 28, Tailings, Harmony Mine (Site SC-34). View Northwest

Feature 29 is an adit trench (Figure 4.1; Figure 4.3). The feature is located approximately 100 ft southeast of, and upslope of, the mill (Feature 6). The trench measures 30 ft long (northwest-southeast) by 7 ft wide (northeast-southwest) by 6 ft deep. One 10 by 2 inch plank and three 8 by 8 inch timbers (dimensions approximately due to burning) are located within the trench. One 8 by 8 inch timber is still vertical and is 5 ft tall. The presence of a large strap hinge and a 2 ft wide by 4 ft high section of stacked, locally occurring rock on each side of the trench (15 ft from the northwest end of the trench) suggest a door once permitted ingress into the adit. No portal is visible.

Feature 30 is the remains of a powerline (Figure 4.1; Figure 4.3); all that remains is double twisted heavy gauge wire that lays on the ground and across the tailings (Feature 28). No poles or insulators were apparent. The powerline generally follows the drainage toward Baker, Idaho.

Ten artifacts were collected from the site for analysis in the North Wind laboratory in Idaho Falls. These artifacts include a heavily rusted oil can, a light bulb, two cupel

fragments, a lot tag, a bottle base fragment, an iron drill fragment, an ore car tie spike, a chaining pin and a milling ball. After analysis the artifacts were returned to the Salmon-Challis National Forest; the artifacts will eventually be submitted to the Southeast Idaho Regional Archaeological Center for ultimate curation.

The oil can was collected from Feature 16; it displays a basal width of 3 1/16 inches and a height of 3 14/16 inches. The spigot which projects from the top of the artifact is broken; the remaining portion of the spigot is 13/16 inch long. The handle of the oil can is missing and a hole is located where the handle once was.

The light bulb was collected from Feature 9. The bulb measures 3 14/16 inches tall by 2 4/16 inches wide; these measures are somewhat problematic based on the slight deformation of the artifact as a result of the fire. The bulb displays a 1 4/16 inch long by 7/16 inch wide glass mount that projects vertically from the base of the copper screw thread contact. The support wires are still intact though no evidence of the filament exists.

Two cupels were collected from Feature 25. The cupels measure 13/16 inch tall by 1 1/2 inch wide. The cupels are made from bone ash.

Also collected from Feature 25 was a steel lot tag. The tag is circular and measures 13/16 inch in diameter by 1/16 inch thick. One side of the tag is stamped with the number "14". A 2/16 inch hole is drilled through the tag immediately above the number.

A clear glass bottle base fragment was collected from Concentration 2 of Feature 1. The bottle base displays a diameter of 2 10/16 inches and a thickness of 5/16 inch. The base exhibits a 2/16 inch push-up. An embossed horseshoe is embossed on the bottom. No information could be found concerning the manufacture or date of the bottle.

Four artifacts were collected from the burned remains of the mill, Feature 6, including a iron drill fragment, an ore car tie spike, a steel chaining pin and a milling ball. The drill fragment is 15 3/16 inches long by 12/16 in diameter. The bit, which constricts to a four-sided point, comprises the initial 1 12/16 inch portion of the drill and the shank constitutes the remainder of the artifact.

An ore car tie spike was also collected from the interior of the remains of the mill. The spike measures 4 7/16 inches long by 7/16 inch wide by 8/16 inch thick.

The chaining pin is 6 10/16 inches long by 3/16 inch wide by 3/16 inch thick. The chaining pin exhibits a 1 4/16 inch diameter loop on one end; the other end tapers to a point.

The milling ball measures 2 3/16 inches in diameter and weighs 1 pound 5 1/4 ounces. A small 4/16 inch projection protrudes from one side of the ball; a similar projection that was on the opposite side of the ball is broken off.

Table 4.10 Total Artifacts, Harmony Mill Site (Site SC-34).

		Dimensions (inches)				
Artifact Description		**Height**	**Width/ Diameter**	**Thickness/Cap**	**Totals**	**Description**
Hole-in-Top	(Type I)	4 4/16	3		1284	Most were ice-pick opened (90%), followed by knife cut(7%), the remainder were cut-around
	(Type II)	4 11/16	4		546	
Sanitary	(Type IS)	4 10/16	4		740	All were cut-around
	(Fruit)	6 14/16	6 2/16		262	All were cut-around
Shorty Sanitary		4 2/16	2 9/16		7	All were cut-around
Tall Sanitary		7 8/16	5 4/16		2	All were cut-around
		7	5 8/16		1	All were cut-around
Olive oil		4 8/16	3 4/16	?	1	
		9	6 4/16		1	
Tall Rectangular		11 8/16	6 1/16	2 7/16	1	
Rectangular		3 15/16	3 12/16	2 10/16	1	
Turpentine		5 2/16	3 4/16	2 1/16	1	
Sardines		4 4/16	3 4/16	14/16	78	
Oval Herring can		6 9/16	4 4/16	1 8/16	7	
Tobacco		4 6/16	2 14/16	15/16	12	Wire-hinged external friction lid
Vegetable or Fruit		6 14/16	6 2/16		16	
Spice Can		4	2 8/16	1 13/16	17	
Spice Can		4 13/16	4 12/16	3 5/16	1	
Wire-handled rectangular		11 8/16	6 2/16	4	2	
Log Cabin					2	
Coffee/Baking Soda		5 2/16	3 12/16		3	
Texaco/Kerosene		13 9/16	9 6/16	9 6/16	28	Embossed star on bottom/spout
Kerosene Can Lid					1	
Texaco Can Lid					1	
Rectangular Can Lid					1	
Can Lid					1	
Hole and Cap		4 12/16	3 7/16	1 6/16	12	
Un ID can fragments					187	
Paint-Gallon					4	
Paint-Gallon Colander					1	
Sanitary		4	3 8/16		1	
Baking Powder Lid			5 2/16		3	
Baking Powder Can		4 13/16	4 12/16	3 5/16	18	
Gun Powder Can		19 4/16	12 7/16		1	
Total Cans					**3244**	

		Dimensions (inches)				
Artifact Description		**Height**	**Width/ Diameter**	**Thickness/Cap**	**Totals**	**Description**
Clear Glass						
Neck and Lip					3	
Bottle Base					3	Embossed horseshoe on bottom
Square bottle fragment					1	
Square bottle base frag.					1	
Window glass Frags					32	
Fluted drinking glass frag.					1	
Chemical Glass					11	
Un ID fragments					43	
Catsup Bottles					5	
Bottle Fragments					201	
Bottle Glass					1	
Bottle Glass					1	
Chemical Glass					11	
Green Glass Insulator Fragments					50	
Brown Glass					2	
Total Glass					**366**	
Ceramics						
Whiteware	fine white paste and glaze				331	
Whiteware	cup fragment				1	
Crockery Lid					1	
Brown Insulator fragments					1	
Piping frags, white	cup fragment				15	
Crockery fragments					1	
Total Ceramics					**350**	
Paper		1 1/4			1	
Total Paper					**1**	
Metal Artifacts						
Oil Can		3 14/16	3 1/6		1	
Steel lot tag			13/16	1/16	1	Stamped with the number "14"
Iron drill fragment		15 3/16	12/16		1	
Ore car tie spike		4 7/16	7/16	8/16	1	
Chaining pin		6 10/16	3/16		1	
Milling ball				2 3/16	1	Weighs 5 pounds 5 ¼ ounces
Strapping		1	1/16		5	
Brass pocket watch rim					1	
Draft horseshoe					1	
Door knob escutcheon					1	
Steel Bar		18	2	4/16	1	
Galvanized Wash tub					1	
Barrel Hoop					1	
Flattened aluminum bowl					1	

		Dimensions (inches)				
Artifact Description		**Height**	**Width/ Diameter**	**Thickness/Cap**	**Totals**	**Description**
Pie Tin					1	
Cast iron stove door					1	
Stove vent fragment					1	
Light Bulb		3 14/16	2 4/16		1	
Total Metal Artifacts					**22**	
Cartridges						
.25 Remington WRA co. 25 REM					3	
Total Cartridges					**3**	
Misc Artifacts						
Insulators cross wrapped with cloth and metal posts					30	
Strapping		24	1 3/16	1/16	3	
Telephone/electrical wire					1	
Tail pipe frag					1	
Cupel		13/16	1 1/2		2	
Rail Screen near F5B					1	
Total Misc. Artifacts					**38**	
Total Artifacts					**4024**	

Eligibility: This site is recommended as eligible for inclusion on the National Register of Historic Places (NRHP) under Criteria A and D. Under Criterion A, it is associated with significant events of Lemhi County, namely the efflorescence and decline of mining in the early 20th century. Under Criterion D, it retains the potential to yield additional significant information on a local, regional, and state level. Because this project was limited to recording the Harmony Mill and its immediate vicinity, the remainder of the associated mine area should be recorded. Other features that are likely to be identified in the site area include foundations, roads and ore car grades, adits, mining equipment and mining artifacts. Because the mine employed both staff and contract labor, information regarding ethnicity and demography may be revealed through library research. Additionally, environmental modifications may yield a chronology relating to the various phases of mine development, as well as documenting changes in mining engineering and technology. To date, it is unknown if the mine is associated with persons significant on a local, regional, state, or national level; therefore, a recommendation concerning Criterion B cannot be provided. The mill has lost complete integrity as a result of the fire of 2003; it is not recommended eligible for listing to the NRPH under Criterion C.

4.2 MONITORING RESULTS

Monitoring of construction was conducted by North Wind archaeologist Thor Olmanson from September 27 to October 2, 2003. Additional inventory was also conducted during the monitoring.

Olmanson monitored and oversaw placement of cut trees/logs between the road and Feature 1 (i.e. can concentrations) on September 27, 2003. The trees were laid parallel to the road to prevent impact to the concentrations by spoil resulting from road grading and widening. The logs were successfully placed and road construction occurred without impacting the feature. Additional monitoring of the truck turnaround at the head of the tailings was conducted with negative results. Feature 13, a partial foundation that had previously been documented during the inventory phase, was removed with negative results. No additional subsurface features were observed. On this date, EQM decided that the two proposed roads that were inventoried through Feature 1 would be unnecessary; however, discussion for the need of an additional rock source south of the mill, in the drainage, occurred. Removal of rock from this area would impact Features 25 and 26.

On September 29, 2003, placement of a plastic pipe in the upper ditch (Feature 5a) was monitored. Breaks in the ditch were repaired and the pipe was laid in the bottom of the feature to divert the flow of Harmony Creek around the tailings. The lower ditch (Feature 5b) that contains the rock lining was not disturbed.

On September 30, 2003, Thor Olmanson met with Steve Matz Salmon-Challis National Forest archaeologist) and Ray Henderson (U.S. Forest Service Engineer) to update them on events concerning the tailings cleanup. The potential rock source near Feature 25 and Feature 26 was placed off limits for this project. Monitoring of road construction and the truck turnaround continued on October 1, 2003. A rock and earth berm was constructed and monitored on the west side of the turnaround on October 2. The berm began approximately 50 ft (15 m) northwest of Feature 26 (foundation). In addition, an inventory adjacent to the repository was conducted. A linear inventory of approximately 300 ft (91.4 m) was conducted opposite the repository on the west side of Harmony Creek with negative results. A total 0.6 acres was inventoried. A log bridge was planned to cross the creek and nets were to be placed beneath the talus slope to reduce impact to the stream channel while removing the rock.

Approximately 80 cubic yards of tailings were removed from the northwest end of the mill. Monitoring revealed additional footings that had been covered by the burned debris. The footings measure 14 by 15 1/2 by 17 inches. The footings were photographed and the remainder of the monitoring was completed with negative results.

No other features were encountered and the monitor was placed on-call and returned to Idaho Falls. EQM did not utilize a monitor during the rest of the tailings removal. Figures 4.24-4.26 are photographs taken during the monitoring of the tailings removal.

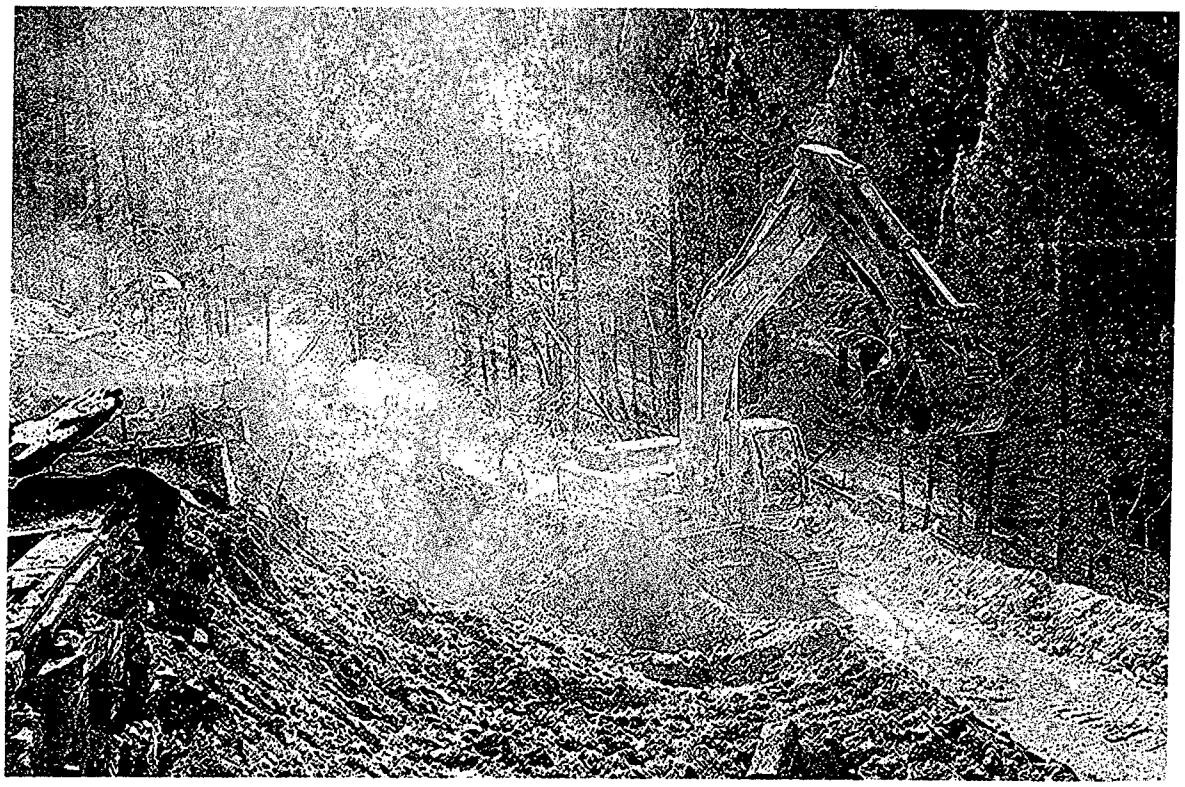


Figure 4.24 Road Improvement Northwest of Feature 6. View to the West.

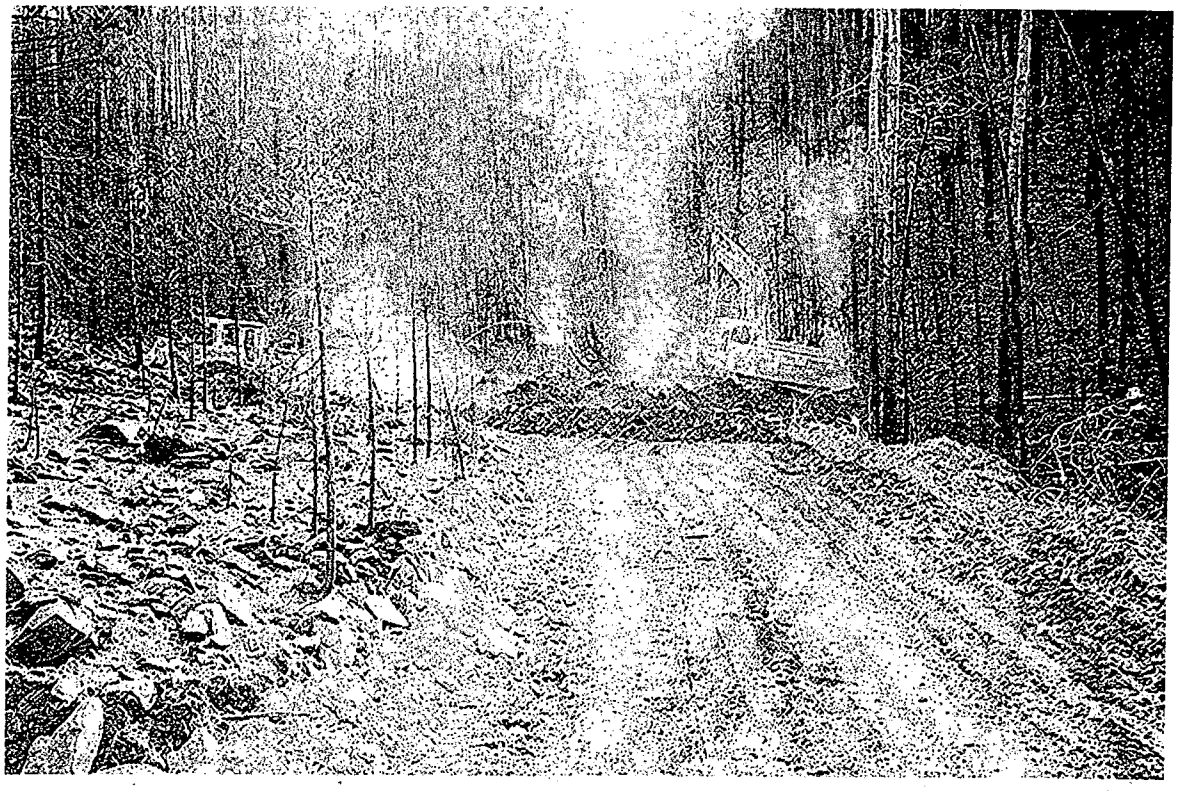


Figure 4.25 Road Improvement Near Eastern Borrow Area

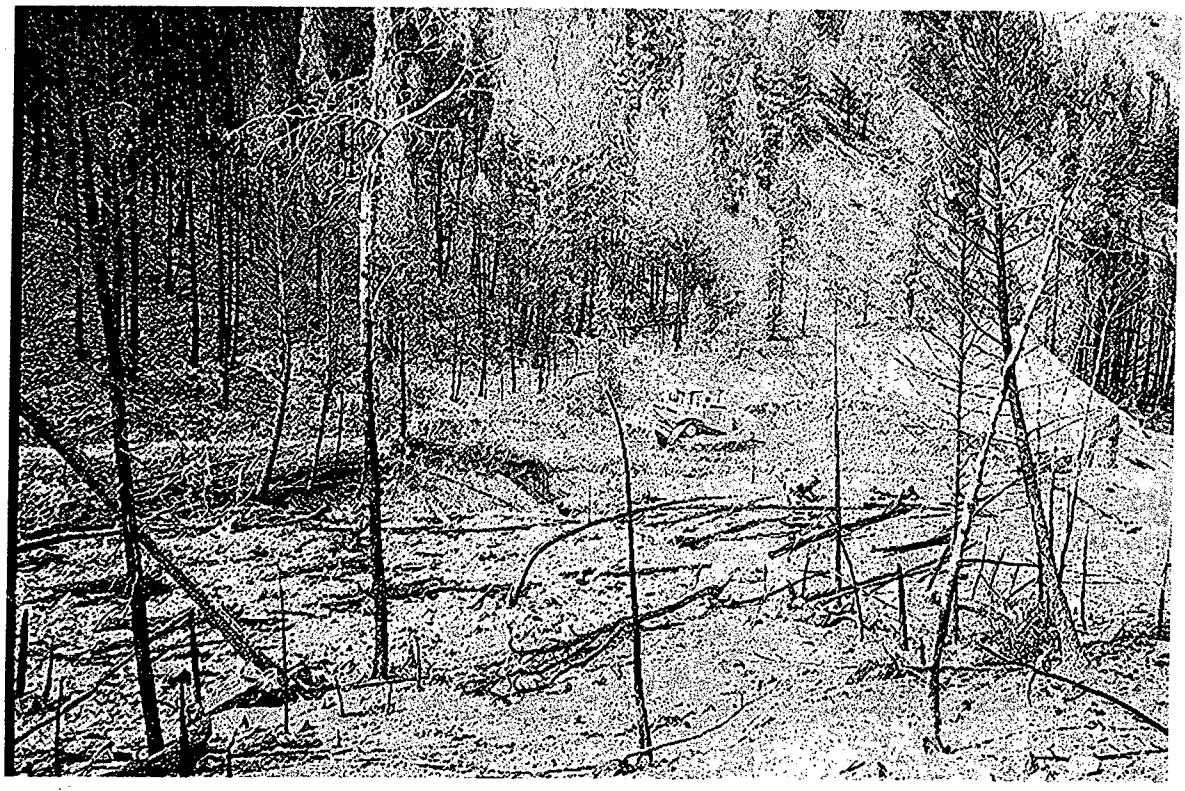


Figure 4.26 Working on South End of Tailings

5.0 SUMMARY AND RECOMMENDATIONS

During the current project, 146.3 acres were inventoried; this included an existing two-track road located between the mill area and the proposed tailings repository, two proposed ancillary road locations between the existing two-track road and the tailings (to facilitate removal of the tailings), a repository for the tailings, three rock sources (borrow areas), the mill remains, the area west and southwest of the mill remains and the area surrounding the tailings. Thirty features and approximately 4,024 artifacts were identified. The features included 11 foundations, three can dumps, three depressions, two roads/grades, two ditches, two dams, the remains of one mill, one section of corduroy road, the remains of a possible corral, one car body, one mill tailings area, one collapsed adit, and one powerline.

Site SC-34 was previously recommended as eligible for inclusion on the NRHP under Criterion D (Unknown 2003). North Wind concurs with that recommendation. North Wind also recommends the site as eligible under Criterion A; it is associated with significant events of Lemhi County, namely the efflorescence and decline of mining in the early 20th century.

As a result of the Withington Fire and the succeeding high intensity thunderstorms that first burned the Harmony Mill and the surrounding area and then washed out the tailings and settling pond, the Salmon-Challis National Forest, in partnership with the Environmental Protection Agency (EPA) and the Idaho State Historic Preservation Officer (ISHPO) contracted Herrara Environmental Consultants, who, in turn, subcontracted EQM to initiate clean up of the tailings.

The urgency to remove the tailings prior to the arrival of winter necessitated that the cultural resource inventory would focus only on those areas of the site that had the potential to be impacted by activities associated with the removal of the tailings. To expedite the removal of the tailings, permission was granted (in select areas) by the Salmon-Challis National Forest archaeologist to allow EQM to remove (if necessary) features associated with the mill area, after the cultural resource inventory had occurred. In most cases, this was not necessary. Only two features were impacted by EQM during the tailings removal. The northwest corner of Feature 6, the mill, was removed; however Feature 6A, the kiln or furnace, was preserved. EQM was also forced to remove Feature 13, a mostly destroyed foundation, to facilitate construction of a truck turnaround near the head of the tailings. By constructing the truck turnaround near the head of the tailings, EQM was able to avoid constructing any ancillary roads through Feature 1. Opening an additional rock source near features 25 and 26, was discussed; however, a conference between the North Wind monitor, the Salmon-Challis National Forest Archaeologist and the U.S. Forest Service Engineer decided a rock source would not be allowed in that area, thus, preserving the features.

North Wind recommends that prior to any other projects that may effect Site SC-34 occurring, the remainder of the site should be inventoried and recorded. The avoidance of this site in relation to any upcoming projects is recommended. Library research may

yield information concerning individual feature function, ethnicity of the workers, and other demographic details. A testing program within features may also likely provide information regarding function and could also address spatial distribution and composition of the mine.

If additional tailings are to be removed in association with this project in the future or if other construction activities may occur that will impact the features at the site, the following is recommended:

1) **Surface Disturbance**: Ground disturbing activities will be confined to the inventoried areas and an archaeological monitor should be present in areas of potential buried deposits.

2) **Accidental Discovery**: Any cultural and/or paleontological resource discovered by any person working on Federal land during project activities will be reported to the Salmon-Challis National Forest archaeologist. Suspension of all operations in the immediate area of the discovery will occur until authorization to proceed is issued by the Salmon-Challis National Forest archaeologist. Evaluation of the discovery will be conducted by the Salmon-Challis National Forest archaeologist to determine the appropriate actions to be taken to prevent the loss of significant cultural or scientific values. Any decision as to proper mitigation measures will be made by the Salmon-Challis National Forest archaeologist.

3) **Avoidance of Features within the Site:** Features within the site will be avoided unless clearance has been provided by the Salmon-Challis National Forest archaeologist.

4) **Collection:** All personnel working in or near the site should be notified that the collection of cultural resources is prohibited.

6.0 REFERENCES

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Appendix A
Site Form

ARCHAEOLOGICAL SURVEY OF IDAHO
SITE INVENTORY FORM
Part A – Administrative Data

1. **State No.** _____
2. **AgencyNo.** SC34
3. **Temporary No.** SC-34

4. Site name(s) Harmony Mill Area **5. County** Lemhi

6. Class:

❑ Prehistoric X Historic ❑ Traditional Cultural Property ❑ Undetermined

7. Land owner Private and Forest Service **8. Federal admin. unit** _____

9. Project Harmony Mill Tailings Emergency Clean-up **10. Report No.** _____

11. Recorder(s) W. Harding, J.Boughton

12. Organization North Wind, Inc **13. Date** 9/19/03 to 9/22/03

14. Attachments and associated records:

X Topographic map (required)
X Site map (required)
X Photos with labels/log (required)
❑ Artifact illustrations
X Feature drawings
❑ Stratigraphic profiles
❑ Rock art attachment
❑ Historical records
❑ Assoc. IHSI forms _____
❑ Other _____

15. Elevation (site datum) 6880 (at mill) **(ft)**

16. Site dimensions: 650 **m X** 450 **m** **Area** 135,060 **m^2**

17. UTM at site datum: Zone 12, 277787 **m Easting** 4988460 **m Northing using NAD 1927.**

18. UTM source:

X Corrected GPS/rectified survey (<5m error) ❑ Uncorrected GPS ❑ Map template ❑ Other explained under comments

19. Township 20N **, Range** 22E **, Section** 35 **;** S1/2 **1/4 of** SW **1/4 of** SW **1/4 of** NE **1/4**

Additional legals listed on an attachment. X .

20. USGS 7.5' map reference Sal Mountain, (1991), Idaho USFS 7.5" Quadrangle Series (1:24,000 Scale)

Additional maps listed on an attachment. ☐

21. Access From the intersection of Hwy. 28 at Baker, Idaho, turn southwest past a bed and breakfast and go .2 mile to a "T" intersection. Turn southeast and proceed .35 mile to a branch in the road. Turn southwest and go approximately 4.2 miles to a gate. Proceed through the gate and go approximately 1.35 mile. Do not follow the main road at this point but instead turn southwest and go 1.8 mile up a southwest-northeast trending drainage. At this point there is a hard switchback to the west. Follow the road .65 mile to the mill remains.

22. Site description This site consists of the Harmony Mill, the tailings and immediate vicinity, and the main road to the mill. It is composed of 30 features. The features comprise 11 foundations, three can dumps, three depressions, two roads/grades, two ditches, two dams, the mill remains, a corduroyed section of a road, corral remains, a car body, the mill tailings, a collapsed adit, and a powerline. A description of the features and artifacts are located on the Continuation Sheet.

23. Site type:

X	Historic building*	❑	Rockshelter/cave	❑	Mortuary	❑	Faunal
❑	Historic structure*	❑	Stacked/placed rocks	❑	Rock art	❑	Culturally modified trees
❑	Historic object*	❑	Quarry/lithic source	X	Feature(s)	X	Other Mill Site
❑	Prehistoric residential	❑	Linear	X	Artifact(s)		

*Following definition for the National Register of Historic Places.

24. Specify themes and time periods:

Themes				Time Periods	
❑	Prehistoric archaeology	❑	Military	❑	Prehistoric-general	❑	Settlement: 1855-1890
❑	Agriculture	X	Mining industry	❑	Paleoindian	❑	Phase 1 statehood: 1890-1904
❑	Architecture	❑	Native Americans	❑	Archaic-general	X	Phase 2 statehood: 1904-1920
❑	Civilian Conservation Corps	❑	Politics/government	❑	Early Archaic	X	Interwar: 1920-1940
❑	Commerce	❑	Public land management	❑	Middle Archaic	❑	Premodern: 1940-1958
❑	Communication	❑	Recreation/tourism	❑	Late Archaic	❑	Modern: 1958-present
❑	Culture and society	❑	Settlement	❑	Late Prehistoric-general	❑	Historic/Modern-general
❑	Ethnic heritage	❑	Timber industry	❑	Protohistoric/Contact	❑	Unknown
❑	Exploration/fur trapping	❑	Transportation	❑	Historic Native American		
❑	Industry	❑	Other	❑	Exploration: 1805-1860		

25. National Register of Historic Places (NRHP) evaluation: *

X Individually eligible ❑ Contributing in a district ❑ Not eligible ❑ Insufficient information to evaluate

*Evaluation subject to review by SHPO.

26. NRHP criteria used:

X A: Event ❑ B: Person ❑ C: Design and construction X D: Information potential

27. Comments on significance This site is recommended as eligible for inclusion on the NRHP under Criteria (A) and (D). Under Criterion (A), it is associated with the latter part of the efflorescence of mining in Lemhi County and it was a copper mine, which is less common than other minerals for the region. Under Criterion (D), the site contains foundations and other features that, with subsurface investigations, may yield clues to the ethnicity and sex of the occupants and workforce, demography, and chronology of environmental modifications for the mine and mill.

28. If not eligible, explain why _____

29. Condition (prehistoric component):

❑ Excellent ❑ Good ❑ Fair ❑ Poor

Condition (historic component):

❑ Excellent ❑ Good ❑ Fair X Poor

30. Impact agents:

❑	Agricultural use	❑	Development project	❑	Mining/quarrying	❑	Road/highway	❑	Vandalism
❑	Building alteration	X	Erosion	❑	No information	❑	Rodent damage	X	Other Fire and flood
❑	Deflation	❑	Grazing	❑	Recreation use	❑	Structural decay		
❑	Demolished	❑	Looting	❑	Research excavation	❑	Timber harvest		

Comments on impact agents The mill was burned by a forest fire in the summer of 2003. A flash flood occurred subsequent to the fire; the flash flood eroded or destroyed several features and redeposited numerous artifacts.

31. Surface collection:

❑ None ❑ Previously collected X Grab sample ❑ Designed sampl ❑ Complete

32. Sediments:

❑ Absent X 0-20 cm ❑ 21-100 cm ❑ >100 cm ❑ Suspected but not tested

Explain how this was determined The foundations were burned and some were partially covered by silt from a subsequent flash flood.

33. Excavation status:

❑	Unexcavated	❑	Auger/probe	❑	Test unit	❑	Backhoe, etc.
X	Surface scrape	❑	Shovel test	❑	Block excavatio		

Describe collection/testing/excavation Clearly functional and temporally diagnostic artifacts were collected from several features. Shovel scrapes were also conducted around the furnace/kiln in the mill.

34. Excavation volume (indicate liters or cubic meters) _____ **Screen mesh** _____

35. Additional comments _____

Part B – Environmental Data

36. Distance to permanent water 0 **m**

37. Water source:

☐ Spring, seep X River/stream ☐ Lake ☐ Other_____

38. On-site vegetation (estimate percentage of total vegetation for each class and identify species):

Trees: 90 **%** **Species:** Lodgepole pine (area recently burned, these trees are all dead).

Shrubs: 10 **%** **Species:** Unknown (scattered shoots, likely sage)

Forbs: _____ **% Species:**

Grasses: _____ **% Species:**

Lichens/mosses: _____ **% Species:**

Describe Prior to the site visit, the area was badly burned by a forest fire. As a result, little vegetation remained except for the burned standing trees. No grasses, forbs, or shrubs, per se, were apparent.

39. Visible surface area:

☐ 0% ☐ 1-25% ☐ 26-50% ☐ 51-75% X 76-100%

40. Landform (Describe, including lithology, form, and soil, using locally or regionally appropriate terms, eg. arroyo, playa, moraine, etc.) This site is located predominantly on the northwest slope of a ridge overlooking Harmony Creek to the northwest. The mill area and ditches were on the opposite side of the creek. Including the road, the site is situated on the bottom of the valley and midway up the ridge. Soils are generally regolic and colluvial. They are composed of silty clays interspersed with talus and angular cobbles and boulders composed of rhyolitc tuff deriving from the Eocene age Challis Volcanic formation. The bottom of the creek was recently scoured by a flash flood in August, 2003, washing in large amounts of angular and subangular cobbles and boulders and stripping the soil in numerous areas.

Part C – Prehistoric Sites

41. Phase/period None

42. How classified_____

43. Maximum artifact density_____ **m^2**

44. Individual artifacts:

Count	Category	Description

45. Lithic Debitage – Estimated Quantity:

☐ None ☐ 1-9 ☐ 10-25 ☐ 25-100 ☐ 100-500 ☐ 500+

Flaking Stages (not present, rare, common, or dominant):

Decortication_____ **Secondary**_____ **Tertiary**_____ **Shatter**_____

46. Material types_____

47. Additional description_____

48. Features:

Count	Category	Description

49. Additional description

Part D – Historic Sites

50. Cultural affiliation EuroAmerican

51. Oldest date 1916 **Recent Date** 1932

52. How determined Documentary sources

53. Maximum artifact density 12 m^2

54. Individual artifacts:

Count	Category	Description
		See attached

55. Additional description

56. Features:

Count	Category	Description
11	Foundations	**SEE ATTACHED (D.57)**
3	Can Dumps	
3	Depressions	
2	Roads/grades	
2	Ditches	
2	Dams	
1	Mill Remains	
1	Corduroy road	
1	Corral remains	
1	Car body	
1	Mill tailings	
1	Collapsed Adit	
1	Powerline	

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19. (Continued) T20N R22E, Section 35 W1/2 W1/2 NW1/4 SE1/4; E1/2 NE1/4 SW1/4; NE1/4 NE1/4 SE1/4 SW1/4; NW1/4 NW1/4 SW1/4 SE1/4

57. Additional description:

This site consists of the Harmony Mill (Site SC-34) and its immediate vicinity that may be impacted by the emergency clean up of contaminated tailings. As recorded, the site is composed of 30 features, although some of the features were broken into subfeatures. The features comprise 11 foundations, three can dumps, three depressions, two roads/grades, two ditches, two dams, the mill remains, a corduroyed section of a road, corral remains, a car body, the mill tailings, a collapsed adit, and a powerline.

The impending arrival of winter necessitated that the cultural resource inventory would focus on those areas that may be impacted by activities associated with the removal of the tailings. For this reason, only selected areas of the entire site were inventoried. This included recording the mill and associated features within the area of potential impact, the inventory of three land parcels for use as a tailings repository and three rock (borrow) sources, and inventory of the main road and the location of two proposed ancillary roads.

Feature 1 consists of a series of seven tin can concentrations located east of the main road (Feature 4) that leads to the mill. The concentrations vary in size from 21 by 25 ft to 120 by 130 ft and contain from 76 (Concentration 4) to approximately 2,383 (Concentration 6) artifacts; the seven can concentrations appear to contain a total of at least 3,918 artifacts—predominantly hole-in-cap tin cans, but also numerous sanitary and other cans. Glass fragments are also present and consist predominantly of clear glass with very little brown glass or other colors. Whiteware ceramics, indicative of boarding houses or institutions, are also apparent. The average size of the concentrations is 57 by 70 ft.

Feature 2 is a can concentration. This feature measures 25 by 25 ft and contains 56 artifacts similar to those identified in Feature 1. Table 4.1 summarizes the concentrations associated with Feature 1 and Feature 2. Tables 4.2-4.9 detail the artifacts located within each concentration.

Table 4.1 Dimensions of Feature 1 Concentrations and Feature 2, Site SC-34.

	Width	Length	No. Artifacts	Sq. Ft	Artifacts/Sq.ft.
Feature 1C1	30	33	165	990	6
Feature 1C2	60	114	599	6840	11
Feature 1C3	30	45	336	1350	4
Feature 1C4	21	25	76	525	7
Feature 1C5	75	80	192	6000	31
Feature 1C6	120	130	2383	15600	7
Feature 1C7	60	60	169	3600	21
Feature 2	25	25	56	625	11

C# = Concentration Number.

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Table 4.2 Artifacts at Feature 1, Concentration 1, Site SC-34.

Artifact	Height	Diameter/Width	Seam/Thickness	No.	Shape	Comments
Hole-in-Top	4 4/16	3	C	73		
	4 11/16	4	C	12		
Sanitary	4 10/16	4		30		
	6	?		1		
Sardines	4 4/16	3 4/16	14/16	15		
Tobacco	4 6/16	2 14/16	15/16	1		
Vegetable or Fruit	6 14/16	6 2/16		16		
Spice Can	4	2 8/16	1 13/16	1		
Total Cans				149		
Clear Glass						
Bottle Glass				1	Rectangular	"-ORIN CO. BRAND REG. U.S. PAT. OFFICE" on side panel
Bottle Glass				1	cylindrical	Wide-mouth jar, with bubbles and seeds
Chemical Glass				11		
Brown Glass				1	Body and Neck	"-oppes No. 9"
Total Glass				14		
Ceramics						
Whiteware	fine white paste and glaze			1		
Paper		1 1/4		1		paper seal
Total Artifacts				**165**		

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Table 4.3 Artifacts at Feature 1, Concentration 2, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.	Shape	Comment	
CANS								
Hole-in-Top	Type I	4 4/16	3	C	79			
	Type II	4 11/16	4	C	47			
Sanitary	Type IS	4 10/16	4		109			
		6 14/16	6 2/16		62		"Without Sugar Added Second"	
		9	6 4/16		1			
Shorty Sanitary		4 2/16	2 9/16		7			
Tobacco		4 6/16	2 14/16	15/16	3			
Spice Can		4	2 8/16	1 13/16	1			
Spice Can		4 13/16	4 12/16	3 5/16	1			
Wire-handled rectangular		11 8/16	6 2/16	4	2		Syrup?	
Log Cabin					1			
Coffee/Baking Soda		5 2/16	3 12/16		3		External Friction Lid	
Texaco/Kerosene		13 9/16	9 6/16	9 6/16	1		Corner Spout, Star on Bottom	
Can Lid					1		"Sanitary" embossed on it	
Hole and Cap		4 12/16	3 7/16	1 6/16	1			
Un ID can Frags					187			
Total Cans					**506**			
Clear Glass								
Neck and Lip					1			
Bottle Base					1	cylindrical		Embossed horseshoe
Chemical Glass					11			
Un ID Frags					43		includes 3 3-2/16 tall fragments,	
Catsup Bottles					2		Six Fragments	
Bottle Fragments					1			embossed on base
Brown Glass					1		Threaded neck Fragment, seam all the way up, 1 inch wide	
Total Glass					**60**			

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Artifact		Height	Diameter/Width	Seam/Thickness	No.	Shape	Comment	
Ceramics								
Whiteware	fine white paste and glaze				20			
Whiteware	cup fragment				1			
Total Ceramics					**21**			
Metal Artifacts								
Strapping		1	1/16		2			
Brass pocket watch rim					1			
Galvanized Wash tub					1		no bottom, 2 ft 8-inches wide	
Total Metal Artifacts					**4**			
Cartridges								
.25 Remington WRA co. 25 REM					3			
Total Cartridges					**3**			
Misc Artifacts								
Modern Herring tin					1			
Telephone/electrical wire					4		10-80 ft	
Total Misc. Artifacts					**5**			
Total Artifacts					**599**			

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Table 4.4 Artifacts at Feature 1, Concentration 3, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comment	
CANS								
Hole-in-Top	Type I	4 4/16	3	C	57			
Sanitary	Type IS	4 10/16	4		43			
Sardines		4 4/16	3 4/16	14/16	7			
Spice Can		4	2 8/16	1 13/16	3			
Tall Sanitary		7 8/16	5 4/16		2		Cut-around	
Paint-Gallon					1			
Sanitary		4	3 8/16		1		Embossed wheel on top	
Baking Powder Lid			5 2/16		1			
Total Cans					**115**			
Clear Glass								
Square bottle frag					1		"A1" embossed on side 1-10/16	
Bottle Base					1		Horseshoe-embossed	
Neck and lip					1		15/16 wide	
Square bottle base frag					1		1-11/6, small diamond embossed on bottom	
Catsup Bottles Frags					1			
Window glass Frags					30			
Total Glass					**35**			
Ceramics								
Whiteware	fine white paste and glaze				150			
Crockery Lid					1		Maybe brown, too burned to tell	
Total Ceramics					**151**			

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Artifact	Height	Diameter/Width	Seam/Thickness	No.	Comment
Metal Artifacts					
Draft horseshoe				1	
Total Metal Artifacts				**1**	
Misc Artifacts					
Insulators cross wrapped with cloth and metal posts				30	
Strapping	24	1 3/16	1/16	3	
Tail pipe frag				1	
Total Misc. Artifacts				**34**	
Total Artifacts				**336**	

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Table 4.5 Artifacts at Feature 1, Concentration 4, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comment
CANS							
Hole-in-Top	Type I	4 4/16	3	C	42		
Sanitary	Type IS	4 10/16	4		14		"SANITARY" stamped on lid, cut around
		6 14/16	6 2/16		16		
Olive oil		4 8/16	3 4/16	?	1		POMPEIAN Virgin Olive Oil--small rectangular with corner spout
Tall Rectangular		11 8/16	6 1/16	2 7/16	1		corner spout
Paint-Gallon					1		
Total Cans					**75**		
Clear Glass							
Cylindrical bottle base					1		"HJ HEINZ CO" on top "186" in center "Pat°" on bottom
Total Glass					**1**		
Total Artifacts					**76**		

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Table 4.6 Artifacts at Feature 1, Concentration 5, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comments
CANS							
Hole-in-Top	Type I	4 4/16	3	C	73		
Sanitary	Type IS	4 10/16	4		17		
		6 14/16	6 2/16		11		
Rectangular Can Lid					1		"HERSHEY COCO_ _ _"
Hole and Cap		4 12/16	3 7/16	1 6/16	3		
Kerosene Can Lid					1		
Baking Powder Lid			4 5/16		1		"PERFECTLY MADE, DR. PRICES CREAM BAKING SODE 2 1/2 lbs FULL WEIGHT"
Total Cans					**107**		
Clear Glass							
Catsup Bottles					1		Octagonal variety?
Green Glass Insulator Frags					50		"BROOKFIELD, NEW YORK" embossed on body
Brown Glass							
Total Glass					**51**		
Ceramics							
Whiteware	fine white paste and glaze				30		
Brown Insulator Frags					1		3 small nubs as feet
Total Ceramics					**31**		
Metal Artifacts							
Door knob escutcheon					1		1-14/16 W x T9/16
Bar		18	2	4/16	1		
Total Metal Artifacts					**2**		

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Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comments
Misc Artifacts							
Telephone/electrical wire					1		100 ft strand
Total Misc. Artifacts					**1**		
Total Artifacts					**192**		

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Table 4.7 Artifacts at Feature 1, Concentration 6, Site SC-34.

Artifacts		Height	Diameter/Width	Seam/Thickness	No.		Comments
CANS							
Hole-in-Top	Type I	4 4/16	3	C	793		
	Type II	4 11/16	4	C	487		
Sanitary	Type IS	4 10/16	4		463		
	Fruit	6 14/16	6 2/16		142		
Sardines		4 4/16	3 4/16	14/16	56		
Tobacco		4 6/16	2 14/16	15/16	7		
Oval Herring can		6 9/16	4 4/16	1 8/16	7		Cut-around with a star in a circle and "QUALITY MADE" embossed around the star
Spice Can		4	2 8/16	1 13/16	12		
Baking Powder Can		4 13/16	4 12/16	3 5/16	18		External friction lid
Log Cabin					1		
Texaco/Kerosene		13 9/16	9 6/16	9 6/16	18		
Hole and Cap		4 12/16	3 7/16	1 6/16	8		
Paint-Gallon					2		
Baking Powder Lid			5 8/16		1		5 lbs
Total Cans					**2015**		
Clear Glass							
Neck and Lip					1		15/16 D
Fluted drinking glass frag					1		
Bottle Fragments					200	plus	
Window Glass Fragments					2		
Total Glass					**204**		
Ceramics							
Whiteware	fine white paste and glaze				130		

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Artifacts		Height	Diameter/Width	Seam/Thickness	No.		Comments
Piping frags, white	cup fragment				15		
Crockery fragments					1		Sugar-glazed lid fragment
Total Ceramics					**146**		
Metal Artifacts							
Strapping		1	1/16		1		
Barrel Hoop					1		
Flattened aluminum bowl					1		
Pie Tin					1		
Total Metal Artifacts					**4**		
Misc Artifacts							
Boot heel					1		
Rubber canning jar seal					1		
Light bulb fragments					2		
Fork					1		
Cast Iron Stove Frags					5		"8 INCH WITH CENTER" One is a griddle fragment
Metal insulator arm					1		Threaded end and two holes
Total Misc. Artifacts					**11**		
Bone					**3**		Bovine Saw-cut
Total Artifacts					**2383**		

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Table 4.8 Artifacts at Feature 1, Concentration 7, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.			Comment	
CANS									
Hole-in-Top	Type I	4 4/16	3	C	107				
Sanitary	Type IS	4 10/16	4		36		21 w/o embossing	15 w/"SANITARY" embossing,	
	Fruit	6 14/16	6 2/16		15				
		7	5 8/16		1		SANITARY embossed on lid and cut around (coffee?)		
Turpentine		5 2/16	3 4/16	2 1/16	1		?		
Texaco/Kerosene		13 9/16	9 6/16	9 6/16	3				
Texaco Can Lid					1				
Fruit					1		1/2 side cut away, but bottom intact, scoop-like		
Total Cans					**165**				
Metal Artifacts									
Strapping		1	1/16		2				
Cast iron stove door					1		23	25	1/16
Stove vent frag					1				
Total Metal Artifacts					**4**				
Total Artifacts					**169**				

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Table 4.9 Artifacts at Feature 2, Site SC-34.

Artifact		Height	Diameter/Width	Seam/Thickness	No.		Comment
CANS		.					
Hole-in-Top	Type I	4 4/16	3	C	29		
Sanitary	Type IS	4 10/16	4		10		
	Fruit	6 14/16	6 2/16		14		
Rectangular		3 15/16	3 12/16	2 10/16	1		Icepick open, but with punch out top
Paint-Gallon Colander					1		
Total Cans					**55**		
Clear Glass							
Catsup Bottles base frag					1		10-sided embossed on bottom: "'PACKED BY CAL. PACK CORP
Total Glass					**1**		
Metal Artifacts							
Galvanized Wash tub					1		no bottom, 2 ft 8-inches wide
Total Metal Artifacts					**1**		
Misc Artifacts							
Telephone/electrical wire					1		10-80 ft
Total Misc. Artifacts					**1**		
Total Artifacts					**58**		

Feature 3 consists of a 17.0 ft long section of corduroy laid on the main road that leads to the mill (Feature 4). Approximately 2.0 ft of the corduroy is visible and deposits on the road obfuscate the rest; however, the corduroy likely extended across the road. The visible portion is on the downslope side of the road. The corduroy is made from planed timbers that measure from 5.0 to 7.0 inches wide; thickness is indeterminable as the timbers are mostly buried below the ground surface.

Feature 4 is the main road to the mill. The inventoried portion of the road measures 2.8 miles in length and is approximately 9.0 ft wide on average. The road is in very poor condition and is cut into the slope. No reinforcement or rock embankments were observed. Feature 3, the corduroy section, is a feature within the road.

Immediately west of Feature 3 and near the east end of Feature 1 is Feature 4A, a road cut that leads from Feature 4 to the bottom of the drainage to the northwest. Feature 4A measures 7-9 ft wide. No reinforcement is apparent with this roadcut. The southern portion of Feature 4A cuts through Concentration 6 of Feature 1.

Features 5A and 5B are ditches located across the drainage (north) from the mill. The ditches are constructed parallel to each other. Two segments of Feature 5A were identified. The northern segment of Feature 5A is located approximately 60.0 ft upslope from Feature 5B. It is an north-south trending earthen ditch that appears to have undergone considerable siltation. It measures 700 ft long by 7 ft wide by 1 ft deep (as a result of siltation) at its south end. At its northern end, where no water is presently flowing, the feature is less silted and appears to display more of the original attributes. The ditch is excavated through talus and it exhibits little siltation. At this point, it measures 3 ft 6 inches deep by 10 ft wide from the eastern (exterior) shoulder to the hill cut. The east shoulder (berm) measures 8 ft wide and is 2 ft above the surrounding slope. The northern segment of this ditch was breached about 210 ft from its southern terminus. At the northern terminus, the ditch turns 90° east and runs down the slope, below the tailings. Another ditch segment that may be associated with Feature 5A was identified on the west side of the drainage where features 25 and 26 are located. This segment is tenuously associated with Feature 5A based on its construction style; neither of the walls of this ditch segment display any reinforcement, such as the walls of Feature 5B. The description of the southern ditch segment mirrors that provided above for the northern segment of Feature 5A; however, the southern segment measures 50 ft long.

Feature 5B is approximately 240 ft long and begins about 100 ft north of the southern terminus of Feature 5A. Presently, Feature 5B carries no water. This feature measures 9 ft wide, from its east shoulder to the west slope, and is 3 ft deep. The initial southern 60 ft of the ditch was excavated through a talus slope and exhibits no reinforcement. The succeeding 140 ft of this feature exhibits the same measurements as the southern portion, but the east wall has been lined with the talus rock, creating an embankment/retaining wall that measure 1 ft 8 inches to 2 ft tall. The northern 40 ft portion exhibits no human modification, although natural talus may have served as a retaining wall. At its northern

terminus, it turns east almost 90° and dumps onto the lower (northern portion) of the tailings.

An artifact was located downslope of this feature, on the east bank of Harmony Creek. The artifact consists of a screen constructed of light gauge rails, such as ore cart rails. It is composed of 26 rails that were cut to form a screen 4 ft high by 3 ft 6 inches wide. The rails are spaced approximately 6 inches apart.

Feature 6 consists of the mill remains. This feature was divided into subfeatures (Features 6A to 6I) for ease of recording. The mill appears to have measured 190 ft long (northwest-southeast) and from 49 to 79 ft wide (northeast-southwest). The mill is roughly rectangular in plan view, with various extensions along its southwest side. Literally thousands of various sizes of wire nails, bolts, joiner plates and pipes were located within and surrounding the mill. Several footings and the remains of a ball mill were observed in the ashes.

The footings of the mill were assigned separate subfeature designations based on elevation. The mill was oriented northwest-southeast along its length and northeast-southwest along its width, with the southeast end highest up the slope. Approximately 108 ft from the southeast corner of the mill is an extension that measures 31 ft (northwest-southeast) by 28 ft 6 inches. Ten, 10 inch wide by 25 ft long timber impressions are visible on the south side of the extension; the timbers were completely burned by the fire. In the northern portion of the extension, approximately 1 ft south of

the last visible timber impression, two 3 inch diameter steel pipes project from the ground. Another 3 inch steel pipe projects from the ground in the northwest portion of the extension,. Another 3 inch diameter steel pipe is located outside the extension, also near

Feature 6A consist of the partial remains of a furnace or kiln located in the northeast corner of the mill. It measures 8 ft 7 inches wide (northeast-southwest) and 18 ft long (northwest-southeast). It is constructed of rock, brick, and concrete. No reinforcement bars, or other reinforcements, are apparent. The rock used in the construction of Feature 6A varies in size from 8 inches to 2 ft while the brick measures a uniform 8 by 2 1/2 by 4 inches. The bricks displayed no maker's marks. A 16 by 16 inch opening is located on the northwest elevation of the feature and appears be the location where the furnace was either fed or cleaned out. Because of the fire, this feature was in poor condition. The actual function of this feature is unknown. It was not mentioned by Gardner (1930) or depicted in his flow sheets.

Feature 6B consists of a series of concrete footing on the lowest tier at the northwest end of the mill. The footings are three different sizes, although prior to the fire, there may have been only two sizes. One footing is square and measures 16 by 16 inches and is 14 inches tall. It is located southeast of the furnace/kiln. Further southeast are five long, linear, footings. They measure 18 ft long by 2 ft wide by 2 ft 6 inches to 5 ft 10 inches tall (dependant on the amount of burned debris around them). Four 12/16 inch by 14 inch

tall rebar and one 3/4 inch by 6 1/2 inch rebar protrude vertically from the northwest end of the five footings. Wood timbers appear to have originally framed the footings. Further to the southeast, in the south corner of the mill, are two additional square footings. They measure 2 ft by 2 ft and are 2 ft 6 inches and 2 ft high—again dependant on the amount of burned debris. These two footings also appear to have been lined with wood.

Feature 6C consists of a series of concrete footings located on the next highest tier of the mill. They are located about 16 ft southeast of, and upslope from, Feature 6B. Feature 6C is composed of seven footings of various sizes. The largest footing in this cluster is "U"-shaped and measures 10 ft 6 inches wide (northwest-southeast) by 11 ft long (northeast-southwest) and is 2 ft 3 inches high. A 7 ft by 2 ft 6 inch section of the southeast end of the footing has been left open. Rebar that measures 1 inch in diameter protrudes 5 1/2 inches vertically from the top of the footing. This footing is located on the north side of the mill and is in poor condition. The remaining footings associated with Feature 6C extend toward the south.

The next series of footings associated with Feature 6C consist of five 2 ft square footings, that extend to the south side of the mill. These footings vary in height from 1 ft 6 inches tall to 3 ft tall, depending on the amount of burned debris around them. One 3/4 inch rebar protrudes 5 inches from the top of the best-preserved footings. The final footing is linear and is about 1 ft southeast of the third and fourth footing in the abovementioned series of five footings. This footing is about 11 ft north of the south side of the mill. It measures 2 ft wide (northeast-southwest) by 8 ft long (northwest-southeast) and is 1 ft tall. A pulley that measures 1 ft 7 inches in diameter by 1 ft 1 inch wide is located near the northwest end of this feature. A 2 inch diameter axle protrudes from both sides of the pulley, which is aligned with the footing. The pulley and footing are part of a belt conveyor that carried material to the concentrates bin (Gardner 1930).

Feature 6D and 6E are parts of the ball mill. Gardner (1930) referred to this as a Hardinge Ball Mill. The ball mill is in several pieces, likely a result of the fire. Feature 6D measures approximately 9 ft long by 16 ft in diameter. An unidentifiable equipment fragment southeast of Feature 6D is embossed with "KROCH MFG Co. SF CAL". Feature 6E is south of Feature 6D; it measures approximately 8 ft by 6 ft. It was originally conical and is one end of the mill. A steel strut/reinforcement is embossed "COLORADO". Both features exhibit riveted construction.

Feature 6F consists of a series of 13 footings on the next higher tier of the mill, approximately 15 ft southeast of Feature 6D. Six of the footings are square and measure 1 ft 8 inches on each side and are approximately 3 ft 6 inches tall. These six footings are placed in a row across the width of the mill and are equidistant from each other (about 5 ft apart). Southeast of these footings are four footings with the same measurements. The northeastern-most of these footings exhibits a 3/4 inch diameter rebar that projects 5 inches from the footing. The other square footings may have displayed similar reinforcement, but because of their poor condition, it is no longer apparent. Three of the four footing are on the north half of the mill and one is on the far east half of the mill;

between the two northern footings are three large irregularly shaped footings made of concrete. The northeastern-most of the three large footings measures 16 ft (northeast-southwest) by 6 ft wide (northwest-southeast) and 12 ft high; it may have originally been taller, but the fire exacerbated the disintegration of the concrete. In plan view, this footing appears as two slightly offset rectangles. Two 1 inch rebar project vertically from the top of this footing. Additionally, two 12 inch wide by 10 inch high recesses are located on the southeast elevation of this footing, near its north side. The recesses are approximately 6 ft above the surrounding debris and appear to represent timbers that the concrete was originally poured around, but which burned during the fire. Two parallel small gauge rails project horizontally from the southeast elevation of this footing; these appear to have served as reinforcements.

Approximately 3.0 ft southeast of the above described 12 ft tall footing is an "L" shaped footing. This footing measures11 ft 6 inches long (northwest-southeast) and 3 ft 6 inches wide northeast-southwest), and is 6 ft tall. Two wrapped dual strand wires project from both the northwest and southeast elevations. Four 3/4 inch and two 1 inch rebar project vertically from the top of the footing. The 3/4 inch rebar project 5 inches while the 1 inch rebar project 3 ft but are bent down due to the fire. Two small gauge, horizontal, rails that are located 3 ft above the ground connect to the southwest corner of the irregularly shaped footing.

The final footing in this series (Feature 6F) is a rectangular footing that measures 9 ft long (northwest-southeast) by 2 ft wide (northeast-southwest) by 6 ft tall. Two 12 inch wide by 10 inch tall recesses are apparent in the northwest elevation and appear to match the recesses in the irregularly shaped 6 ft tall footing that is 10 ft to the northwest. Both recesses are located near the northwest corner of this footing. The recesses represent the anchor locations for timbers that connected this footing with the 6 ft tall footing to the northwest. The timbers were completely incinerated by the fire.

Feature 6G consists of a concrete footing that is on the same tier of the mill as Feature 6D and Feature 6E, the ball mill parts. This footing measures 3 ft 6 inches wide (northeast-southwest) and is 1 ft 3 inches tall. Length is indeterminable because the southeast end of this footing is covered by debris; however, the visible portion is approximately 7 ft long. Four 1 inch diameter rebar extend 3 inches from the corners at the top of this feature.

Feature 6H consists of a series of three square concrete footings on the next highest tier in the southeast portion of the mill, approximately 35 ft southeast of Feature 6F. They are severely disintegrated as a result of the fire, but they likely originally measured from 1 ft 10 inches by 1 ft 8 inches to 2 ft by 2 ft. They are presently approximately 15 inches square and 2 to 3 ft tall and virtually obscured by burned rock and other debris.

Feature 6I is a concrete footing located on the highest tier of the mill, approximately 35 ft south of Feature 6H. Feature 6I measures 3 ft wide (northwest-southeast) by 6 ft long (northeast-southwest) and is 2ft 6 inches tall. Three 3/4 inch diameter rebar project 1 ft from the top of this feature.

Feature 7 consists of the remains of a breached, cribbed rock, dam. It is composed of logs cribbed together (log cabin style) into squares and filled with rock.

The dam measures 30 ft long (east-west) by 5 ft wide (north-south), and is presently 5 ft 6 inches tall. The remaining portion of the dam is constructed from 4 to 6 inch axe-cut poles that span the drainage. The parallel, east-to-west, poles are separated into boxes every 3 ft 6 inches to 4 ft by four sets of 4 inch to 6 inch poles that exhibit very shallow saddle notching. The resultant boxes are filled with locally occurring talus rock for reinforcement. The dam may have extended approximately 7 ft further north, however, the poor condition of the dam due to the breach and subsequent flood obfuscates this portion. Two vertical and one horizontal planed (or sawn) 2 by 10 inch boards that form a "U" are located in the stream at the base of the dam. This is the only occurrence of planed/sawn timbers at the dam. This dam is located in the creek at the approximate midpoint of the tailings. Because it is underneath the tailings, it may represent the original tailings containment impound.

Feature 8 consists of a dam and retaining wall located approximately 80 ft north of Feature 7. The feature is constructed by non-uniform 6 to 9 by 3 inch horizontal timbers. The length of the timbers is indeterminable because they extend into the tailings on either side of the feature. The horizontal timbers extend east-to-west and span the north-to-south trending drainage. The timbers are held in place by 8 inch diameter wooden posts that are set vertically into the streambed and ground. Only two of the vertical timbers are visible. On each side of the creek on the tailings, and above the retaining wall, one 6 inch diameter post projects vertically from the ground. In addition, two 2 by 6 inch timbers protrude from the tailings on the east side and three timbers protrude from the tailing on the west side of the creek; however, their function is indeterminable, though they may be part of the retaining wall. One 2 by 10 inch timber was washed down the creek and is resting on the feature.

Feature 9 is a small can dump located below the mill, between the road (Feature 4) and the tailings. Feature 9 measures 70 ft (north-south) by 40 ft (east-west) and is composed of 31 hole-in-top cans (Type I) that measure 4 4/16 inches high by 3 inches in diameter. They exhibit crimped side sides and lapped end seams. Most of the cans were opened by ice pick, but a few were opened with a knife. In addition, one light bulb (collected) was observed in this feature.

Feature 10 consists of a possible ore-cart grade that measures 7 ft wide. No tracks or ties are present and no reinforcement or bracing was observed. The feature is located 10 ft south of the southwest corner of the mill (Feature 6) and runs in a general north-south to northeast-southwest direction.

Feature 11 is a burned building/structure. This feature is located near the southeast corner of the mill. It measures 21.0 ft (northwest-southeast) by 36 ft (northeast-southwest). Nine, 12 inch timber impressions are visible on the floor of the feature. The

timbers were oriented northwest-to-southeast. A 2 1/2 inch and a 1 1/2 inch pipe project from the northwest corner of the feature. The function of this feature is unknown.

Feature 12 is a road or ore cart grade that is located between Feature 11 and the mill; the feature is oriented in a general north-south to northeast-southwest direction. It measures 7 to 9 ft wide. No tracks, ties, or bracing were observed. Approximately 280 ft to the south, in the drainage, is a stacked rock retaining wall that is adjacent to Feature 25. This retaining wall is associated with Feature 12; it supports the road grade as it ascends in elevation toward the mill (Feature 6) from the bottom of the drainage. The rocks used in the construction of the retaining wall are locally occurring and vary in size from 1 to 2 ft. It is constructed in an "L" shape to avoid Feature 25, which suggests that Feature 25 was constructed prior to the road grade. The retaining wall measures 27 ft long by 1 to 5 ft tall.

Feature 13 is a foundation located approximately 200 ft southwest of the mill and adjacent to the upper ditch (Feature 5A). Because the west and north walls of this feature are indiscernible, only the south and east walls were recorded; the overall feature measurements are based on extrapolation. The feature measures 19 ft (north-south) by 13 ft (east-west). The foundation was constructed from 7 by 7 inch timbers. The east ends of the timbers display notching; however, they are so badly burned that the type is indeterminable. Four timbers are still in place and are oriented east-west; one, possibly two, are visible and oriented north-south. A single 3/4 inch by 3 inch tall rebar projects from the east end of the east-west oriented timbers.

Feature 14 consists of four 4 inch diameter by 5 ft tall wood posts that form a square. The posts are placed 9-10 ft apart. A single wire nail is located in the top of each post. This feature is located 10 ft west of the creek and may represent a relatively recent corral constructed by hunters.

Feature 15 is the foundation of a building. The feature measures 31 ft (east-west) by 20 ft (north-south). The foundation appears to have been made with rock mortared with concrete, and timbers. The feature is heavily burned and in very poor condition. The feature contains approximately 50 whiteware fragments, numerous wire nails, a 50-gallon steel drum, 30 bone fragments (some bovine), three sanitary can fragments, two 1 inch diameter pipes, one clock spring, unidentifiable metal fragments, and five segments of bailing wire. Considering the presence of the numerous wire nails, the foundation likely represents the remains of a frame structure rather than a log cabin. The feature is located on the south end of the site on a small secondary ridge about 400 ft from the southwest corner of the mill.

Feature 16 is a depression that measures 7 ft (northwest-southeast) by 4 ft (northeast-southwest) by 2 ft deep. The depression may represent the location of a privy. One burned 8 inch by 2 inch timber fragment is located on the southeast end of the feature. This feature is located about 20 ft southwest of Feature 15. One oil can was located in the southeast corner of the feature (collected).

Feature 17 is a 1910s or 1920s automobile frame. No maker's mark is apparent; portions of the frame, suspension, engine, and transmission remain. The engine is 4-cylinder. This feature is located approximately 54 ft southeast of Feature 16.

Feature 18 is a burned foundation that measures 19 ft long (north-south) by 14 ft wide (east-west). The feature is composed of concrete and wood. One wood timber, that measures approximately 12 by 12 inches, is located on the west wall. Innumerable wire nails, a headboard, footboard, and rails from a steel bed, two hole-in-top cans, one kerosene can, and a flashing for a stovepipe were observed. Because of the numerous wire nails, this feature may represents the remains of a frame structure rather than a log cabin. Feature 18 is located approximately 43 ft southwest of Feature 15.

Feature 19 is a foundation. The feature measures 7 ft (north-south) by 8 ft (east-west) by 1 to 2 ft deep. It is constructed from rock and concrete. A total of seven external friction lid, wire-hinged, tobacco cans are located just north of the feature. This feature is located approximately 72 ft east-southeast of Feature 18.

Feature 20 is a foundation. It measures 10 ft (north-south) by 12 ft (east-west) and is about 1 ft deep. The feature is composed of concrete and timber; the timbers are too badly burned to ascertain dimensions. Artifacts associated with this feature include innumerable wire nails, three clear glass bottle top fragments (one with a Hutchinson stopper), one strap hinge, one bottle base (that exhibits an embossed star containing an "S" above an embossed "5") that measures 3 2/16 inches in diameter, three external friction lid tobacco cans, a crushed and distorted sardine can, and numerous bottle fragments that are extremely brittle from the heat of the forest fire. A pipe projects from the ground on the east side of the feature about 1 ft from the foundation. Based on the plethora of wire nails, this feature likely represents the remains of a frame structure. Feature 20 is located approximately 58 ft south of Feature 17.

Feature 21 is a depression that measures 5 ft (north-south) by 4 ft (east-west) by is 6 inches deep. Numerous locally-occurring, rocks surround the depression. Approximately 2 ft south of the feature are 200 clear glass bottle fragments, one purple-discolored (solarized) glass fragment, four crushed external friction lid tobacco cans, and five modern cartridges. The base of one bottle measures 2 10/16 inches in diameter and has "IPCCO" embossed in a diamond with an embossed "6" below the left end of the diamond. Toulouse (1971:268-269) states that this mark is from the Illinois Pacific Coast Company that was based in San Francisco, California. This plant operated from 1930-1932, when the Owens-Illinois Glass Company took over operations and named it as its West Coast division. The function of Feature 21 is indeterminable. It is located approximately 25 ft northeast of Feature 20.

Feature 22 is a foundation that measures 22 ft (east-west) by 19 ft (north-south). It was constructed from timbers and concrete; the timbers were completely burned away but their impressions are still apparent. Associated artifacts include innumerable wire nails, a red-painted latch plate, a metal sheet fragment, two wire barrel hoops, two metal strap

barrel hoops, one "TEXACO" 5-gallon square can, two external friction lid tobacco cans, three stovepipe fragments, and a white milk glass fragment. This feature likely represents the remains of a frame structure and is located approximately 21 ft east of Feature 21.

Feature 23 is a depression that measures 11 ft (northwest-southeast) by 8 ft (northeast-southwest) by 4 ft deep. The northeast wall is lined with stacked unmortared, locally occurring, rock that varies from 3 inches to 1.0 ft in size. The feature contains about 10 clear glass bottle fragments, seven 6 inch wire nails, two 8 inch wire nails, two burned timber fragments (possibly from 2 x 8 inch timbers), one metal heel plate and 10 shell button fragments. This feature may represent a powder magazine. It is located approximately 65 ft southeast of Feature 22.

Feature 24 consists of foundation remains that measure 10 ft (east-west) by 8 ft (east-west). It is composed of rock, concrete, and timbers, although all the timbers were burned away, leaving only impressions in the sediments. The feature contains an internal friction lid can fragment and it is located adjacent to Feature 23.

Feature 25 consists of a foundation located in the bottom of the drainage, about 94 ft northeast of Feature 19. The feature measures 26 ft (northwest-southeast) by 8 ft (northeast-southwest). It is made of rock and timber, although only one burned timber that measures 8 by 8 inches remains. The rocks vary from 6 inches to 2 ft in size. A 1 inch and a 2 inch pipe project vertically from the ground near the southwest corner of the foundation. Artifacts associated with this feature include a milling ball, two cupel fragments, and innumerable wire nails. Approximately 8 ft from the southwest corner along the west wall are the remains of a possible furnace or oven base—the dimensions are indeterminable. It consists of a very friable concrete pad that is very deteriorated. Based on the presence of the cupels and furnace, this feature likely represents an assay office,. It is located adjacent to the road (Feature12) and associated road grade retaining wall that leads from the mill to the bottom of the drainage, approximately 278 feet south of the mill.

Feature 26 is a burned out foundation that measures 19 ft (northeast-southwest) by 12 ft (northwest-southeast). It is located in the bottom of the drainage, about 83 ft northwest of Feature 25. This foundation appears to have been constructed solely of rocks that measure 5 inches to 2 ft in size. Associated artifacts comprise green glass insulator fragments, four corrugated metal sheets, white ceramic tube electrical insulator fragments, an exhaust manifold, innumerable wire nails, 10 whiteware fragments, a stove vent fragment, a bedframe, and two sets of bed springs. The insulator fragments tenuously suggest this feature may represent the remains of a powerhouse.

Feature 27 consists of two parallel concrete footings. The west footing measures 13 ft 6 inches long (north-south) by 3 ft 6 inches wide (east-west) and is 1 ft 7 inches tall. The east footing measures 11 ft long (north-south) by 2 ft 6 inches (east-west) by 1 ft 7 inches tall. The footings are separated by 6 ft 6 inches. The footings encompass an area that

measures 12 ft wide (east-west) by 13 ft 6 inches long (north-south). Eight 1 inch diameter rebar project 8 inches from the top of the west footing and five 1 inch diameter rebar project 3 1/2 inches from the top of the east footing. A sixth rebar, which would have been located on the northwest corner of the east footing is missing because that corner has crumbled away. A possible steel stove fragment is located on the south base of the east footing and has likely been dumped there. The footings rest on an irregularly shaped earth and rock pad that measures 35 ft long (north-south) by 28 ft wide (east-west). The pad is situated approximately 2 to 3 ft above the surrounding ground surface. The northeast corner of the pad appears to have had a 10 by 10 inch timber located at its north side, which likely represents foundation remains. The function of the original structure is indeterminable, though it may represent the hoist house for the tram to the mines. The actual measurements of Feature 27 from the southwest corner of the pad are 28 ft to the southeast corner, thence 35 ft to the northeast corner, thence 19 ft to the northwest corner, thence 6 ft south to an interior southeast corner, thence 9 ft west to an additional northwest corner, thence 29 ft south to the southeast corner. This feature is located approximately 202 ft southwest of the mill and 54 ft northeast of Feature 13.

Feature 28 consists of the mill tailings that are bisected by the creek. The tailings are irregularly shaped and measure approximately 4,280 ft long (north-south) by 2,600 ft wide (east-west). Prior to the breaching of the dam, the tailings were approximately 2,240 ft long. Features 7 and 8—dams and retaining walls, contained the tailings. Additionally, prior to the breaching of the dams, a settling pond was located upstream from the features. The tailings consist of yellowish mill fines that resulted from the processing of ore at the mill (Feature 6). The tailings are located approximately 170 ft downslope from the mill.

Feature 29 is an adit trench. The feature is located approximately 100 ft southeast of, and upslope of, the mill (Feature 6). The trench measures 30 ft long (northwest-southeast) by 7 ft wide (northeast-southwest) by 6 ft deep. One 10 by 2 inch plank and three 8 by 8 inch timbers (dimensions approximately due to burning) are located within the trench. One 8 by 8 inch timber is still vertical and is 5 ft tall. The presence of a large strap hinge and a 2 ft wide by 4 ft high section of stacked, locally occurring rock on each side of the trench (15 ft from the northwest end of the trench) suggest a door once permitted ingress into the adit. No portal is visible.

Feature 30 is the remains of a powerline; all that remains is double twisted heavy gauge wire that lays on the ground and across the tailings (Feature 28). No poles or insulators were apparent. The powerline generally follows the drainage toward Baker, Idaho.

Ten artifacts were collected from the site for analysis in the North Wind laboratory in Idaho Falls. These artifacts include a heavily rusted oil can, a light bulb, two cupel fragments, a lot tag, a bottle base fragment, an iron drill fragment, an ore car tie spike, a chaining pin and a milling ball. After analysis the artifacts were returned to the Salmon-Challis National Forest; the artifacts will eventually be submitted to the Southeast Idaho Regional Archaeological Center for ultimate curation.

The oil can was collected from Feature 16; it displays a basal width of 3 1/16 inches and a height of 3 14/16 inches. The spigot which projects from the top of the artifact is broken; the remaining portion of the spigot is 13/16 inch long. The handle of the oil can is missing and a hole is located where the handle once was.

The light bulb was collected from Feature 9. The bulb measures 3 14/16 inches tall by 2 4/16 inches wide; these measures are somewhat problematic based on the slight deformation of the artifact as a result of the fire. The bulb displays a 1 4/16 inch long by 7/16 inch wide glass mount that projects vertically from the base of the copper screw thread contact. The support wires are still intact though no evidence of the filament exists.

Two cupels were collected from Feature 25. The cupels measure 13/16 inch tall by 1 1/2 inch wide. The cupels are made from bone ash.

Also collected from Feature 25 was a steel lot tag. The tag is circular and measures 13/16 inch in diameter by 1/16 inch thick. One side of the tag is stamped with the number "14". A 2/16 inch hole is drilled through the tag immediately above the number.

A clear glass bottle base fragment was collected from Concentration 2 of Feature 1. The bottle base displays a diameter of 2 10/16 inches and a thickness of 5/16 inch. The base exhibits a 2/16 inch push-up. An embossed horseshoe is embossed on the bottom. No information could be found concerning the manufacture or date of the bottle.

Four artifacts were collected from the burned remains of the mill, Feature 6, including a iron drill fragment, an ore car tie spike, a steel chaining pin and a milling ball. The drill fragment is 15 3/16 inches long by 12/16 in diameter. The bit, which constricts to a four-sided point, comprises the initial 1 12/16 inch portion of the drill and the shank constitutes the remainder of the artifact.

An ore car tie spike was also collected from the interior of the remains of the mill. The spike measures 4 7/16 inches long by 7/16 inch wide by 8/16 inch thick.

The chaining pin is 6 10/16 inches long by 3/16 inch wide by 3/16 inch thick. The chaining pin exhibits a 1 4/16 inch diameter loop on one end; the other end tapers to a point.

The milling ball measures 2 3/16 inches in diameter and weighs 1 pound 5 1/4 ounces. A small 4/16 inch projection protrudes from one side of the ball; a similar projection that was on the opposite side of the ball is broken off.

Table 4.10 Total Artifacts, Harmony Mill Site (Site SC-34).

		Dimensions (inches)				
Artifact Description		**Height**	**Width/ Diameter**	**Thickness/Cap**	**Totals**	**Description**
Hole-in-Top	(Type I)	4 4/16	3		1284	Most were ice-pick opened (90%), followed by knife cut(7%), the remainder were cut-around
	(Type II)	4 11/16	4		546	
Sanitary	(Type IS)	4 10/16	4		740	All were cut-around
	(Fruit)	6 14/16	6 2/16		262	All were cut-around
Shorty Sanitary		4 2/16	2 9/16		7	All were cut-around
Tall Sanitary		7 8/16	5 4/16		2	All were cut-around
		7	5 8/16		1	All were cut-around
Olive oil		4 8/16	3 4/16	?	1	
		9	6 4/16		1	
Tall Rectangular		11 8/16	6 1/16	2 7/16	1	
Rectangular		3 15/16	3 12/16	2 10/16	1	
Turpentine		5 2/16	3 4/16	2 1/16	1	
Sardines		4 4/16	3 4/16	14/16	78	
Oval Herring can		6 9/16	4 4/16	1 8/16	7	
Tobacco		4 6/16	2 14/16	15/16	12	Wire-hinged external friction lid
Vegetable or Fruit		6 14/16	6 2/16		16	
Spice Can		4	2 8/16	1 13/16	17	
Spice Can		4 13/16	4 12/16	3 5/16	1	
Wire-handled rectangular		11 8/16	6 2/16	4	2	
Log Cabin					2	
Coffee/Baking Soda		5 2/16	3 12/16		3	
Texaco/Kerosene		13 9/16	9 6/16	9 6/16	28	Embossed star on bottom/spout
Kerosene Can Lid					1	
Texaco Can Lid					1	
Rectangular Can Lid					1	
Can Lid					1	
Hole and Cap		4 12/16	3 7/16	1 6/16	12	
Un ID can fragments					187	
Paint-Gallon					4	
Paint-Gallon Colander					1	
Sanitary		4	3 8/16		1	
Baking Powder Lid			5 2/16		3	
Baking Powder Can		4 13/16	4 12/16	3 5/16	18	
Gun Powder Can		19 4/16	12 7/16		1	
Total Cans					**3244**	
Clear Glass						
Neck and Lip					3	

		Dimensions (inches)				
Artifact Description		**Height**	**Width/ Diameter**	**Thickness/Cap**	**Totals**	**Description**
Bottle Base					3	Embossed horseshoe on bottom
Square bottle fragment					1	
Square bottle base frag.					1	
Window glass Frags					32	
Fluted drinking glass frag.					1	
Chemical Glass					11	
Un ID fragments					43	
Catsup Bottles					5	
Bottle Fragments					201	
Bottle Glass					1	
Bottle Glass					1	
Chemical Glass					11	
Green Glass Insulator Fragments					50	
Brown Glass					2	
Total Glass					**366**	
Ceramics						
Whiteware	fine white paste and glaze				331	
Whiteware	cup fragment				1	
Crockery Lid					1	
Brown Insulator fragments					1	
Piping frags, white	cup fragment				15	
Crockery fragments					1	
Total Ceramics					**350**	
Paper		1 1/4			1	
Total Paper					**1**	
Metal Artifacts						
Oil Can		3 14/16	3 1/6		1	
Steel lot tag			13/16	1/16	1	Stamped with the number "14"
Iron drill fragment		15 3/16	12/16		1	
Ore car tie spike		4 7/16	7/16	8/16	1	
Chaining pin		6 10/16	3/16		1	
Milling ball				2 3/16	1	Weighs 5 pounds 5 ¼ ounces
Strapping		1	1/16		5	
Brass pocket watch rim					1	
Draft horseshoe					1	
Door knob escutcheon					1	
Steel Bar		18	2	4/16	1	
Galvanized Wash tub					1	
Barrel Hoop					1	
Flattened aluminum bowl					1	
Pie Tin					1	

		Dimensions (inches)				
Artifact Description		**Height**	**Width/ Diameter**	**Thickness/Cap**	**Totals**	**Description**
Cast iron stove door					1	
Stove vent fragment					1	
Light Bulb		3 14/16	2 4/16		1	
Total Metal Artifacts					**22**	
Cartridges						
.25 Remington WRA co. 25 REM					3	
Total Cartridges					**3**	
Misc Artifacts						
Insulators cross wrapped with cloth and metal posts					30	
Strapping		24	1 3/16	1/16	3	
Telephone/electrical wire					1	
Tail pipe frag					1	
Cupel		13/16	1 1/2		2	
Rail Screen near F5B					1	
Total Misc. Artifacts					**38**	
Total Artifacts					**4024**	

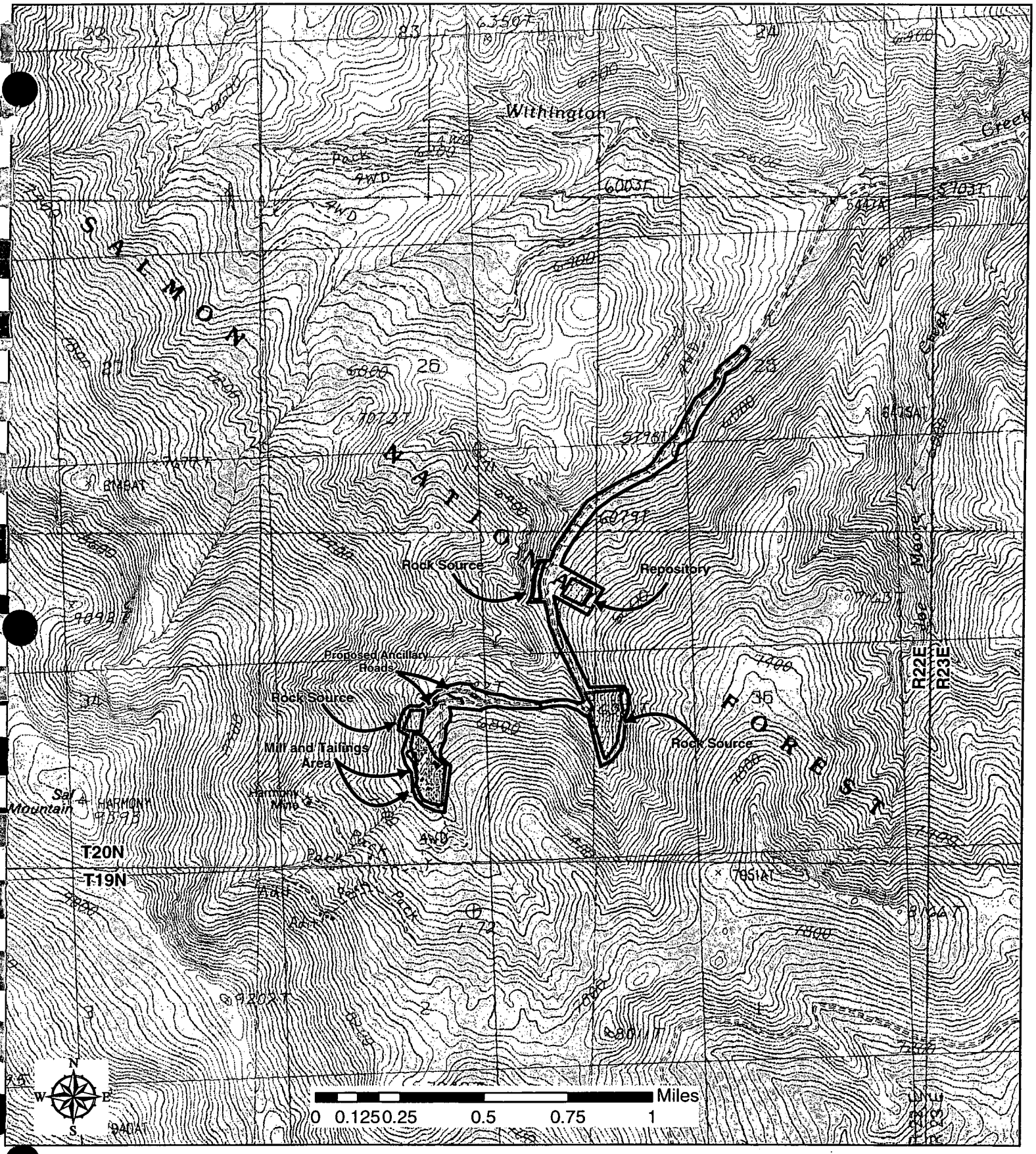


Figure 1.2 Inventoried Areas

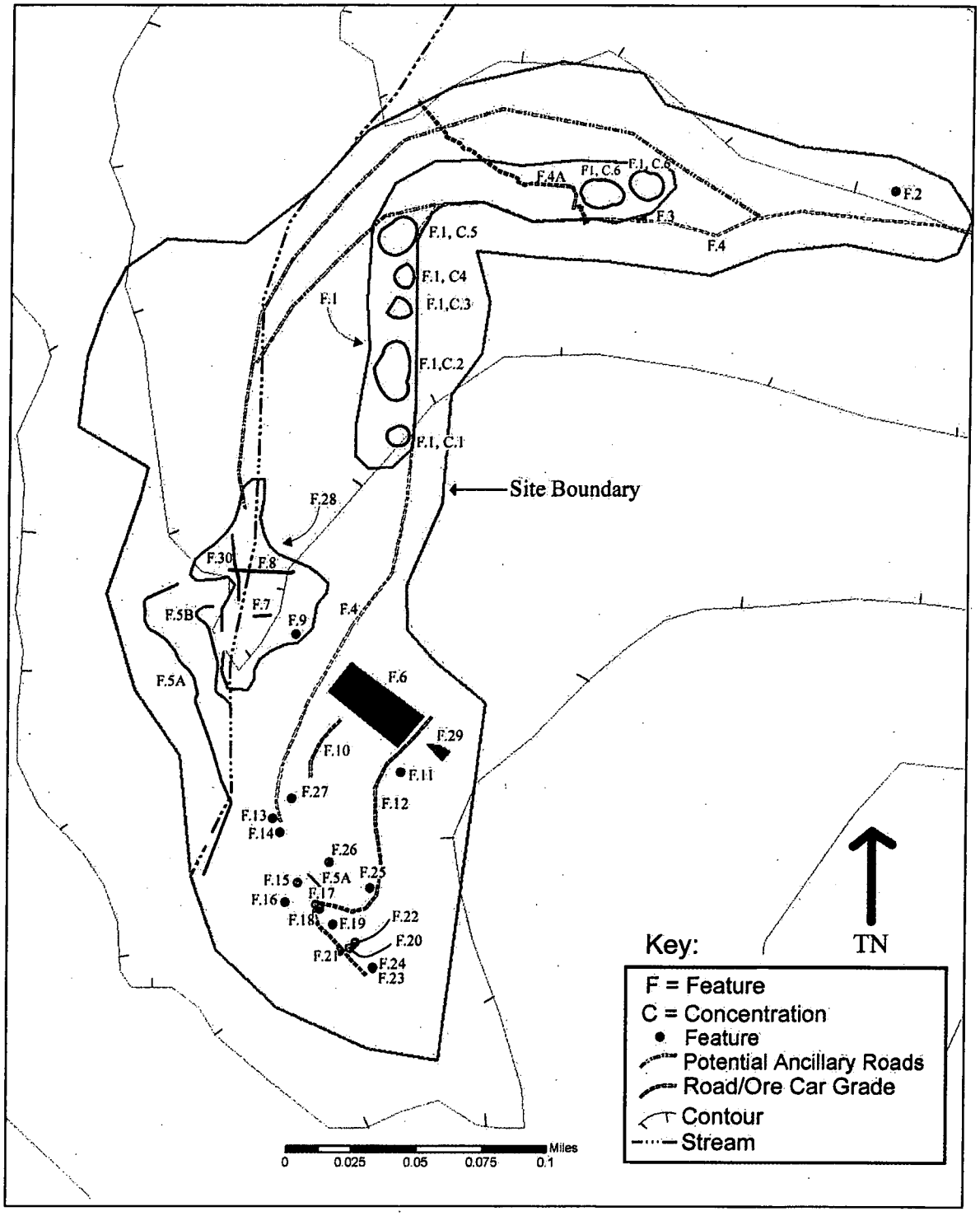
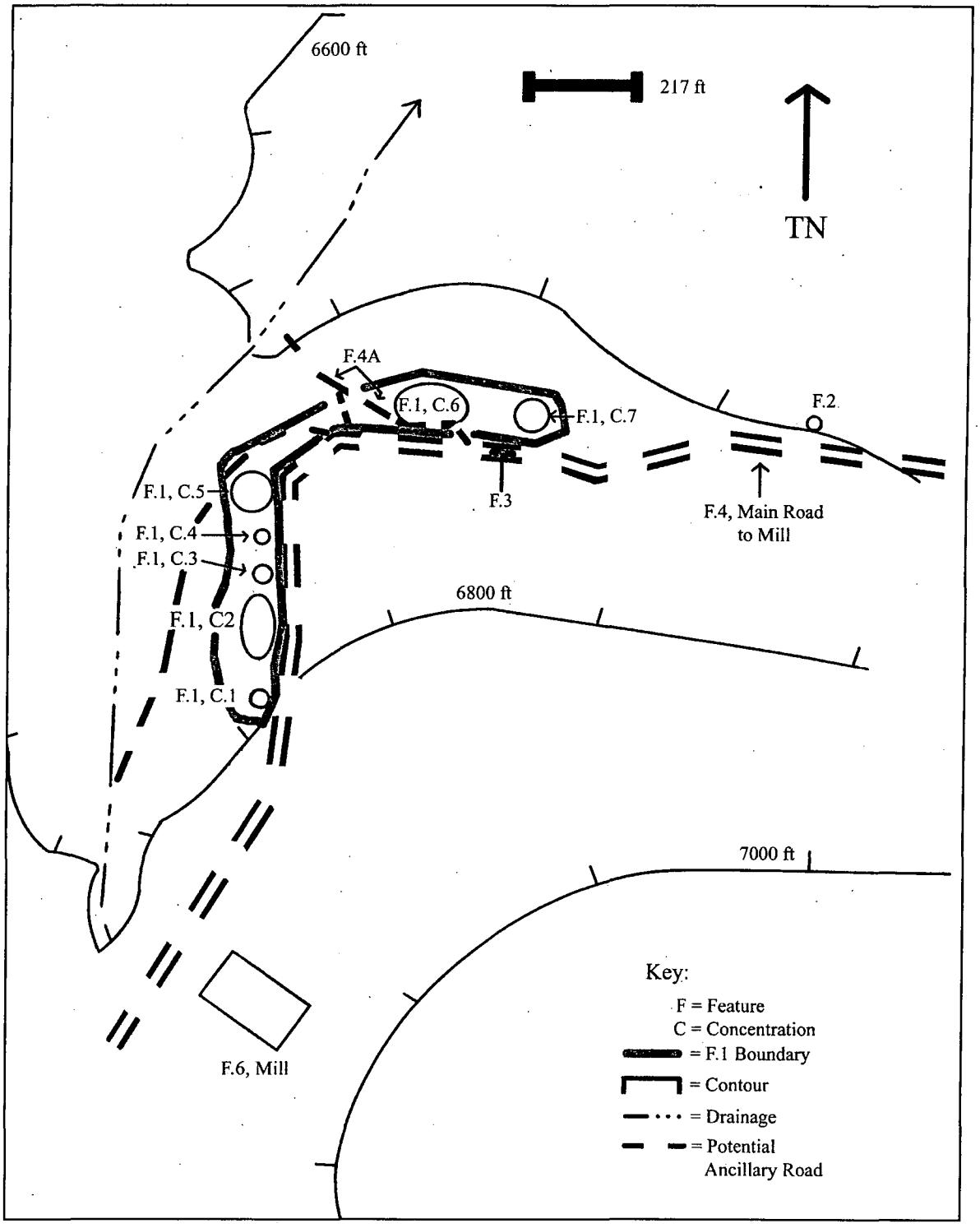
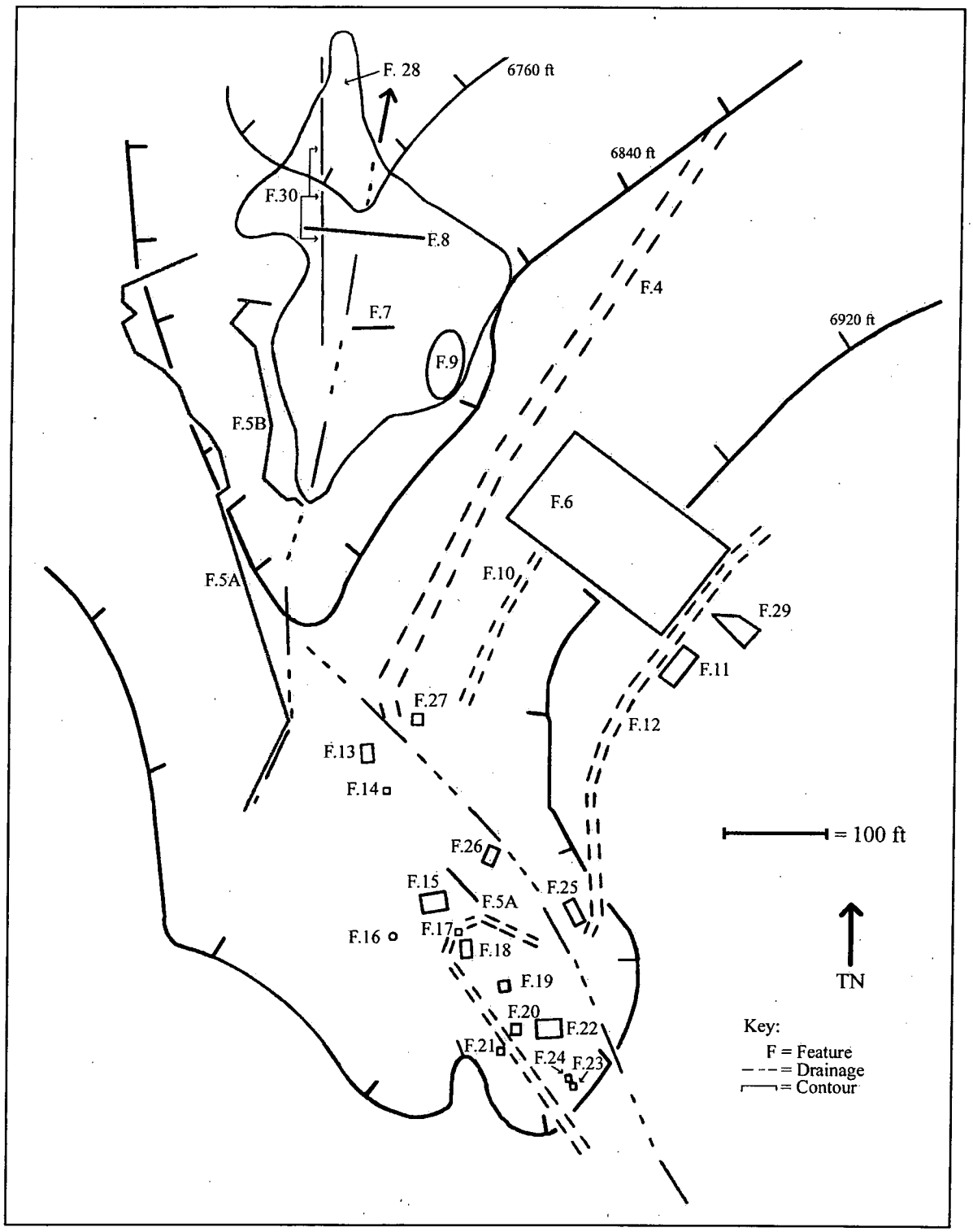


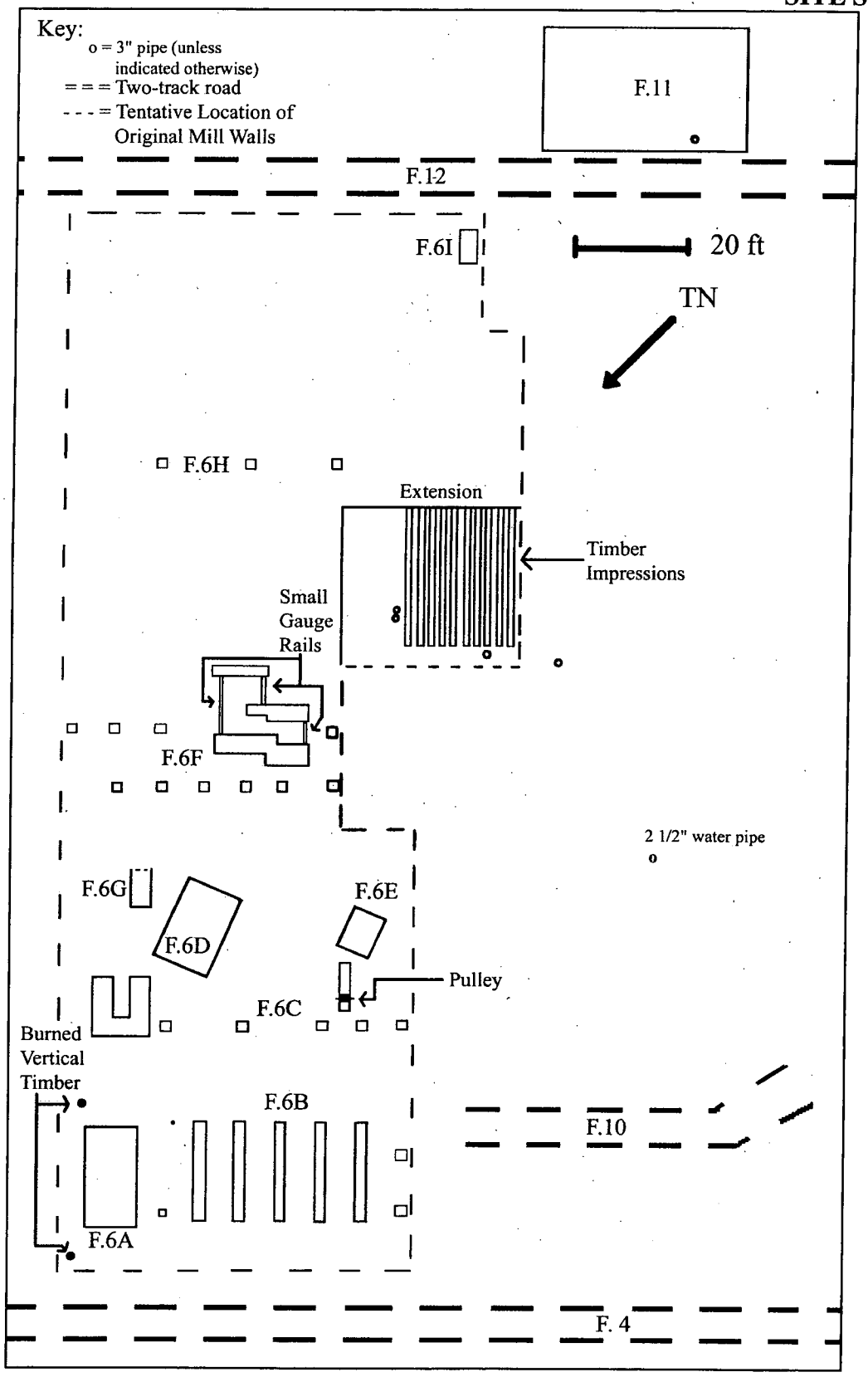
Figure 4.1 Identified Features



Plan Map of Feature 1 and Other Nearby Features



Features Identified Near the Mill and Tailings Area



Plan Map of Feature 6, Harmony Mill.



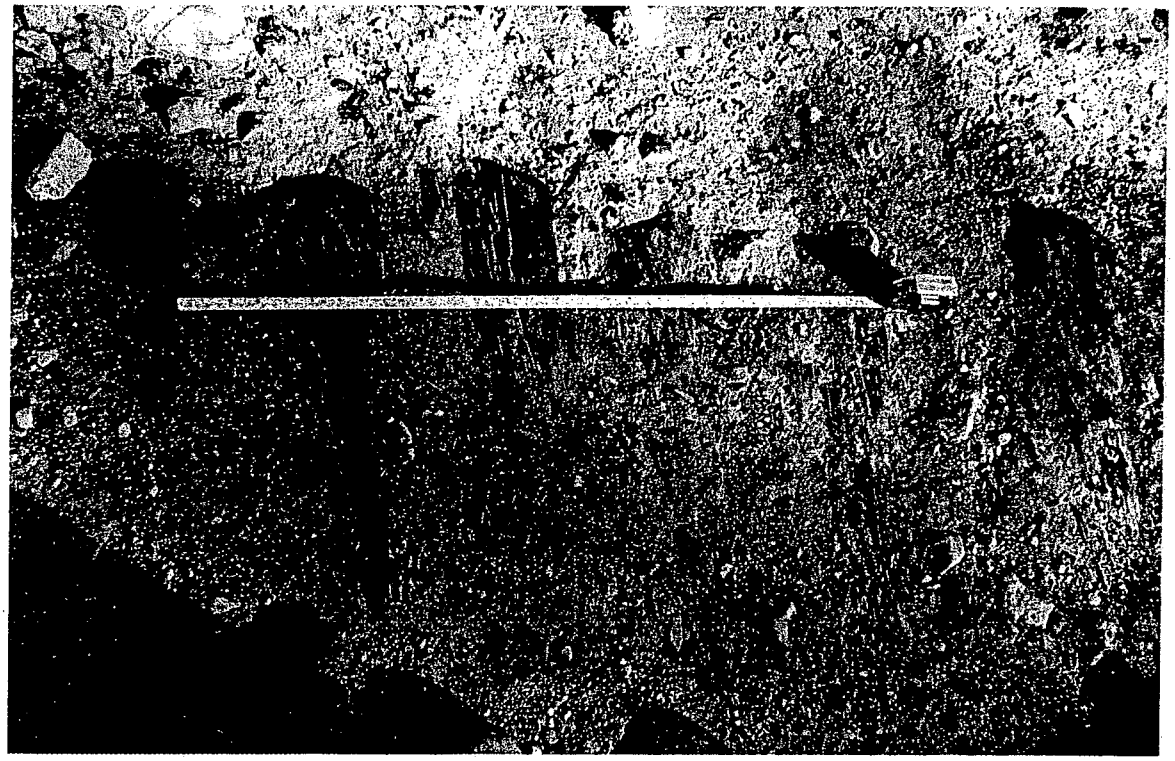
Overview of Feature 1, Concentration 1 with Feature 4 on right. View to the North



Overview of Feature 2. View to the West



Feature 3, corduroy, on Feature 4 (road to mine). View to the West



Close-up of Feature 3, corduroy



Feature 4A, overview of road that runs from the main mill road (Feature 4) to the bottom of the drainage. View to the West



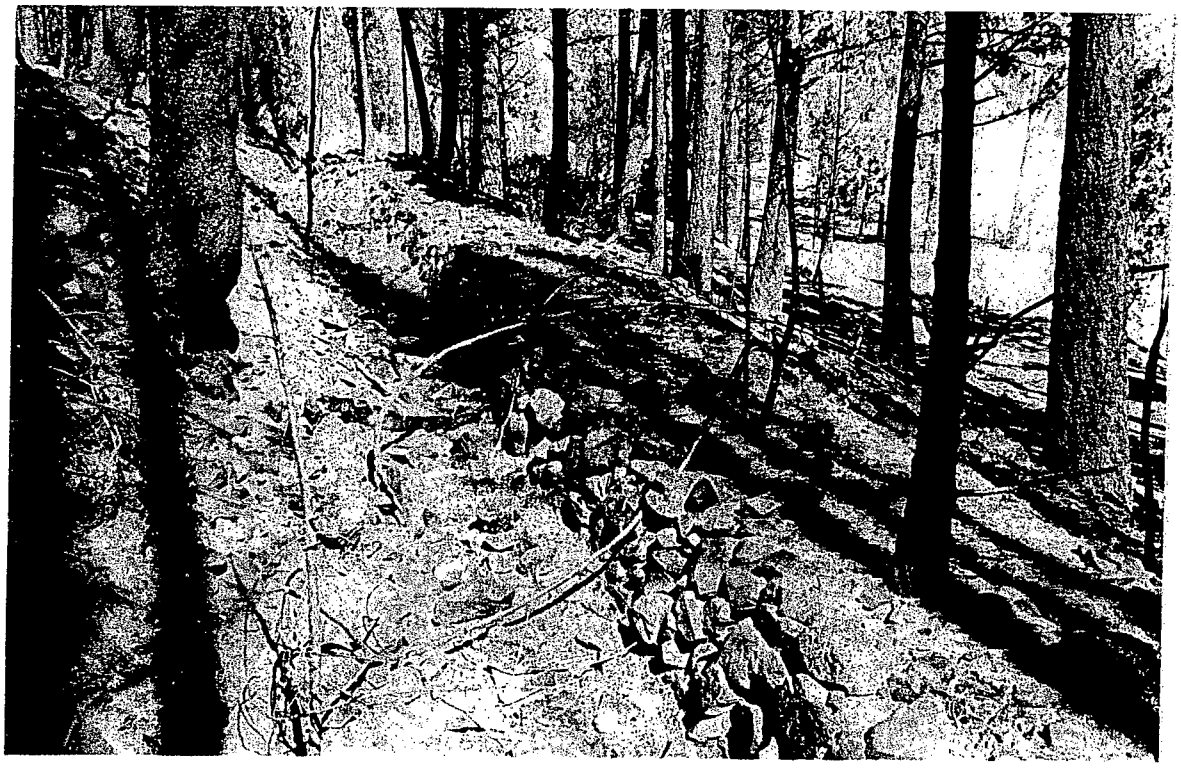
Overview of Feature 4. View to the West



Overview of Feature 5A. View to the Northwest



Feature 5A, south portion of upper ditch. View to the Southeast



Overview of Feature 5B. View to the North



Overview of Feature 6, after burn. View to the East



Feature 6A, kiln/furnace. View to the East



Feature 6B, lowest set of footings in mill remains. View to the West



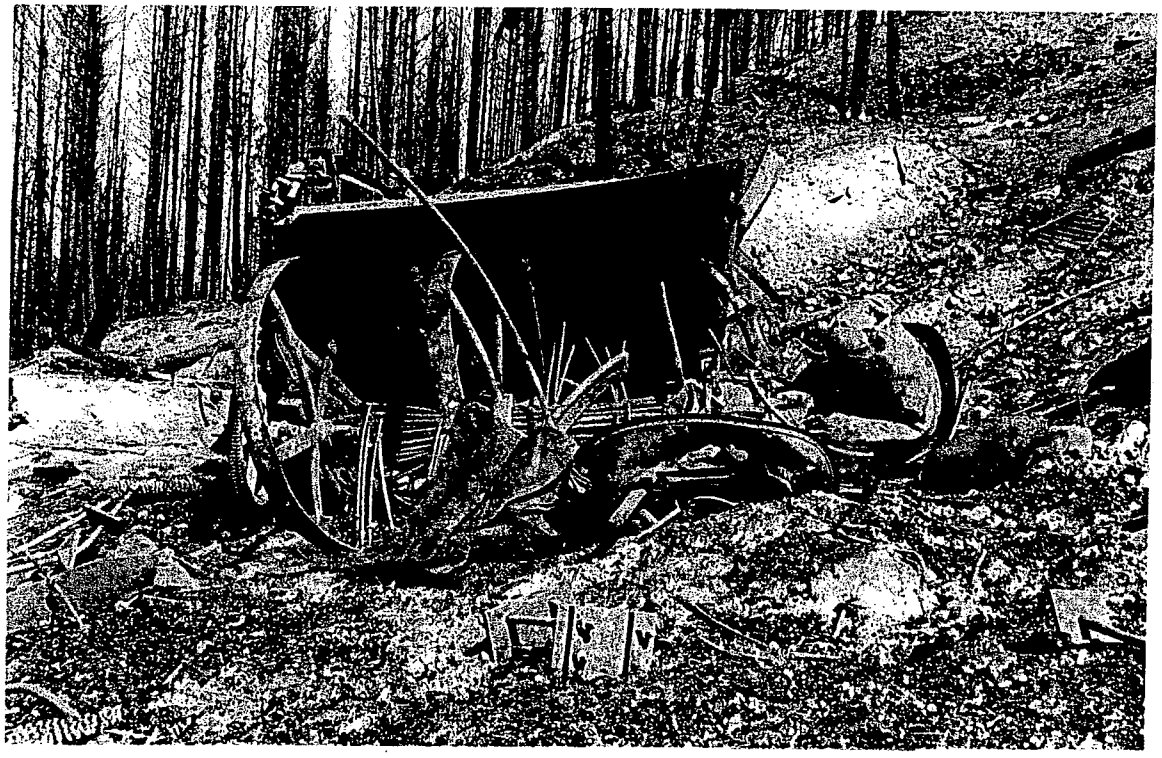
Feature 6C, footing with pulley. View to the Northeast



Feature 6C, Mid-tier footings in mill, View to the East



Feature 6D, Ball mill. View to the Southwest



Close up of Ball mill fragment, Feature 6D. View to the Northeast



Close-up of Ball mill fragment (Feature 6E). View to the South



Feature 6F, upper footings. View to the Southeast



Feature 6F, upper footings. View to the East



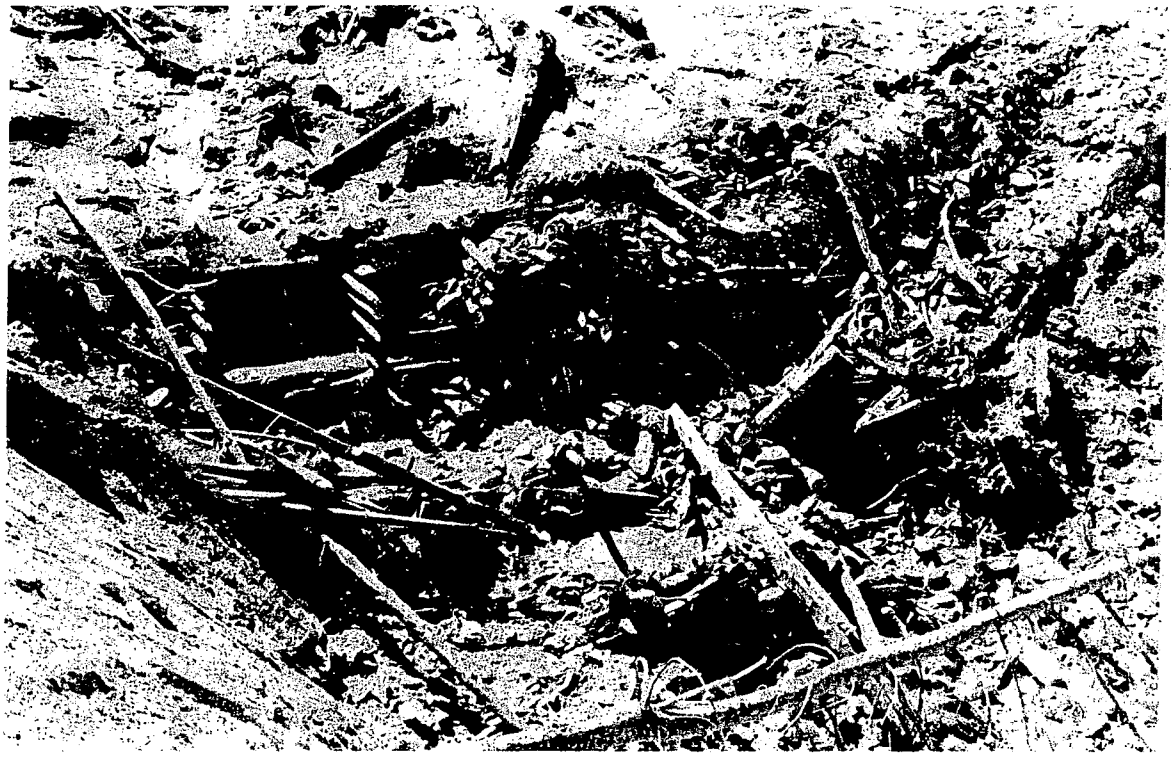
Feature 6G. View to the East



Feature 6H. View to the South



Feature 6I. View to the South



Overview of Feature 7. View to the Southwest



Feature 7. View to the Southeast



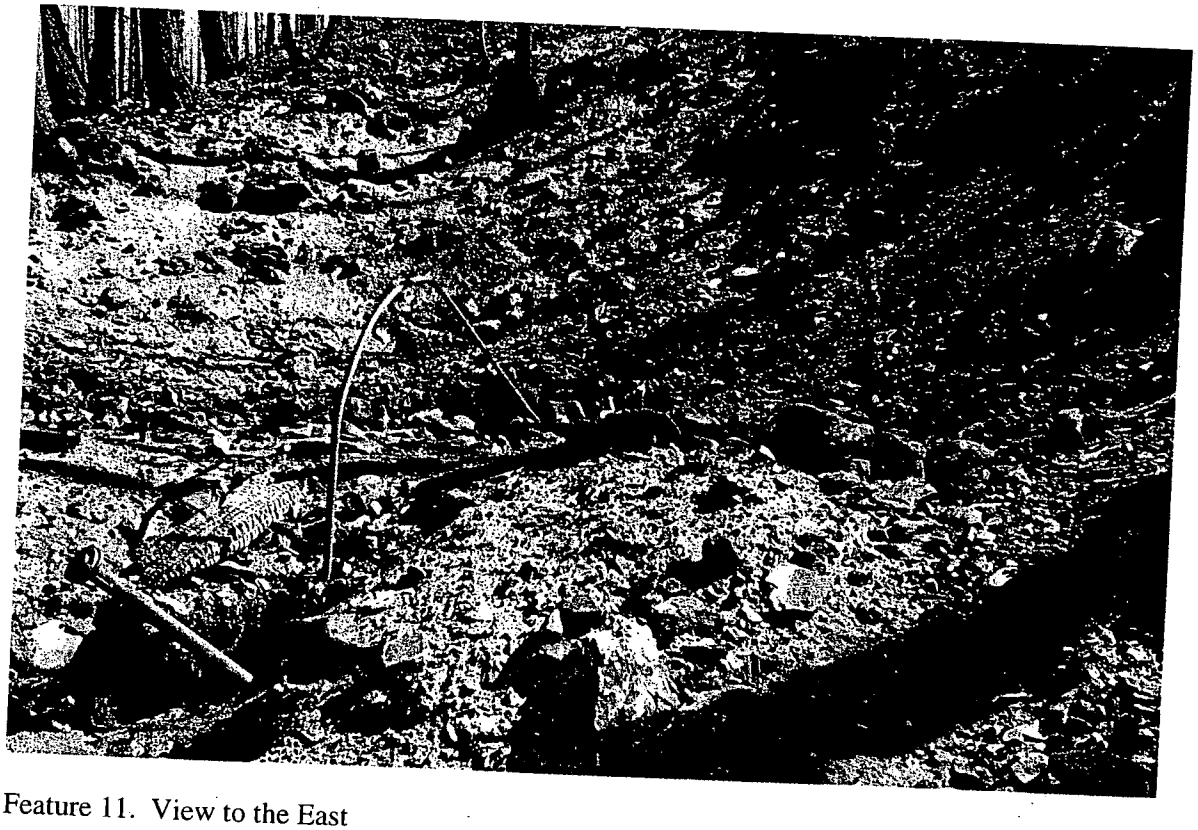
Feature 8. View to the South



Overview of Feature 9. View to the North



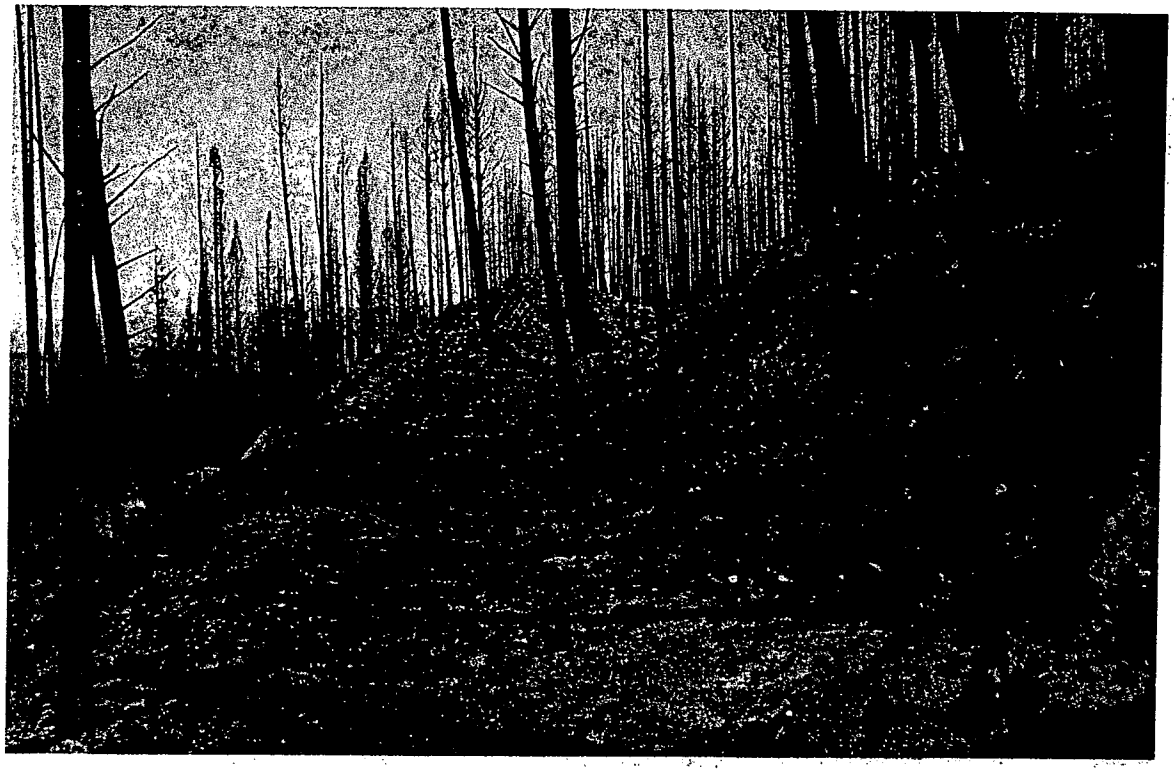
Feature 10, ore cart or rail bed to mill. View to the South



Feature 11. View to the East



Feature 12, road grade west of features 15 to 24. View to the North



Feature 12, upper road to mill. View to the Northeast



Feature 13. View to the Southeast



Feature 14, View to the Northeast



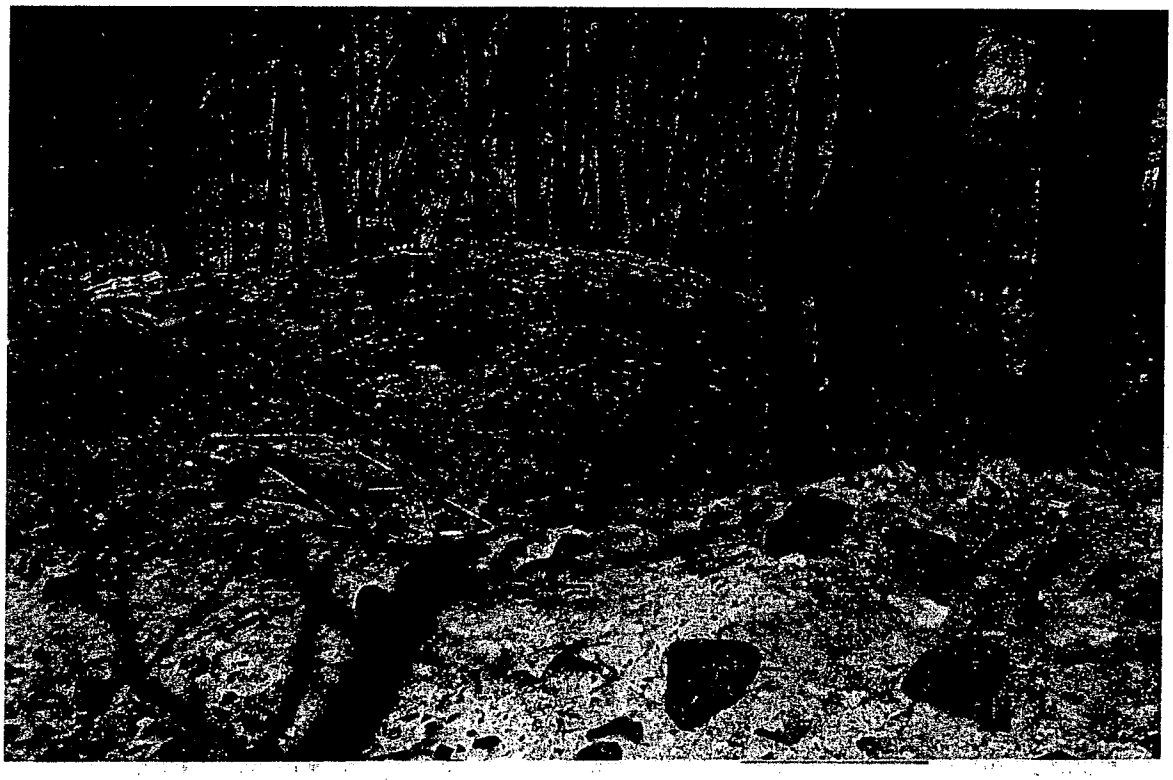
Feature 15. View to the North



Feature 16. View to the Southeast



Feature 17. View to the North



Feature 18. View to the Northeast



Feature 19. View to the Northeast



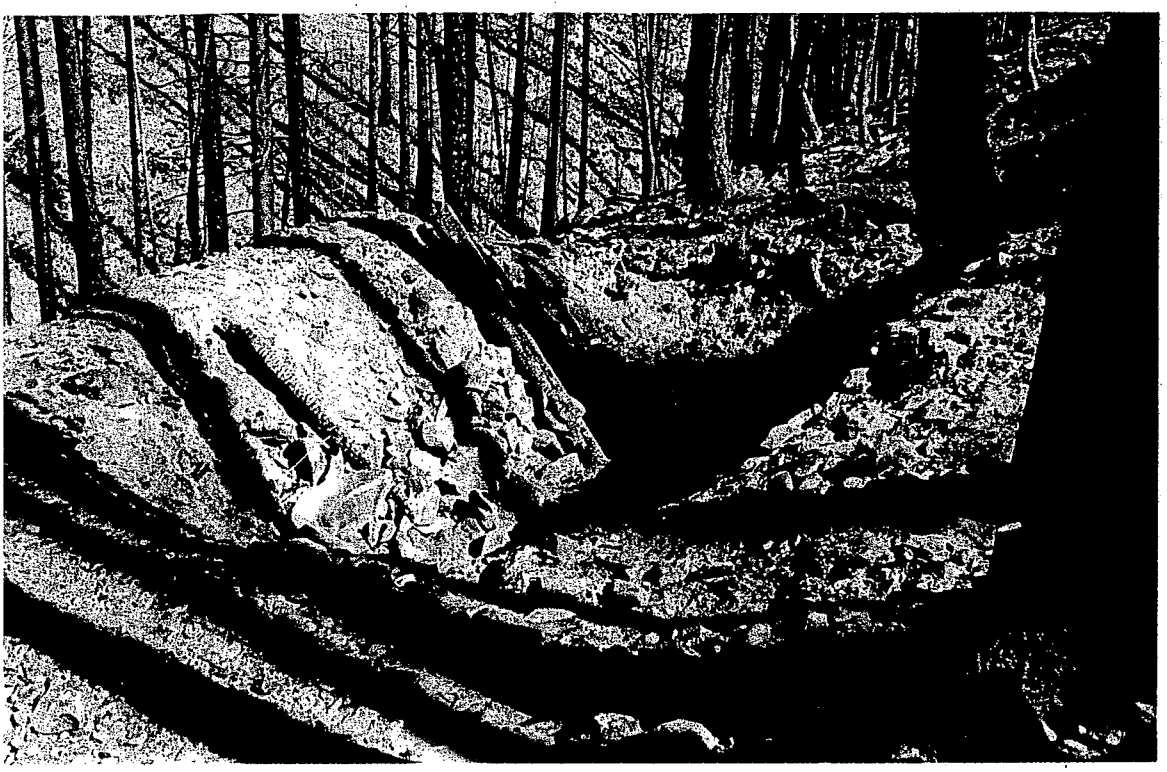
Feature 20. View to the Southeast



Feature 21. View to the Northeast



Feature 22. View to the Southeast



Feature 23. View to the East



Feature 24. View to the Northeast



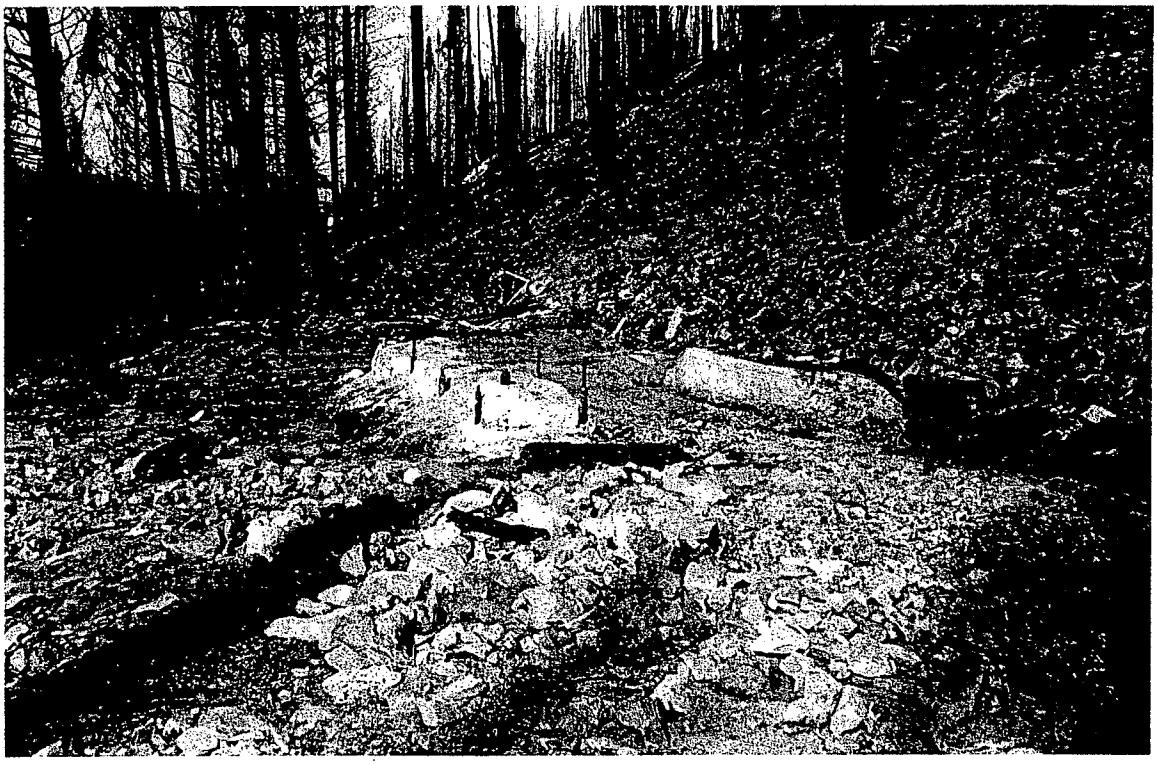
Feature 25 in foreground and Feature 12 in background. View to the Southeast



Feature 25, foundation in drainage, with Feature 12 (road grade) in right side of photo. View to the North



Feature 26 View to the Northwest



Feature 27. View to the North



Feature 28 as observed from Feature 27. View to the North



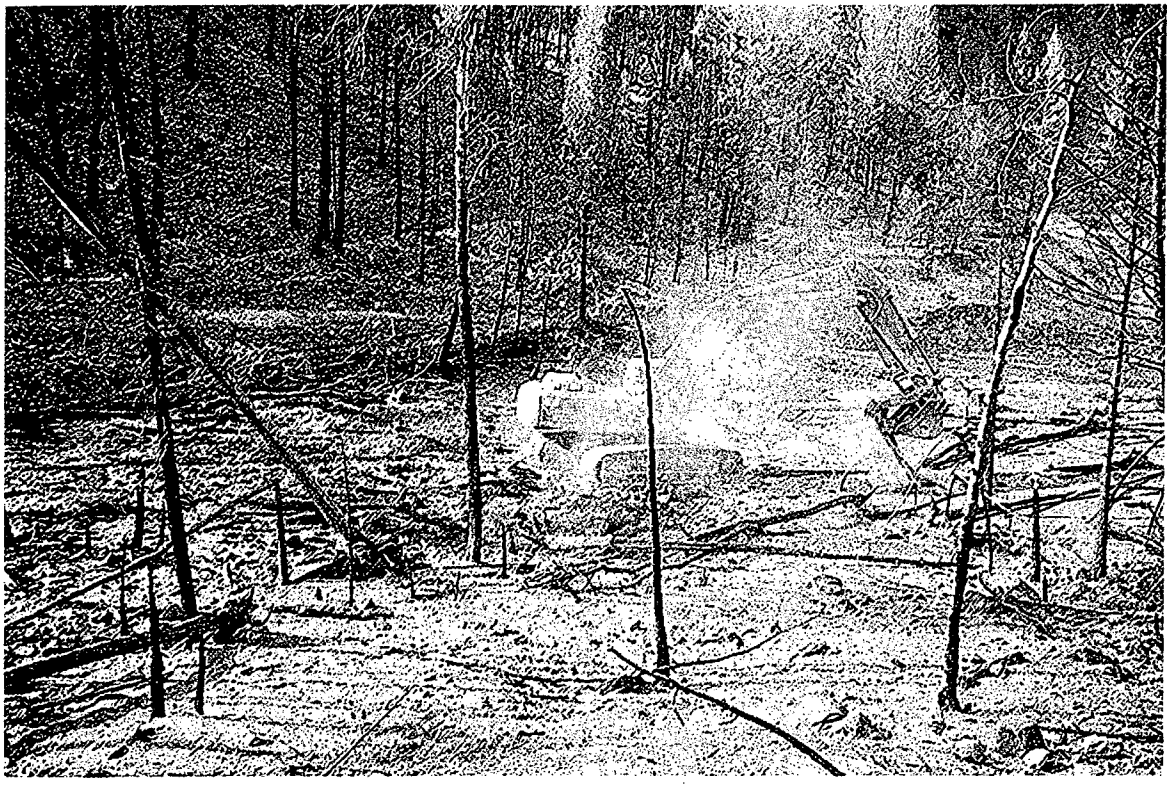
Feature 28, south tailings. View to the Northwest



Feature 29, collapsed adit. View to the Southwest



Feature 30, powerline remnants. View to the Northeast



Tailings Removal Preparation on South End of Tailings. View to the Northwest



Road Improvement West of Feature 6, View to the West

Appendix B
Curriculum Vitae of Key Personnel

WILLIAM M. HARDING, M.A.

EDUCATION

M.A., Anthropology, Idaho State University, Pocatello, 1995. Master's Thesis: The Relationship of Two Sites to the Archaeology and Paleoenvironment of the Bighorn Basin, Wyoming.

B.A., Anthropology, Idaho State University, Pocatello, 1987

PROFESSIONAL REGISTRATIONS/CERTIFICATIONS

Member of Society of American Archaeology, Idaho Advisory Council of Professional Archaeologists
Mr. Harding has been permitted to perform cultural resource investigations by the Bureau of Land Management and/or SHPO in the following states: Alaska, Arizona, Colorado, Idaho, Montana, Nebraska, Nevada, North and South Dakota, Oregon, Utah, Washington, and Wyoming.

TECHNICAL SPECIALTIES

Mr. Harding has 18 years of experience:

- Cultural Resources Management
- Archaeological Site Assessments
- Data Recovery Excavations
- Test Excavations
- Site Inventory
- Environmental Impact Statements and Assessments
- Historical Investigations
- Historical Archaeology
- Preparation of Data Recovery Plans
- Geoarchaeology
- Class I Overviews

EXPERIENCE

Cultural Resources Management

Mr. Harding is the principal investigator for the cultural resource management division at North Wind, Inc.'s (North Wind's) Idaho Falls office (2000 to present). He is responsible for the implementation of all aspects of individual cultural resource projects for North Wind's western service area. Mr. Harding ensures that projects he manages meet the high quality standards of the company and are completed on time and within budget and that the client's needs are met. He oversees the technical completeness and competence of the work and is responsible for the development of work plans and/or research designs. He oversees fieldwork and provides overall supervision of field crews and crew chiefs that include as many as 20 archaeological technicians. He selects and ensures that crew chiefs are of high technical caliber and that crewmembers are employed on work assignments according to their abilities. He is also responsible for the analysis and interpretation of field data, the integration of fieldwork results into comparative regional perspectives, and the timely preparation of reports. He has written cultural resource portions of environmental assessments (EAs) and environmental impact statements (EISs), He has successfully marketed numerous corporations and government agencies and responds with well-prepared proposals to requests for proposals, quotes, and invitations to bid. Mr. Harding has over 18 years of experience working on major archaeological and historical projects in Wyoming, South Dakota, Colorado, Texas, Nevada, Utah, Nebraska, Alaska, Montana, Oregon, and Idaho. These projects included cultural resource inventories, monitor and inspection, testing, and large, complex data recovery projects.

Mr. Harding also served as a supervisory archaeologist for the cultural resource management program at TRC Mariah Associates Inc.'s (TRC Mariah's) Laramie office for nine years (7/90-7/99). He was responsible for the implementation of all aspects of individual cultural resource projects in TRC Mariah's northern service area. Mr. Harding ensured that projects he managed met the high quality standards of the company and were completed on time and within budget and

that the client's needs were met. He oversaw fieldwork and provided overall supervision of field crews and crew chiefs that included as many as 20 archaeological technicians. Some of Mr. Harding's duties include coordinating with clients and government agencies, tracking project budgets, developing research designs, planning and organizing projects, and writing reports. He also coordinated with subcontractors and wrote cultural resource portions of environmental assessments (EAs) and environmental impact statements (EISs).

ARCHAEOLOGICAL SITE ASSESSMENTS

Mr. Harding has assessed sites for impacts subsequent to their being recorded for the Bureau of Land Management (BLM), Vernal District, Utah.

Monument Butte Oil Field, Bureau of Land Management, 1994, Duchesne County, Utah. Mr. Harding conducted site assessments for a 50 percent sample of sites prior to an environmental assessment (EA) within the Monument Butte Oil Field in the Uintah Basin, Duchesne County, Utah. The assessments were conducted for the BLM to determine whether impacts occurred to the sites subsequent to their recordation. Mr. Harding documented the results prior to the completion of the EA.

Data Recovery Excavations

Mr. Harding served as a field director and supervised the field crews and placement and excavation of data recovery blocks during several data recovery excavations. Several of the sites were complex and involved unique excavation techniques to recover the data. Mr. Harding ensured that requirements of regulatory agencies were met and that the projects were completed on time and within budget.

Data Recovery Excavations, Department of Energy, Idaho Operations Office, 2002, Southeast Idaho. Mr. Harding supervised the excavation of a site at the Idaho National Engineering and Environmental Laboratory (INEEL) in southeast Idaho. He was responsible for the placement of the excavation blocks, excavation techniques to maximize the acquisition of recovered archaeological data. He oversaw the analysis of the artifacts and the report writing.

Data Recovery Excavations, Express Pipeline Project, Express Pipeline Co., 1993-1997, Northern and Central Wyoming. Mr. Harding supervised crew chiefs and field crews during the excavation of five sites and assisted in the supervision of field crews at several others. He was responsible for the placement of the excavation blocks and excavation techniques to maximize the acquisition of recovered archaeological data. Some of the excavations were completed throughout the winter in a large temporary shelter. Additionally, Mr. Harding ensured that the requirements of the regulatory agencies were met.

Data Recovery Excavations, Northwest Pipeline Expansion II Project, Northwest Pipeline Company, 1996, Lincoln County, Wyoming. Mr. Harding supervised a field crew during the excavation of a data recovery block of a site found during monitoring of the pipeline right-of-way. Additionally, Mr. Harding supervised the excavation of several blocks simultaneously when the field director was absent. The excavations were completed in a timely manner allowing Northwest Pipeline to continue with construction activities in the area.

Data Recovery Excavations, Site 48PL385, Limestone-Gering-McGrew Transmission Line Project, Western Area Power Administration, 1992, Platte County, Wyoming. Mr. Harding supervised the field crew and assisted in the placement of the excavation blocks during this project. The site, an abandoned town, dated to the Early Historic period and contained Native American artifacts from the post-reservation period. Mr. Harding conducted the historical investigations and prepared the report, which was complimented by the Bureau of Reclamation.

Data Recovery Excavations, Black Buttes Data Recovery Project, 1990, Sweetwater County, Wyoming. Mr. Harding worked as an excavator on several prehistoric sites near the Rock Springs Uplift in southwestern Wyoming. Additional duties included the analysis of lithic materials and coauthoring the report.

Data Recovery Excavations, Dagger Falls Data Recovery Project, 1988, Custer County, Idaho. Mr. Harding was a staff member for the Idaho State University field school. He supervised and taught students and volunteers excavation techniques and methods as well as in artifact processing for laboratory analyses. Mr. Harding also was responsible for the organization of kitchen, logistical, and excavation equipment and shuttling vehicles.

Data Recovery Excavations, Wahmuza Data Recovery Project, 1985, Bannock County, Idaho. Mr. Harding was an excavator at Wahmuza, an Early Archaic to Historic Native American site on the Fort Hall Reservation in southeastern Idaho. Mr. Harding also acted as site supervisor during part of the project. Additional duties included the analysis of the recovered debitage and ceramics.

Test Excavations

Mr. Harding has directed or supervised many test excavation projects. Several of these projects required the use of two crews testing several sites simultaneously. Information from the test excavations was used to develop eligibility recommendations for the National Register of Historic Places (NRHP) and in developing data recovery plans. Listed below is a sample of the projects that Mr. Harding has supervised in the western United States over the past 11 years.

Test Excavations, Pompeys Pillar National Historic Landmark, Montana Bureau of Land Management, South central Montana. Mr. Harding supervised the testing of a prehistoric site and supervised the placement and excavation of 23 backhoe trenches. The project required the supervision of a field crew during all aspects of the project, including the report.

Test Excavations, Poorman and Balm Creek Mines, Oregon Bureau of Land Management, Baker Resource Area, Northeast Oregon. Mr. Harding supervised the excavation of several test units for this project. Several 1 x 1 m test units and .50 x .50 m test units were excavated on this historic site. Mr. Harding also wrote the subsequent report.

Test Excavations, Idaho National Engineering and Environmental Laboratory (INEEL), Department of Energy, 2001, Southeast Idaho. Mr. Harding supervised the testing of three prehistoric sites that were proposed for trenching. The project required the supervision of a field crew during all aspects of the project, which included preparing a testing plan, artifact analyses, and report. The project was funded by the Shoshone-Bannock Tribe.

Test Excavations, Baker Resource Area, Balm Creek Tailings Repository, Bureau of Land Management, 2001, Northeast Oregon. Mr. Harding supervised the testing of a prehistoric site that is a proposed repository to bury nearby, contaminated, mine tailings. Mr. Harding supervised the field crew during all aspects of the project, which included preparing a testing plan, artifact analyses, and report.

Test Excavations and Site Recording, Express Pipeline Project, Express Pipeline Co., 1993-1997, Northern and Central Wyoming. Mr. Harding supervised the recording and testing of numerous sites along a 220-mile segment of pipeline. The project required the supervision of a field crew during various aspects of the project, including location and mapping of the sites and placement of test units to fulfill the requirements of the various regulatory agencies.

Test Excavations and Site Recording, Altamont Gas Pipeline Transmission Project, Altamont Pipeline Company, 1992-1996, Wyoming. Mr. Harding supervised a field crew during the testing of over 100 sites on the 313-mile pipeline in Wyoming. The project entailed the supervision of a field crew during various aspects of the project including recording and testing the sites for the NRHP. When the project was acquired by TRC Mariah, the investigations were critically behind schedule. Mr. Harding supervised the testing and field crew(s) in such a manner that the testing phase was completed in a timely and cost-efficient manner which allowed the inventory and evaluation report to be submitted on time to the regulatory agencies.

Test Excavations, Burlington Northern Railroad, 1995, Sioux County, Nebraska. Mr. Harding supervised the testing for and completed recording of four sites north of Joder, Nebraska. Mr. Harding supervised the field crew and placement of test units to determine whether any were eligible for the NRHP. The testing and recording was completed in a timely and cost-efficient manner.

Test Excavations and Site Recording, Wyoming Department of Transportation, 1991-1993, Wyoming. Mr. Harding supervised field crews testing and recording sites for several projects throughout Wyoming. To facilitate evaluations for the NRHP, sites discovered during cultural resource inventories were tested. The testing and recording was completed in a timely and cost-efficient manner.

Test Excavations and Site Recording, Northwest Pipeline Projects, Northwest Pipeline Company, 1991-1996, Southwest Wyoming. Mr. Harding supervised a field crew during the inventory, testing, and monitoring of several sites in Lincoln County in southwest Wyoming. Mr. Harding directed the field crew during the various aspects of the project, including the recovery of features discovered during monitoring, which allowed Northwest Pipeline to resume construction activities in the area.

Test Excavations, Fort Hood Project, Department of the Army, 1991, Central Texas. Mr. Harding supervised a field crew during testing of several archaeological sites to determine NRHP eligibility. He was responsible for testing numerous sites on the military installation, many of which were in remote locations, and assisting the project geomorphologists.

Test Excavations and Site Recording, J.R. Simplot Phosphate Slurry Pipeline, Conda to Pocatello, 1989, Southeast Idaho. Mr. Harding supervised a field crew during the inventory and testing of the pipeline while with Dames and Moore (1990). He was responsible for the supervision of a field crew during the inventory and testing of a site found on the pipeline, which crossed private land and lands administered by the Bureau of Land Management and U.S. Forest Service.

Test Excavations, American Falls Reservoir Project, Idaho State University Field School, 1989, Power County, Idaho. Mr. Harding directed students in the placement of test units at sites during a bank stabilization project. The test excavations were conducted in a timely manner to determine whether any were eligible for the NRHP.

Site Inventory

Mr. Harding has completed, supervised, or managed numerous cultural resource inventories in Idaho, Wyoming, Utah, Colorado, Nevada, Oregon, South Dakota, and Texas. The inventories ranged from very large block areas of several hundred acres and long linear rights-of-way to small areas for well pads, gravel pits, short roads, and pipelines. The inventories were completed for government agencies and private clients. The projects involved intensively inventorying the area for archaeological remains, recording identified sites on forms and maps, making National Register of Historic Places eligibility recommendations, and completing the required reports. Mr. Harding's supervision of these projects ensured the investigations were completed on time and within budget and to the client's and agencies' satisfaction. Listed below is a representative sample of the inventory projects Mr. Harding has supervised.

Cultural Resource Inventory, Montana BLM, Virginia City, Wildland Urban Interface, June-September 2003, Western Montana. Mr. Harding was the Principal Investigator for the inventory of approximately 2,000 acres around Virginia City, Montana. This was a designed survey and Mr. Harding developed the sampling design, and oversaw fieldwork and reporting in a timely and cost efficient manner.

Cultural Resource Inventory, U.S. Fish and Wildlife Service, Sheldon-Hart National Wildlife Refuge, October 2002, North-central Nevada. Mr. Harding was the Principal Investigator for the inventory of approximately 2,000 acres near Denio, Nevada.

Cultural Resource Inventory, Bureau of Land Management, Klamath Falls District, September to October 2002, Southwestern Oregon. Mr. Harding was the Principal Investigator for the inventory of approximately 6,000 acres in southwestern Oregon. The parcels were widely separated. Mr. Harding oversaw the fieldwork and report writing in a timely and cost efficient manner.

Cultural Resource Inventory, Bureau of Land Management, Vale District, November 2002, Atkins Fire, Southeastern Oregon. Mr. Harding was the Principal Investigator of approximately 6,000 acres for re-seeding. Mr. Harding oversaw the fieldwork and reporting in a timely and cost efficient manner.

Cultural Resource Inventory, The Nature Conservancy, Absaroka Program, October 2002, Land Exchange, Northwest Wyoming. Mr. Harding was the Principal Investigator and field supervisor for a land exchange between the Nature Conservancy and the Bureau of Land Management of 1,800 acres near Cody, Wyoming. Mr. Harding oversaw fieldwork and reporting in a timely and cost efficient manner.

Cultural Resource Inventory, Bureau of Land Management, Baker Resource Area, November 2002, Hells Canyon Heritage Sites, Southeast Washington. Mr. Harding was the Principal Investigator and field supervisor for the relocation of six sites initially recorded in the 1960s. The project entailed jet-boating a crew up Hells Canyon and relocating historical and prehistoric sites. A project report consisting only of completed site forms was required for this project.

Cultural Resource Inventory, Bureau of Land Management, Idaho Falls District, October-January 2002-2003, INEEL, Southeast Idaho. Mr. Harding was the Principal Investigator for this project, which entailed the inventory of 12 miles of road. Much of the inventory included the Goodales Cutoff of the Oregon Trail. He managed the project in a timely and cost efficient manner.

Cultural Resource Inventory, Utah Division of Oil, Gas, and Mining, Stateline Project, July-October 2002, Southwest Utah. Mr. Harding was the Principal Investigator for this project, which entailed the inventory and recordation of approximately 30 mine openings slated for closure in Iron County, Utah. Mr. Harding managed the project, from the fieldwork to the reporting, in a timely and cost efficient manner.

Cultural Resource Inventory, Raft River Electrical Co-op Powerline Replacement and Re-alignment, Northwest Utah, August-November 2002, Box Elder County, Utah. Mr. Harding was the Principal Investigator and field supervisor for this project, which entailed the replacement and re-alignment of an historic powerline. Mr. Harding managed the project in a timely and cost efficient manner.

Cultural Resource Inventory, Bureau of Land Management, Vale District, West Little Owyhee River Wild and Scenic River Corridor, May, 2002, Southwestern Oregon. Mr. Harding was the Principal Investigator (PI) for the inventory of approximately 6,000 acres in the Owyhee Desert of Oregon. Mr. Harding supervised the fieldwork and the subsequent filling out of forms and reporting in a timely and cost efficient manner (in progress).

Cultural Resource Inventory, Bureau of Land Management, Four Rivers Resource Area, Cove Recreation Area, April, 2002, Southwestern Idaho. Mr. Harding was the Principal Investigator (PI) for the inventory of approximately 164 acres in the Owyhee Desert of Idaho. Mr. Harding supervised the fieldwork and the subsequent filling out of forms and reporting in a timely and cost efficient manner.

Cultural Resource Inventory, Wallowa-Whitman National Forest, Unity Ranger District, Mile 9 Planning Unit, August 2001, Eastern Oregon. Mr. Harding was the Principal Investigator (PI) for the inventory of approximately 4,000 acres in the Blue Mountains of Oregon. Mr. Harding supervised the fieldwork and the subsequent filling out of forms and reporting in a timely and cost efficient manner.

Cultural Resource Inventory, Idaho Tower Company, Cell Phone Tower, Idaho and Nevada, September 2001. Mr. Harding was the PI for this cell phone tower, which straddled the Idaho/Nevada border north of Jackpot, Nevada. Mr. Harding was responsible for the fieldwork and subsequent report writing.

Cultural Resource Inventory, Bureau of Land Management, Lemhi Resource Area, Salmon Office, Hayden Drainage Inventory, August 2001, Northeast Idaho. Mr. Harding was the PI for the inventory of approximately 1,850 acres in the Lemhi Mountains of Idaho. Mr. Harding supervised the field crew during fieldwork and for the subsequent form completion and report writing. The former Lemhi Indian reservation was recorded as a result of this project.

Cultural Resource Inventories, Grand Mesa, Uncompahgre, Gunnison National Forest Rollerchops and Grazing Allotments, August 2001, Southwest Colorado. Mr. Harding was the PI and field supervisor of approximately 1,000 acres for several parcels on the Uncompahgre Plateau, in Southwest Colorado. Mr. Harding was responsible for supervising a field crew on these surveys, which located several prehistoric and historic sites. He also supervised the reporting, and supporting documentation.

Cultural Resource Inventory, Upper Snake River Bureau of Land Management, Idaho Falls Office, Southeast Idaho. Mr. Harding was the PI for two inventories, the Clowards Crossing Project and the Windy Ridge Project. Mr. Harding supervised the fieldwork and the reporting of these projects, one of which included the recordation of an historic trash dump.

Cultural Resource Inventory, Idaho Travertine, Caribou-Targhee National Forest, Eastern Idaho. Mr. Harding was the PI for this project, which occurred on land administered by the Caribou-Targhee National Forest. He was responsible for the quality of the fieldwork and the subsequent reporting.

Cultural Resource Inventory, Idaho Transportation Department Projects, May-December 2001, Southeast and Eastern Idaho. Mr. Harding was the PI for several Class III cultural resource inventories conducted for the Idaho Transportation Department. The inventories included gravel pits, highway widening, and interchange placement.

Cultural Resource Inventory, Moose Creek Wagon Road, Kokopelli Endeavors, May 2001, Lemhi County, Idaho. Mr. Harding (PI) obtained and managed the inventory for this road in a timely and cost efficient manner (North Wind, Inc. Project 3053).

Cultural Resource Inventory, Pocatello Creek to Fort Hall Reservation, Intermountain Gas Company Project, April 2001, Bannock County, Idaho. Mr. Harding (PI) managed and conducted an inventory for a new pipeline in a timely and cost efficient manner (North Wind, Inc. Project 3048).

Cultural Resource Inventory, District VII Health Building, South-Central Planning and Development Association, Inc. April, 2001, Lemhi County, Idaho. Mr. Harding (PI) managed an inventory for a District VII Health Building in a timely and cost efficient manner (North Wind, Inc. Project 3051).

Cultural Resource Inventory, Jerome County Historical Society, Idaho Farm and Ranch Museum, June 2001, Jerome County, Idaho. Mr. Harding (PI) managed and conducted the inventory of a 244-acre parcel that the BLM will patent for the Idaho Farm and Ranch Museum in a timely and cost efficient manner (North Wind, Inc. Project 3055).

Cultural Resource Inventory, 12th Street Bridge Project, Idaho Transportation Department, June 2001, Bannock County, Idaho. Mr. Harding (PI) conducted the inventory and historical research of a bridge to the standards of Section 4(f) for the Idaho Transportation Department (North Wind, Inc. Project 3038). The Idaho Transportation Department uses this report as an example for other contractors.

Cultural Resource Inventory, Aggregate Source BL-102, Idaho Transportation Department, June 2001, Bear Lake County, Idaho. Mr. Harding (PI) managed the inventory and the report writing to the standards of Section 4(f) for the Idaho Department of Transportation (North Wind, Inc. Project 3063.01).

Cultural Resource Inventories, Clear Talk Wireless, June-July, 2001 and September, Southeast and South-central Idaho. Mr. Harding (PI) managed the inventory and the report writing for 57 cell phone tower locations in southeast and south-central Idaho. The locations occurred on private and BLM-administered land (North Wind, Inc. Project 3058).

Cultural Resource Inventory, Alan B. Probst Aggregate Source, Idaho Transportation Department, July 2001, Bear Lake County, Idaho. Mr. Harding (PI) managed the inventory and the report writing to the standards of Section 4(f) for the Idaho Department of Transportation (North Wind, Inc. Project 3068).

Cultural Resource Inventory, Grand Teton National Park, US West Communications, Inc., 1999, Teton County, Wyoming. Mr. Harding managed and conducted an inventory for a fiber optic line in a timely and cost-effective manner.

Cultural Resource Inventory, Aspen 3-D Seismic line, Quantum Geophysical, Inc., 1998, Sweetwater and Uinta Counties, Wyoming. Mr. Harding managed a field crew during the inventory for a large, 3-D seismic line in southwest Wyoming in a timely manner.

Cultural Resource Inventory, Paris to Pocatello, Idaho, Direct Communications Rockland, Inc., 1998, Bear Lake, Caribou, Bannock, and Power Counties, Idaho. Mr. Harding managed and completed the inventory and the report for a fiber optic line between Paris and Pocatello, Idaho and a facility upgrade in Rockland, Idaho in a timely and cost-efficient manner.

Cultural Resource Inventory, Superior 3-D Seismic line, Quantum Geophysical, Inc., 1998, Sweetwater County, Wyoming. Mr. Harding was the field director during the inventory of this project for a large, 3-D seismic line near the Rock Springs Uplift, which he managed in a timely and cost-efficient manner.

Cultural Resource Inventory, Waste Area, Burlington Northern Santa Fe Railroad, TranSystems Corporation, 1998, Goshen County, Wyoming. Mr. Harding managed and conducted the inventory of a 90 acre parcel of land to be used to store waste from the upgrade of the railroad in a timely and cost-efficient manner.

Cultural Resource Inventories, North McCallum Oil Field, Nielson and Associates, Inc., 1998, Jackson County, Colorado. Mr. Harding managed and completed the inventories and reports of three short cultural inventories for proposed flowlines in a timely and cost-effective manner.

Cultural Resource Inventories and Trench Inspections, Lost Soldier and Wertz Well Fields, AMOCO, 1992-1998, Carbon and Sweetwater Counties, Wyoming. Mr. Harding completed several cultural resource inventories for flowlines. Several of the subsequent trenches were also inspected for archaeological material.

Cultural Resource Inventories, City of Cody, 1997, Park County, Wyoming. Mr. Harding completed two short inventories for the City of Cody for a proposed nature trail and water line.

Cultural Resource Inventories, Express Pipeline Project, Express Pipeline Co., 1993-1996, Northern and Central Wyoming. Mr. Harding supervised field crew(s) and completed several inventories for the pipeline right-of-way, access roads, and extra work spaces. He also inventoried several access roads and extra work spaces while conducting trench inspection during construction of the pipeline to facilitate continued construction of the pipeline.

Cultural Resource Inventories, Mine Expansion Areas, Wharf Resources and Golden Reward Mining Co., 1994-1995, Black Hills, South Dakota. Mr. Harding completed several cultural resource inventories for Wharf Resources and historic investigations for gold mine expansion areas in the Black Hills.

Cultural Resource Inventory, Project Plowshare, International Technology Corporation Surveys, 1995 Rifle and Parachute, Colorado. Mr. Harding completed two surveys near ground zero of subsurface atomic testing (operation Plowshare)for International Technology Corporation in west-central Colorado.

Cultural Resource Inventories, US West Buried Telephone Cable Project, US West, 1995, Colorado. Mr. Harding completed several cultural resource inventories in northwestern Colorado.

Cultural Resource Inventory, Relocation of an Amoco Production Company Rectifier, Pacific Power and Light, 1995, Carbon County, Wyoming. Mr. Harding completed a cultural resource inventory to relocate the rectifier in south-central Wyoming.

Cultural Resource Inventories, Wyoming Department of Transportation, 1991-1994, Wyoming. Mr. Harding completed several cultural resource inventories for several highway right-of-way expansions and gravel pits throughout Wyoming.

Cultural Resource Inventories, US West Buried Telephone Cable Project, US West, 1994-1997, Campbell, Uinta, and Lincoln Counties, Wyoming. Mr. Harding completed several cultural resource inventories throughout Wyoming.

Cultural Resource Inventories, Northwest Pipeline Expansion I and II Projects, Northwest Pipeline Company, 1992-1996, Sweetwater and Lincoln Counties, Wyoming. Mr. Harding completed several cultural resource inventories in southwestern Wyoming.

Cultural Resource Inventories, KENETECH Windpower Project, KENETECH Windpower Inc., 1994-1995, Carbon County, Wyoming. Mr. Harding completed several cultural resource inventories for a proposed windpower plant in southeast Wyoming.

Cultural Resource Inventory, Rural Electrical Association Project, WYRULEC, 1994, Goshen County, Wyoming. Mr. Harding completed a cultural resource inventory for an electrical transmission line in eastern Wyoming.

Cultural Resource Inventory, Teton County Landfill Project, Teton County, 1993, Sublette County, Wyoming. Mr. Harding completed a block cultural resource inventory for the Teton County Landfill in Sublette County, Wyoming.

Cultural Resource Inventory, Gas Pipeline Project, Trigon Engineering Inc., 1993, Sublette County, Wyoming. Mr. Harding completed a cultural resource inventory for a small gas pipeline right-of-way in Sublette County, Wyoming.

Cultural Resource Inventory, Mine Reclamation Project, Western Water Consultants, Inc., and Wyoming Department of Environmental Quality, 1992, Johnson County, Wyoming. Mr. Harding completed block cultural resource inventories for the reclamation of three bentonite mines in Johnson County, Wyoming.

Cultural Resource Inventory, US West Buried Telephone Cable Project, US West, 1989, Southern Idaho. Mr. Harding completed cultural resource inventories for a buried US West line across southern Idaho while with Dames and Moore.

Cultural Resource Inventories, Idaho National Engineering Laboratory, 1985-1989, Southeast Idaho. Mr. Harding completed several cultural resource inventories and testing projects at these properties for a variety of projects, including the proposed super collider/conductor project, and small projects for the United States Navy. Some of these projects, which Mr. Harding conducted as a crew chief, include:

Test Excavations, Ten Sites along the Powerline between the Power Burst Facility and Argonne National Laboratory-West, August 1988, Southeast Idaho. SCAR-Lab Project No. 88-6.

Cultural Resource Inventory, Argonne National Laboratory-West Administrative Boundary, 1988, Southeast Idaho. SCAR-Lab Project No. 88-9

Cultural Resource Inventory, Test Reactor Gravel Pit Survey, September, 1989, Southeast Idaho. SCAR-Lab Project No. 89-1.

Cultural Resource Inventory, Hunting Boundary Signing Project, June-July, 1989, Southeast Idaho. SCAR-Lab Project No. 89-2

Cultural Resource Inventory, New Production Reactor Survey, July, 1989, Southeast Idaho. SCAR-Lab Project No. 89-5.

Cultural Resource Inventory, Fast Attack Vehicle Area, July-August, 1989, Southeast Idaho. SCAR-Lab Project No. 89-6.

Environmental Impact Statements and Assessments

Mr. Harding has been the author of the cultural resource section and paleontological section of several environmental impact statements and environmental assessments. He was responsible for the research on prehistoric and historic sites which were located in the areas to be affected on projects in Wyoming and Utah.

Third-Party Environmental Assessment for the Holbrook IC Project, 2002, Idaho, Department of Transportation, Project No. NH-6470(121), Key No. 7816. Mr. Harding served as the cultural resource specialist for this project. He was the project principal archaeologist for the inventory and wrote the cultural resource portion of the document for release for public comment.

Third-Party Environmental Impact Statement for the Jonah Field II Natural Gas Project, 1996, Wyoming, Bureau of Land Management. Mr. Harding served as the cultural resource specialist for this project. He prepared the cultural resource section of the document for release for public comment.

Third-Party Environmental Impact Statement for Creston/Blue Gap Natural Gas Project, Bureau of Land Management, 1994, Wyoming. Mr. Harding was the cultural resource specialist for this project. He prepared the cultural resource section of the document for release for public comment. Mr. Harding's duties included analyses of archaeological sites and site locational predictions based on known sites within the area.

Third-Party Environmental Assessment for North Roundup Coal Development, Bureau of Land Management, 1994, Wyoming. Mr. Harding was the cultural resource specialist in the preparation of both the cultural and paleontological resource sections for this document, which was released for public comment. His duties included analyses of archaeological sites and site locational predictions based on known sites within the area, as well as research into fossil-bearing formations within the area of proposed development.

Third-Party Environmental Assessment for Monument Butte/Myton Bench Oil Field Development, Bureau of Land Management, 1994, Utah. Mr. Harding was the cultural resource specialist in the preparation of the cultural resource section of this document which was released for public comment. His duties included analyses of archaeological sites and site locational predictions based on known sites within the area.

Third-Party Environmental Assessment for Questar-Birch Creek Pipeline, Bureau of Land Management, 1994, Wyoming. Mr. Harding was the cultural resource specialist in the preparation of the cultural resource section of the document for release for public comment. His duties included the analysis of archaeological sites and site locational predictions based on known sites within the area.

Third-Party Environmental Impact Survey for Stagecoach Draw Natural Gas Development, Bureau of Land Management, 1993, Wyoming. Mr. Harding served as the cultural resource specialist in the preparation of the cultural resource section of this document. The document was released for public comment. His duties included the analysis of archaeological sites and site locational predictions based on known sites within the area.

Third-Party Environmental Impact Survey for KENETECH Windpower Development, Bureau of Land Management, 1993, Wyoming. Mr. Harding was the cultural resource specialist in the preparation of the cultural resource section of the document, prior to actual fieldwork, for release for public comment. His duties entailed the analysis of archaeological sites and site locational predictions based on recorded sites within the area.

Historical Investigations

Mr. Harding completed archival and archaeological historic investigations for several projects in Wyoming and South Dakota. These historic investigations included trails, townsites, and homesteads. The projects are listed below and were completed as part of larger cultural resource projects.

Historical Investigations of the Poorman Mine, Baker Resource Area, Bureau of Land Management, October-January 2002-2003, Baker County Oregon. Mr. Harding was the Principal Investigator for this project, which entailed test excavations, historical and archival research and documentation, HABS/HAER like elevation drawings, historical artifact analysis, and reporting.

Historical Investigations of Fairbanks, Wyoming, Site 48PL385, Limestone-Gering-McGrew Transmission Line Project, Western Area Power Administration, 1992, Platte County, Wyoming. Mr. Harding conducted archival and archaeological historical investigations of this townsite as part of data recovery excavations.

Historical Investigations, Altamont Pipeline Project, Altamont Pipeline Company, 1992, Northern and Western Wyoming. Mr. Harding conducted archival investigations of homesteads at courthouses as part of this project.

Historical Investigations for the Golden Reward Mine Project, Golden Reward Mining Co., 1994-1995, Black Hills, South Dakota. Mr. Harding conducted historical investigations on structures found during various cultural resource inventories.

Historical Investigations for the Idaho Transportation Department, 12th Street Bridge Project, May 2001, Bannock County, Idaho. Mr. Harding (PI) conducted archaeological, archival and historical investigations, including oral interviews, for the historic 12th Street Bridge near McCammon, Idaho (North Wind, Inc. Project 3038).

Historical Investigations for the CMS Facility, Alaska Department of Military and Veterans Affairs, June 2001, Anchorage, Alaska. Mr. Harding (PI) managed and conducted archival investigations, including oral interviews, for three buildings at Fort Richardson in Anchorage, Alaska (North Wind, Inc. Project 2077).

Historical Investigations for the Idaho Transportation Department, Holbrook Interchange Project, August 2001, Jefferson County, Idaho. Mr. Harding was the PI for this project, which included the recording of several residences, canals, a railroad, and trash dump. Mr. Harding was responsible for the fieldwork and subsequent report writing.

Historical Investigations for the Idaho Transportation Department, Park-Artemesia Road Project, August 2001, Mackay, Custer County, Idaho. Mr. Harding was the PI for this project, which entailed the recording of several historic buildings and archival research associated with them. The 24th J.C. Penney Store built—called the Golden Rule--was one of the results of this project.

PREPARATION OF DATA RECOVERY PLANS

Mr. Harding prepared data recovery and treatment plans that detailed the proposed cultural resource investigations to mitigate potential adverse effects of a highway project. The plan was approved without change by the State Historic Preservation Office, the Bureau of Land Management, and the Wyoming Department of Transportation.

Data Recovery Plan, Meeteetse Highway Reconstruction Project, 1991, Park County, Wyoming. Mr. Harding prepared the data recovery plan for the excavation of two sites for the Wyoming Department of Transportation.

Data Recovery Plan, Big Lost RiverGeomorphic Testing Project, 2002, Butte County, Idaho. Mr. Harding prepared the data recovery plan for the excavation of two sites for the Wyoming Department of Transportation

Historical Archaeology

Mr. Harding has recorded numerous historical sites for numerous projects throughout the western United States. Mr. Harding is familiar with the references involved in dating historical sites as well as their evaluation The following is a sample of the projects Mr. Harding has worked on which included historical archaeological sites.

Historical Investigations of the Jennie Mine, Utah Division of Oil Gas and Mining, April-July 2003, Iron County, Utah. Mr. Harding was the Principal Investigator for this project, which entailed HABS/HAER-like elevation drawings, historical and archival research, and reporting.

Historical Investigations of the Poorman Mine, Baker Resource Area, Bureau of Land Management, October-January 2002-2003, Baker County Oregon. Mr. Harding was the Principal Investigator for this project, which entailed test excavations, historical and archival research and documentation, HABS/HAER like elevation drawings, historical artifact analysis, and reporting.

Historical Investigations of Fairbanks, Wyoming, Site 48PL385, Limestone-Gering-McGrew Transmission Line Project, Western Area Power Administration, 1992, Platte County, Wyoming. Mr. Harding conducted archival and archaeological historical investigations of this townsite as part of data recovery excavations.

Historical Investigations, Altamont Pipeline Project, Altamont Pipeline Company, 1992, Northern and Western Wyoming. Mr. Harding conducted archival investigations of homesteads at courthouses as part of this project.

Historical Investigations for the Golden Reward Mine Project, Golden Reward Mining Co., 1994-1995, Black Hills, South Dakota. Mr. Harding conducted historical investigations on structures found during various cultural resource inventories.

Historical Investigations for the Idaho Transportation Department, 12th Street Bridge Project, May 2001, Bannock County, Idaho. Mr. Harding (PI) conducted archaeological, archival and historical investigations, including oral interviews, for the historic 12th Street Bridge near McCammon, Idaho (North Wind, Inc. Project 3038).

Historical Investigations for the CMS Facility, Alaska Department of Military and Veterans Affairs, June 2001, Anchorage, Alaska. Mr. Harding (PI) managed and conducted archival investigations, including oral interviews, for three buildings at Fort Richardson in Anchorage, Alaska (North Wind, Inc. Project 2077).

Historical Investigations for the Idaho Transportation Department, Holbrook Interchange Project, August 2001, Jefferson County, Idaho. Mr. Harding was the PI for this project, which included the recording of several residences, canals, a railroad, and trash dump. Mr. Harding was responsible for the fieldwork and subsequent report writing.

Historical Investigations for the Idaho Transportation Department, Park-Artemesia Road Project, August 2001, Mackay, Custer County, Idaho. Mr. Harding was the PI for this project, which entailed the recording of several historic buildings and archival research associated with them. The 24th J.C. Penney Store built—called the Golden Rule--was one of the results of this project.

Cultural Resource Inventory, Paris to Pocatello, Idaho, Direct Communications Rockland, Inc., 1998, Bear Lake, Caribou, Bannock, and Power Counties, Idaho. Mr. Harding managed and completed the inventory and the report for a fiber optic line between Paris and Pocatello, Idaho and a facility upgrade in Rockland, Idaho in a timely and cost-efficient manner. Mr. Harding recorded portions of the Oregon Trail and the Lincoln Highway.

Geoarchaeology

Mr. Harding served as a geoarchaeologist on sites for the Express Pipeline project and worked closely with the project geoarchaeologist. Mr. Harding has given doctoral-level lectures at the University of Wyoming on the subject of geoarchaeology.

Mr. Harding was the project geoarchaeologist for test excavations at the INEEL, in Southeast Idaho, 2001. He ascertained the age and depositional event of the geological sediments, the pedological profiles superimposed on them, and the classification of the soil.

Mr. Harding was the project geoarchaeologist for test excavations at Temporary Site BK310 near Baker, Oregon, 2001. Mr. Harding ascertained the age and depositional events of the geological sediments as well as the pedological profiles of the site, and the classification of the soil.

Class I Overviews

Class I Overview of U.S. West Fiber Optic Line, Evanston to Kemmerer Segment, Uinta and Lincoln Counties, Wyoming. Prepared by Mariah Associates, Inc. for US West Telecommunications Inc. in 1993.

Class I Cultural Resource Inventory for Syringa Networks, LLC, Proposed Fiber Optic Line, Dubois-Kilgore-Parker Route in Clark and Fremont Counties, Idaho. Prepared by North Wind, Inc. for Syringa Networks, LLC, Rupert in 2002

Class I Cultural Resource Inventory for Syringa Networks, LLC, Proposed Fiber Optic Line, Mud Lake to Howe Route in Butte and Jefferson Counties, Idaho. Prepared by North Wind, Inc. for Syringa Networks, LLC. Rupert in 2002.

SPECIALIZED TRAINING/QUALIFICATIONS/LANGUAGES

Mr. Harding has attended several training courses, including those sponsored by the Advisory Council on Historic Preservation on Federal Projects and Historic Preservation Law.

Mr. Harding speaks, reads, and writes Spanish.

REGULATORY EXPERIENCE

Major environmental regulations with which Mr. Harding has experience include the following:

National Environmental Policy Act of 1969 (NEPA) (42 USC §4321 et seq.)
Antiquities Act of 1906, as amended (16 USC §431 et seq.)
Historic Sites Act of 1935 as amended (16 USC §461 et seq.)
National Historic Preservation Act (NHPA) of 1966, as amended (16 USC §470 et seq.)
UNESCO Convention, 16th General Conference of 14 November 1970, Paris
Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, as amended (25 USC §3001-3013)
Archaeological and Historic Preservation Act (AHPA) of 1974, as amended (16 USC §469-469c-2)
EO 11593 Protection and Enhancement of the Cultural Environment
American Indian Religious Freedom Act (AIRFA) of 1978, as amended (42 USC §1996 et seq.)
Archeological Resources Protection Act (ARPA) of 1979, as amended (16 USC 470aa-mm)
Presidential Memorandum of April 29, 1994, Government-to-Government Relations with Native American Tribal Governments.
EO 13007 Indian Sacred Sites

PROFESSIONAL HONORS/AFFILIATIONS

2004 Empire *Who's Who of Executives and Professionals*
Selected as a 1986 *Outstanding Young Man of America*

PROFESSIONAL PUBLICATIONS

Harding, William M.
1988 *Manioc Processing Among the Tukuna.* Manuscript on file at the Idaho Museum of Natural History, Pocatello, Idaho.

1985 *Evolutionary Forces.* In *Physical Anthropology Laboratory Manual.* Edited by Dr. Allen C. Turner. Manuscript on file.

Harding, William M., and Brenda L. Ringe
1986 *Ceramics.* In *Shoshone-Bannock Culture History.* Edited by Richard Holmer, pp. 149-155. Idaho State University Press, Pocatello, Idaho.

Harding, William M., and Edward H. Romasko
1985 *Aging and Sexing the Human Skeleton.* In *Physical Anthropology Laboratory Manual.* Edited by Dr. Allen C. Turner. Manuscript on file.

TECHNICAL REPORTS

Bureau of Land Management
1993 *Environmental Impact Statement, Stagecoach Gas Well Development, Sweetwater City, Wyoming.* Prepared by TRC Mariah Associates Inc. for Bureau of Land Management, Rock Springs District, and Heitzman Drill Site Services. pp. 75-77, 101-102.

1993 *Environmental Impact Statement, Natural Gas Development Project, Carbon and Sweetwater Counties, Wyoming.* Prepared by TRC Mariah Associates Inc. for Bureau of Land Management, Rawlins District, and Snyder Oil Corporation.

Harding, William M.

2002 *Archaeological and Historical Investigations of the Poorman Mine, Baker County, Oregon.* Prepared by North Wind, Inc. for the Baker District of the Oregon Bureau of Land Management, Baker City.

2002 *Burial Plan for the Construction of the Early Child Development Center, Fort Hall, Idaho.* Prepared by North Wind for the Shoshone-Bannock Tribes, Fort Hall.

2002 *Monitor Plan for the Construction of the Early Child Development Center, Fort Hall, Idaho.* Prepared by North Wind for the Shoshone-Bannock Tribes, Fort Hall.

2002 *Mitigation Plan for the Construction of the Early Child Development Center, Fort Hall, Idaho.* Prepared by North Wind for the Shoshone-Bannock Tribes, Fort Hall.

2002 *Class III Cultural Resource Inventory for the Holbrook Interchange,, Jefferson County, Idaho.* Prepared by North Wind, Inc. for HDR Engineering, Inc..

2001 *A Class III Cultural Resource Inventory for a Proposed Intermountain Gas Line, Bannock County, Idaho.* Prepared by North Wind, Inc. for Intermountain Gas Company.

2001 *A Class III Cultural Resource Inventory for the 12th Street Bridge Project, McCammon, Bannock County, Idaho.* Prepared by North Wind, Inc. for the Idaho Department of Transportation.

1999 *A Class III Cultural Resource Inventory for a Proposed Fiber Optic Line for US West Communications, Inc. in Grand Teton National Park, Teton County, Wyoming.* Prepared by TRC Mariah Associates Inc., for US West Communications, Inc.

1998 *Addendum to Class III Cultural Resource Inventory for the Horse Thief Canyon 3-D Seismic Project Near Superior, Sweetwater County, Wyoming.* Prepared by TRC Mariah Associates Inc. for Quantum Geophysical, Inc.

1998 *A Class III Cultural Resource Inventory for a Proposed Waste Area for Burlington Northern Santa Fe Railroad Gratten to Guernsey Double Track Project, Goshen County, Wyoming.* Prepared by TRC Mariah Associates Inc., for TranSystems Corporation.

1998 *Trench Inspection of a Flowline in the Lost Soldier Oil Field at Bairoil, Sweetwater County, Wyoming.* Prepared by TRC Mariah Associates Inc. for Amoco Production Company.

1998 *Class III Cultural Resource Inventory of a Flowline Connecting Oil Wells No. 79, No. 5, and No. 12, Jackson County, Colorado.* Prepared by TRC Mariah Associates Inc. for Neilson and Associates, Inc.

1998 *Addendum to Class III Cultural Resource Inventory from No. 79 Well, Jackson County, Colorado.* Prepared by TRC Mariah Associates Inc. for Neilson and Associates, Inc.

1997 *Class III Cultural Resource Inventory of Five Segments of a US West Buried Fiber Optic Line within the Thunder Basin National Grasslands, Campbell County, Wyoming.* Prepared by TRC Mariah Associates Inc. for Power Engineers, Inc.

1995 *A Class III Cultural Resource Inventory of Four Parcels in the Vicinity of Terry Peak, Lawrence County, South Dakota.* Prepared by TRC Mariah Associates Inc. for Golden Reward Mining Company L.P.

1995 *A Class III Cultural Resource Inventory of a Parcel in the Vicinity of Foley Mountain, Lawrence County, South Dakota.* Prepared by TRC Mariah Associates Inc. for Wharf Resources Partnership.

1995 *Addendum to: A Class III Cultural Resource Inventory for a US West Telecommunications Line East of Kremmling, Grand County, Colorado, and A Class III Cultural Resource Inventory for a US West*

Telecommunications Line Northwest of Kremmling, Grand County, Colorado. Prepared by TRC Mariah Associates Inc. for US West Communications, Inc.

1995 *A Class III Cultural Resource Inventory for a US West Telecommunications Line near Dice Hill, Summit County, Colorado.* Prepared by TRC Mariah Associates Inc. for US West Communications, Inc.

1995 *Class III Cultural Resource Inventory for Proposed US West Telecommunications Lines, Oak Creek, Routt County, Colorado.* Prepared by TRC Mariah Associates Inc. for US West Communications, Inc.

1995 *Archaeological Investigations Near Toadstool Park for the Burlington Northern Railroad, Sioux County, Nebraska.* Prepared by TRC Mariah Associates Inc. for Burlington Northern Railroad Inc.

1995 *Class III Cultural Resource Inventory for the Relocation of an Amoco Production Company Rectifier, Carbon County, Wyoming.* Prepared by TRC Mariah Associates Inc. for Pacific Power and Light Company.

1995 *A Class III Cultural Resource Inventory for Geologic Exploration Trenches, Drill Holes, and Access Routes, Crook County, Wyoming.* Prepared by TRC Mariah Associates Inc. for Phelps Dodge Mining Company.

1994 *Assessment of Twenty-three Cultural Sites in the Monument Butte Oil Field, Duchesne, County, Utah.* Prepared by Mariah Associates, Inc. for Equitable Resources Energy Company.

1993 *A Construction Monitor and Cultural Resource Investigations at Five Prehistoric Sites for the Northwest Pipeline System Expansion Project, Kemmerer South Segment, Lincoln County, Wyoming.* Prepared by Mariah Associates, Inc. for Northwest Pipeline Corporation.

1993 *Background Information on Cultural Resources for Kenetech/U.S. Windpower Project Area in Carbon County, Wyoming.* Prepared by Mariah Associates, Inc. for KENETECH/U.S. Windpower.

1993 *Class I Overview of U.S. West Fiber Optic Line, Evanston to Kemmerer Segment, Uinta and Lincoln Counties, Wyoming.* Prepared by Mariah Associates, Inc. for US West Telecommunications Inc.

1993 *Results of 1992 Phase II Test Excavations, Wyoming. Addendum to Historic Properties Inventory and Evaluation Report for Cultural Resources on the Proposed Altamont Gas Pipeline Project in Wyoming: 1992 Field Investigations.* Prepared by Mariah Associates, Inc. for Altamont Pipeline Company.

1993 *Review Draft, Historic Properties Treatment Plan for Cultural Resources on the Proposed Altamont Gas Pipeline Project, Wyoming Segment.* Prepared by Mariah Associates, Inc. for Altamont Pipeline Company.

1993 *Test Excavation at Site 48PL253 and 48PL329 for the Bosler Junction-Wheatland, Bluegrass Creek and Sybille Creek Sections (PREB-0109[19] and PREB-0109[20]), Platte County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1993 *A Class III Cultural Resource Inventory for Gas Pipelines for Trigon Engineering, Inc., Sublette County, Wyoming.* Prepared by Mariah Associates, Inc. for Trigon Engineering, Inc.

1993 *A Class III Cultural Resource Inventory for the Teton County Sanitary Landfill, Sublette County, Wyoming.* Prepared by Mariah Associates, Inc. for Teton County, Wyoming.

1993 *A Class III Cultural Resource Inventory for the Moorcroft-Sundance, Sundance West Section Project (IR-90-4[96]177), Crook County Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1993 *A Class III Cultural Resource Inventory of a Proposed Gravel Pit, Bosler-Wheatland, Bosler Junction East Project (PREB-0109[17]), Albany County, Wyoming (Revised).* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1993 *A Class III Cultural Resource Inventory of the Proposed Meyers No. 6 Gravel Pit, Evanston-Granger Junction Project (IR-80-1[96]12), Uinta County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1993 *A Class III Cultural Resource Inventory of Eight Proposed Snow Fences (Snow Fences 4a, 5, 6a, 8a, 9-12) Laramie-Colorado State Line Project (PREB-023-2[31]), Albany County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1993 *A Class III Cultural Resource Inventory of Road Segments, Pitkin County, Colorado.* Prepared by Mariah Associates, Inc. for Tom Barron.

1993 *Class III Cultural Resource Inventory and Construction Monitor for Cathodic Protection Station in the Lost Soldier and Wertz Well Fields, Carbon and Sweetwater Counties, Wyoming.* Prepared by Mariah Associates, Inc. for Amoco Production Company.

1993 *Class III Cultural Resource Inventory and Construction Monitor of a Pipeline and Flare Stack Relocation Area in the Lost Soldier Well Field, Sweetwater County, Wyoming.* Prepared by Mariah Associates, Inc. for Amoco Production Company.

1993 *Class III Cultural Resource Inventory of a Drainage Ditch and a Pipeline in the Lost Soldier and Wertz Well Fields, Carbon and Sweetwater Counties, Wyoming.* Prepared by Mariah Associates, Inc. for Amoco Production Company.

1993 *Archaeological Investigations at Five Archaeological Sites Monitored Along the Kemmerer South Loop for the Northwest Pipeline System Expansion Project, Lincoln County, Wyoming.* Prepared by Mariah Associates, Inc. for Northwest Pipeline Corporation.

1993 *Class III Cultural Resource Inventory and Construction Monitor of a Pipeline in the Lost Soldier Well Field, Sweetwater County, Wyoming.* Prepared by Mariah Associates, Inc. for Amoco Production Company.

1992 *Archaeological Investigations at Site 48PL385 for the Limestone-Gering-McGrew Transmission Line Project, Unita County, Wyoming.* Prepared by Mariah Associates, Inc. for Western Area Power Administration.

1992 *Open Trench Inspection of Five Pipelines in the Wertz Well Field, Sweetwater County, Wyoming.* Prepared by Mariah Associates, Inc. for Amoco Production Company.

1992 *A Class III Inventory of A Pipe Storage Yard and Vent Enclosure for the Northwest Pipeline System Expansion Project in Lincoln County, Wyoming.* Prepared by Mariah Associates, Inc. for Northwest Pipeline Corporation.

1992 *A Class III Cultural Resource Inventory of the Proposed JI Gravel Pit, Evanston-Granger Junction Project (IR-80-1[96]12), Uinta County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1992 *Archaeological Excavations at Site 48PL385 for the Limestone-Gering-McGrew Transmission Line Project, Platte County, Wyoming.* Prepared by Mariah Associates, Inc. for Western Area Power Administration.

1992 *Class III Cultural Resource Inventory for the Bosler Junction-Wheatland, Bluegrass Creek and Sybille Creek Sections (PREB-0109[19] and PREB-0109[20]), Albany and Platte Counties, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1992 *Class III Cultural Resource Inventory for the Snake River Bridge, Alpine to Alpine Junction (BRP-010-3[50]), Lincoln County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1992 *Class III Cultural Resource Inventory for the Moorcroft-Sundance, Pine Ridge Section Project (IR-90-4[96]165), Crook County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1992 *Class III Cultural Resource Inventory of the Glenrock-Ross Road and Associated Areas (PREB-0504[9]), Converse County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

1988 *Archaeological Investigations at Devil's Corral.* Prepared by Swanson/Crabtree Anthropological Research Laboratory for the Bureau of Land Management, Shoshone District.

1988 *The Ross Park Petroglyphs.* Prepared by Swanson/Crabtree Anthropological Research Laboratory for the Parks and Recreation Department, Pocatello, Idaho.

Harding, William M., and James A. Lowe
1999 *Section 2.1 - Paleoenvironment.* In *Archaeological Investigations along the Wyoming Segment of the Express Pipeline: Volume 5, Project Synthesis,* William Martin and Craig S. Smith, series editors. Prepared by TRC Mariah Associates Inc., for Express Pipeline Company, Alberta, Canada.

1995 *Class III Cultural Resource Inventory of Two Parcels in the Vicinity of Ruby Basin Associated with the Golden Reward Mining Company LP Exploratory Drilling, Lawrence County, South Dakota.* Prepared by TRC Mariah Associates Inc. for Golden Reward Mining Company L.P.

1993 *Class III Cultural Resource Inventory for the Eight Mile Road Project (SC-CFM 10-66), Fremont County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

Green, C., J.S. Shelton, and W.M. Harding
2002 *Class I Cultural Resource Inventory for Syringa Networks, LLC, Proposed Fiber Optic Line, Dubois-Kilgore-Parker Route in Clark and Fremont Counties, Idaho.* Prepared by North Wind, Inc. for Syringa Networks, LLC, Rupert.

Harding, W.M., and W.M. Martin
1999 *Section 6 - The Nowater Housepit Site (Site 48WA1463).* In *Archaeological Investigations along the Wyoming Segment of the Express Pipeline: Volume 3, Big Horn Basin and Bridger Mountain Sites,* William Martin and Craig S. Smith, series editors. Prepared by TRC Mariah Associates Inc., for Express Pipeline Company, Alberta, Canada.

Harding, W.M., B.R. McClelland, K.D. Coppinger, and N. Fleming
1998 *A Class III Cultural Resource Inventory for the Paris to Pocatello Fiber Optic Line and Rockland Facility Upgrade, Bear Lake, Caribou, Bannock, and Power Counties, Idaho.* Prepared by TRC Mariah Associates Inc. for Direct Communications Rockland, Inc., Pocatello, Idaho.

Harding, W.M., B.R. McClelland, and C.S. Smith
1991 *Test Excavations at Four Archaeological Sites and Data Recovery Plan for the Thermopolis-Meeteetse, Buffalo Creek and Meeteetse South Sections Project (033-2[26] and 033-1[14]), Hot Springs and Park Counties, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Transportation.

Harding, W.M., and L.M. McNees
1995 *Miscellaneous Class III Cultural Resource Inventories Associated with the Northwest Pipeline Corporation Expansion II Project, Lincoln County, Wyoming.* Prepared by TRC Mariah Associates Inc. for Northwest Pipeline Corporation.

1994 *A Class III Cultural Resource Inventory of the McCoy/Cove Mine Claimblock Exploration Project, Lander County, Nevada.* Prepared by Mariah Associates, Inc. for Echo Bay Minerals Company.

1994 *Class III Cultural Resource Inventories for a Superseded Segment of the Northwest Pipeline System II Project, Muddy Creek North Loop, and the Kemmerer Compressor Station Parcel, Lincoln County, Wyoming.* Prepared by Mariah Associates, Inc. for Northwest Pipeline Corporation.

Harding, W.M., and D. Newton

1993 *Class III Cultural Resource Survey for Three Stockpile Areas and an Access Road for the No. 9 Mine Fire, Sweetwater County, Wyoming.* Prepared by Mariah Associates, Inc. for Wyoming Department of Environmental Quality.

Harding, W.M., J. Shelton, and C. Green
2002 *Class III Heritage Survey of the Mile 9 Planning Area, Unity Ranger District, Wallowa-Whitman National Forest, Baker County, Oregon.* Prepared by North Wind, Inc. for Wallowa-Whitman National Forest, Oregon.

Harding, W.M., J. Shelton, C. Green, and M. Koller
2002 *Test Excavations for the Big Lost River Study Group Project at the Idaho National Engineering and Environmental Laboratory, Southeast Idaho.* Prepared by North Wind, Inc. for the Shoshone-Bannock Tribes, Fort Hall.

Mariah Associates, Inc.
1995 *Inventory and Evaluation Report, Altamont Gas Transmission Line Project.* Prepared for Altamont Gas Transmission Line Co., Alberta.

1993 *Historic Properties Inventory and Evaluation Report, Express Pipeline Project, Wyoming Segment.* Prepared for Express Pipeline Company.

Lowe. J. and W.M. Harding
1998 *Class III Cultural Resource Inventory for the Horse Thief Canyon 3-D Seismic Project Near Superior, Sweetwater, County. Wyoming.* Prepared by TRC Mariah Associates, Inc. for Quantum Geophysical, Inc.

Harding, W.M., and W.M. Martin
1999 *Section 2 - Site 48BH1731.* In *Archaeological Investigations along the Wyoming Segment of the Express Pipeline: Volume 3, Big Horn Basin and Bridger Mountain Sites,* William Martin and Craig S. Smith, series editors. Prepared by TRC Mariah Associates Inc., for Express Pipeline Company, Alberta, Canada.

Martin, W.M., B.R. McClelland, W.M. Harding, and L.M. McNees
1999 *Archaeological Investigations along the Wyoming Segment of the Express Pipeline, Volume 2: Construction Inspection,* William Martin and Craig S. Smith, series editors. Prepared by TRC Mariah Associates Inc. for Express Pipeline Company, Alberta, Canada.

Martin, W.M., W.M. Harding, and R.D. Richard
1999 *Section 9 - The Hatten Site (Site 48HO646).* In *Archaeological Investigations along the Wyoming Segment of the Express Pipeline: Volume 3, Big Horn Basin and Bridger Mountain Sites,* William Martin and Craig S. Smith, series editors. Prepared By TRC Mariah Associates Inc., for Express Pipeline Company, Alberta, Canada.

Martin, W.M., W.M. Harding, R.D. Richard, N.E. Fleming, and J.S. Johnston
1999 *Section 7 - The Flying A Ranch Site (Site 48NA1431).* In *Archaeological Investigations along the Wyoming Segment of the Express Pipeline: Volume 4, Wind River Basin and Casper Arch Sites,* William Martin and Craig S. Smith, series editors. Prepared for by TRC Mariah Associates Inc., for Express Pipeline Company, Alberta, Canada.

McNees, L.M., and William M. Harding
1994 *Supplemental Phase I Report for the Northwest Pipeline System Expansion II Project, Muddy Creek North and Kemmerer North Loops, Lincoln County, Wyoming.* Prepared by Mariah Associates, Inc. for Northwest Pipeline Corporation.

McNees, L.M., W.M. Harding, B.M. McClelland, J. Marmor, D. Newton, B. Barrows, S. Powley, J. Lowe, and C. Smith
1993 *Phase I Cultural Resource Inventory Investigation for the Northwest Pipeline System Expansion II Project, Muddy Creek North and Kemmerer North Loops, Lincoln County, Wyoming.* Prepared by Mariah Associates, Inc. for Northwest Pipeline Corporation.

McNees, L.M., W.M. Harding, and C.S. Smith
1994 *Phase I Cultural Resource Investigations for the Northwest Pipeline Corporation Expansion II Project, Muddy Creek North and Kemmerer North Loops, Lincoln County, Wyoming: Report Addendum.* Prepared by Mariah Associates, Inc. for Northwest Pipeline Corporation.

McNees, M., T. Reust, R. Weathermon, R. Anduze, B. McClelland, K. Kibler, F. Oglesby, C. Webb, C. Smith, and W.M. Harding
1992 *Data Recovery Investigation at the Black Butte and Leucite Hills Mine Permit Areas, Sweetwater County, Wyoming.* Prepared by Mariah Associates, Inc. for Black Butte Coal Company.

McNees, L.M., E.A. Schneider, B.R. McClelland, W.M. Harding, J.A. Lowe, and C.S. Smith
1996 *The Archaeology of the Weston Site on the Upper Bear River, Lincoln County, Wyoming.* Prepared by TRC Mariah Associates Inc. for Northwest Pipeline Corporation.

Reust, T., D. Newton, R. Weathermon, W.M. Harding, and C.S. Smith
1991 *The Bairoil Archaeological Project: 7500 Years of Prehistory in the Bairoil Area, Carbon and Sweetwater Counties, Wyoming.* Prepared by Mariah Associates for Wyoming Bureau of Land Management Cultural Resource Series No. 8.

Schneider, E.A., B.R. McClelland, W.E. Batterman, W.M. Harding, W.W. Martin, D.W. Newton, T.P. Reust, and C.S. Smith.
1997 *Data Recovery Investigations Along State Highway 24: The Red Canyon Rockshelter and Other Sites in the Bear Lodge Mountains of Wyoming.* Prepared by TRC Mariah Associates Inc. for Wyoming Department of Transportation.

Shelton, J. and W.M. Harding
2002 *A Class III Cultural Resource Inventory for the Raft River Electrical Co-op Stateline to Lynn Powerline Re-Alignment, Box Elder County, Utah.* Prepared for Raft River Electrical Co-op, Malta, Idaho by North Wind, Inc. Idaho Falls.

Shelton, J., W.M. Harding, C. Green, and M. Koller
2001 *Fourteen Ouray Grazing Allotments, Cultural Resource Assessment.* Prepared by North Wind, Inc. for the Gunnison, Uncompahgre, and Grand Mesa National Forests, Delta, Colorado.

Shelton, J.S. , C. Green, and W.M. Harding
2002 *Class I Cultural Resource Inventory for Syringa Networks, LLC, Proposed Fiber Optic Line, Mud Lake to Howe Route in Butte and Jefferson Counties, Idaho.* Prepared by North Wind, Inc. for Syringa Networks, LLC. Rupert.

PRESENTATIONS AND OTHER PROFESSIONAL ACCOMPLISHMENTS

Harding, William M.
1998 *Paleosols.* Lecture given at the Soils 5520 Class, College of Agriculture, University of Wyoming.

1998 *Soil Color and Texture as Pertaining to Archaeology.* Lecture given to the Soils 5520 Class, College of Agriculture, University of Wyoming.

Martin, W.M., W.M. Harding, and B.R. McClelland
1997 *Recent Investigations at Four Middle Plains Archaic Housepit Sites in North-Central and Central Wyoming.* Poster presented at the 55th Annual Plains Anthropological Conference, Boulder.

WORK HISTORY

North Wind
Principal Investigator
2000 - Present

TRC Mariah Associates Inc.
Supervisory Archaeologist
1990 - 1999

Dames and Moore
Archaeologist
1989 and 1990

Idaho State University
Swanson/Crabtree Anthropological Research Laboratory (SCAR-Lab)
Project Director
1989 - 1990

Idaho State University
SCAR-Lab
Lab Manager and Crew Chief
1988 - 1989

Idaho State University
Archaeology Field School Staff Member
1988 & 1989

Idaho State University
SCAR-Lab
Lab and Field Assistant and Survey Crew Member
1985 - 1987

Idaho State University
Excavator
1985

Idaho Museum of Natural History
Ethnographic Collections Technician
1984 - 1985

PROFESSIONAL REFERENCES

Craig Smith
Cultural Resources Program Manager
TRC Environmental, Inc.
47 Orange St # B1
Salt Lake City, UT 84116
(801) 363-7585 (Work)
(801) 582-2666 (Home)

Dr. Richard Holmer
Department of Anthropology,

Idaho State University,
Pocatello, Idaho
(208) 282-2629 (Work)
(208) 232-8068 (Home)

Mr. Mike Bies
Archaeologist
Bureau of Land Management
Worland District
101 South 23
Worland, WY 82401
(307) 347-5154 (Work)
(307) 347-8608 (Home)

Mr. William Eckerle
Western GeoArch Research
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JOHN BOUGHTON, M.A.

EDUCATION:

1989 M.A., Anthropology, University of Oregon. Master's Paper: Projectile Points and the Beaverdam Creek Site, North-Central Oregon.

1985 B.A., Anthropology, Oregon State University.

Summary of Qualifications

Mr. Boughton has over 16 years of experience conducting small to large-scale archaeological investigations throughout the west, particularly in Montana, North Dakota Utah and Oregon. Mr. Boughton has worked for several private, state, and federal clients as a project archaeologist, field director, and field supervisor. Clients with whom Mr. Boughton has worked (while with North Wind, Inc. and prior to his tenure at North Wind) include the Montana Department of Transportation, Bureau of Indian Affairs-Billings Area Office, the Bureau of Land Management-Montana State Office, the Montana Heritage Preservation and Development Commission, the Coteau Properties Company and the Express Pipeline Company. He has authored over 30 technical reports and two professional publications. Mr. Boughton has conducted intensive inventories, reconnaissance inventories, site testing, and full-scale data recovery excavations in Montana, North Dakota, Oregon, California, Utah, Nevada and Hawaii. He is a member of the Montana Archaeological Society, the Plains Anthropological Society and the Association of Oregon Archaeologists.

Experience

North Wind, Inc., Project Director

Mr. Boughton is currently working as North Wind's Field Director and Alternate Principal Investigator. He coordinates with clients and government agencies, conducts fieldwork, project analyses, report writing, and artifact analyses. He is permitted by the Bureau of Land Management (BLM) and/or the State Historic Preservation Office (SHPO) to conduct work in Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, and Washington. He is permitted by the BLM in Nevada as a historical archaeologist and historian.

Rimrock Archaeology, LLC, Billings, MT, Vice-President

Mr. Boughton's duties included archaeological and historic consultation for various clients. He communicated with clients, performed fieldwork, project analyses, project write-ups, and developed project budgets and proposals. He was responsible for maintaining company vehicles and field equipment.

Montana Heritage Preservation and Development Commission, Virginia City, MT., Project Archaeologist
Mr. Boughton completed monitoring and testing of archaeological locales in Virginia City and Nevada City, MT. He was instrumental in the preparation of the 2001 Annual Archaeological Report.

Ethnoscience, Billings, MT, Project and Field Director
Mr. Boughton's duties included writing project budgets and proposals, hiring personnel, directing both small and large-scale cultural resource surveys, testing and excavation projects, lab analysis of artifacts, and write-up of project reports. His other job-related experience included historic site documentation, familiarity with the Section 106 process, and the ability to maintain a good client relationship.

Gallegos and Associates, Carlsbad, CA., Field Supervisor and Archaeologist
Mr. Boughton supervised survey and testing projects, participated as a crewmember, performed lab analysis, and contributed to project report write-up.

Dames & Moore, Inc., San Diego, CA., Field Supervisor and Archaeologist
Mr. Boughton supervised cultural resource survey and excavation projects and participated as a crewmember.

Oregon State University, Corvallis, OR; Heritage Research Associates, Eugene, OR; Oregon State Museum of Anthropology, Eugene, OR; and the Bernice P. Bishop Museum, Honolulu, HI, Field Archaeologist
Mr. Boughton's responsibilities included artifact analysis and cultural resource survey, testing, and excavation.

Work History

2002-Present	North Wind, Inc.
2001-2002	Montana Heritage Preservation and Development Commission and Rimrock Archaeology, LLC
1993-2001	Ethnoscience
1992-1993	Dames and Moore, and Gallegos and Associates
1991-1992	Dames and Moore
1989-1991	Bishop Museum, Oregon State Museum of Anthropology and Heritage Research Associates
1988-1989	Heritage Research Associates and the Oregon State Museum of Anthropology

Field Projects

2003	Co-Field Director for the recording of the Harmony Mine in Lemhi County, Idaho. North Wind, Inc. for Environmental Quality Management, Seattle, Washington.
2003	Field Director for the Cultural Resource Inventory of Archaeological Investigations for the Virginia City Wildlife Fire-Urban Interface Fuels

Reduction Project, Madison County, Montana. North Wind, Inc. for the Bureau of Land Management, Dillon Resource Area.

2003 Field Director for the Recording of the Jennie Mine in Iron County, Utah. North Wind, Inc. for the State of Utah, Department of Natural Resources, Division of Gas, Oil and Mining, Salt Lake City, Utah.

2002 Field Director for the Cultural Resource Inventory of the Atkins Burn, Vale District, Southeast Oregon. North Wind, Inc. for the Vale District, Bureau of Land Management, Vale, Oregon.

2002 Field Director for the Class III Cultural Resource Inventory of 6722 Acres in the Klamath Falls Resource Area, Lakeview District. North Wind, Inc. for the Klamath Falls Resource Area, Lakeview District, Bureau of Land Management.

2002 Field Supervisor for the Inventory of 80 Historic Mining Sites in Iron County, Utah. Northwind, Inc. for the State of Utah Department of Natural Resources Division of Oil, Gas and Mining, Salt Lake City, Utah.

2002 Field Supervisor for the Class III Cultural Resource Inventory of the West Little Owyhee River Wild and Scenic Corridor, Vale District, Southeast Oregon. North Wind, Inc. for the Vale District, Bureau of Land Management, Vale, Oregon.

2001 Field Supervisor for the Class III Cultural Resource Inventory of the 37 km N. of Terry North Project, Prairie County, MT. Recorded two historic sites. Renewable Technologies, Inc. for the Montana Department of Transportation, Helena, MT.

2001 Field Supervisor for the Class III Cultural Resource Inventory for the expansion and improvement of the Ashland County Water and Sewer District, Rosebud County, MT. Rimrock Archaeology, LLC for the Ashland County Water and Sewer District, Ashland, MT.

2001 Field Supervisor for the Class III Cultural Resource Inventory of the Meadow Lake Recreation Area, Madison County, MT. Rimrock Archaeology, LLC for Legacy Consulting Services, Butte, MT.

2001 Field Supervisor for the Class III Cultural Resource Inventory of the Proposed White Sandy Beach Access Area, Lewis and Clark County, MT. Rimrock Archaeology, LLC for Legacy Consulting Services, Butte, MT.

2001 Field Supervisor for the Class III Cultural Resource Inventory of a 20-acre tract leased to the South Dakota Army National Guard, Pennington County, SD. Rimrock Archaeology, LLC for Maxim Technologies, Inc., Rapid City, SD.

2001 Project Archaeologist for the monitoring and testing of archaeological locations in Virginia City and Nevada City, MT. Montana Heritage Preservation and Development Commission.

2000 Field Director for the testing of prehistoric sites in the Permit Areas D and H and the West Permit Area of the Coteau Mine, Beulah, ND. Tested 170 sites for National Register of Historic Places eligibility under Criterion D. Ethnoscience for the Coteau Properties Co., Beulah, ND.

2000 Project Director for the Cultural Resource Inventory of Highway 2 in Hill and Blaine Counties, MT. Recorded 16 historic sites and two prehistoric sites. Ethnoscience for the Montana Department of Transportation, Helena, MT.

1999 Field Director for the Cultural Resource Inventory of Permit Areas D and H and the West Permit Area of the Coteau Mine, Beulah, ND. Inventoried 22,800 acres and recorded 231 prehistoric and 67 historic sites. Ethnoscience for the Coteau Properties Co., Beulah, ND.

1999 Project Director for the Cultural Resource Inventory of Allotment No. 3361-A, William Little Owl, on the Crow Reservation, Big Horn County, MT. Ethnoscience for the Bureau of Indian Affairs, Billings Area Office.

1999 Project Director for the Cultural Resource Inventory of Allotment No.914, Maud Door, on the Crow Reservation, Big Horn County, MT. Ethnoscience for the Bureau of Indian Affairs, Billings Area Office.

1999 Project Director for the Cultural Resource Inventory and testing of sites in the Falkirk Riverdale Second Increment and Riverdale South Unit, McLean County, ND. Ethnoscience for the Falkirk Mining Company, Underwood, ND.

1998 Project Director for the mitigation of Sites 32ME797 and 32ME1456, Mercer County, ND. Ethnoscience for the Coteau Properties Co., Beulah, ND.

1998 Project Director for the survey and testing of portions of Sections 26 and 35, T146N R88W, within the North Mine Extension Area, Mercer County, ND. Ethnoscience for the Coteau Properties Co., Beulah, ND.

1997 Project Director for the mitigation of 32ME254, a multi-component ring site in Central North Dakota. Ethnoscience for the Coteau Properties Co., Beulah, ND.

1997 Project Director for the testing and evaluation of 32OL286 and 32OL338, two prehistoric sites near Center, ND. Ethnoscience for BNI Coal, Center, ND.

1997 Field Director for the mitigation of 24HL1078, a Bison Processing Site in Hill County, MT. Ethnoscience for Express Pipeline Company, Calgary, Alberta.

1996 Field Supervisor for the mitigation of 24HL946, a multi-component campsite in Hill County, MT. Ethnoscience for Express Pipeline Company, Calgary, Alberta.

1996 Field Supervisor for the mitigation of 24FR760, a Bison Processing Site in Hill County, MT. Ethnoscience for Express Pipeline Company, Calgary, Alberta.

1996 Field Director for the testing and mitigation of 12 sites along the Express Pipeline Route. Ethnoscience for Express Pipeline Company, Calgary, Alberta.

1996 Field Director for the inventory of waste areas for Washington Construction Company. Ethnoscience for the Washington Construction Company, Fishtail, MT.

1996 Field Director for an inventory for a proposed access road in Sections 31 and 32, T2S R23E and Section 6, and T3S R23E in Stillwater County, MT. Ethnoscience for Express Pipeline Company, Calgary, Alberta.

1995 Field Director for the mitigation of 13 sites located in the North Mine Extension Area, Mercer Co., ND. Excavated 22 stone rings and three cairns. Ethnoscience for the Coteau Properties Co., Beulah, ND.

1994 Field Director for the testing of sites located in the North Mine Extension Area, Beulah, ND. Tested 59 prehistoric sites. Ethnoscience for the Coteau Properties Co., Beulah, ND.

1994 Field Director for the inventory of Section 16 of T34N R45E, Daniels County, MT. Ethnoscience for Western Geophysical, Englewood, CO.

1994 Field Director for an inventory of portions of Sections 3 and 9, T31N R36E, Section 25; T32N R36E; and Sections 3, 7, 8, 10, 17, 18 and 19, T32N R37E in Valley County, MT. Ethnoscience for Reliable Exploration, Inc. Billings, MT.

1994 Field Director for an inventory in the change in the point of access to a two-track road in Bighorn County, MT. Ethnoscience for Sue and Tim Murphy, Hardin, MT.

1993 Field Director for an inventory of the Falkirk Mine Riverdale Extension, McLean County, ND. Ethnoscience for the Falkirk Mining Company, Underwood, ND.

1993	Field Supervisor for the mitigation of the Bees Nest Site (32ME175). Excavated 17 stone rings. Ethnoscience for the Coteau Properties Co., Beulah, ND.
1993	Field Director for the Cultural Resource Survey of the North Mine Extension Area, Beulah, ND. Inventoried 4,520 acres and recorded 63 prehistoric sites. Ethnoscience for the Coteau Properties Co., Beulah, ND.
1993	Field Supervisor for the Remington Hills Testing Project, Otay Mesa, CA. Gallegos and Associates, Carlsbad, CA.
1992	Field Supervisor for the Edwards Air Force Base Installation Restoration Project, Edwards Air Force Base, CA. Dames & Moore, Inc. for Jacobs Engineering, Pasadena, CA.
1991	Field Supervisor and Archaeologist for the mitigation of sites located along the Kern River Gas Pipeline, Las Vegas, NV; Barstow, CA; and St. George and Beaver, UT. Dames & Moore, Inc. for the Kern River Gas Transmission Co.
1991	Field Archaeologist for the East Lake Testing Project, Newberry Crater, OR. Oregon State Museum of Anthropology for the Oregon Department of Transportation, Salem, OR.
1990	Field Archaeologist for the excavation of 35CLT778, a midden shell, Ecola State Park, OR. Heritage Research Associates for Oregon State Parks Department.
1989-1990	Field Supervisor/Archaeologist for the Highway H-3 Project, Halava Valley, Oahu, HI. Bernice P. Bishop Museum for the Hawaii Department of Transportation.
1989	Field Archaeologist for the Drews Valley Testing Project on Highway 140. Drews Valley, OR. Oregon State Museum of Anthropology, Salem, OR.
1989	Field Archaeologist for the Crater Lake Wilderness Survey, Crater Lake, OR. Heritage Research Associates for the National Parks Service.
1989	Field Archaeologist for the excavation of a looted burial site, The Dalles, OR. Heritage Research Associates for the Army Corps of Engineers.
1989	Field Archaeologist at Yaquina Head, an eroding shell midden on the Oregon Coast. Yaquina Head, OR. Heritage Research Associates for the State of Oregon.
1989	Archaeological Lab Assistant. Oregon State Museum of Anthropology, Eugene, OR.

1988 Field Archaeologist for the Trail-Casey Project, (35JA189 and 190), Trail, OR. Oregon State Museum of Anthropology for the Oregon State Department of Transportation, Salem, OR.

1988 Field Archaeologist in Christmas Valley, OR (35LK1881). Heritage Research Associates, Eugene, OR.

1986 Field Archaeologist in the excavation of 35CS43, Bandon, OR. Oregon State University.

Technical Reports

2003 *Archaeological Investigations for the Virginia City Fire Management Zone of the Wildland-Urban Fuels Reduction Project, Madison County, Montana.* North Wind, Inc. for the Bureau of Land Management, Dillon Resource Area.

2003 *The Jennie Mine (42IN2026) in Iron County, Utah.* North Wind, Inc. for the State of Utah, Department of Natural Resources, Division of Gas, Oil and Mining, Salt Lake City, Utah.

2003 *Inventory of the Atkins Fire Burn Area, Malheur County, Oregon, Vale District.* North Wind, Inc. for the Vale District, Bureau of Land Management, Vale, Oregon.

2003 *Class III cultural Resource Inventory of 6722 Acres in the Klamath Falls Resource Area, Lakeview District.* North Wind, Inc. for the Klamath Falls Resource Area, Lakeview District, Bureau of Land Management.

2002 *Intensive Inventory and Recordation of 80 Mines in Iron County, Utah*; co-authored with J. Anderson, North Wind Environmental, Inc., for Utah Division of Oil, Gas, and Mining.

2002 *A Class III Cultural Resource Inventory along the West Little Owyhee River, Malheur County, Oregon*; co-authored with J. Anderson, J. Shelton, and W.M. Harding, North Wind Environmental, Inc., for Vale District, Bureau of Land Management.

2001 *A Class III Cultural Resource Inventory for the Expansion and Improvement of the Ashland County Water and Sewer District*; co-authored with L. M. Peterson, Rimrock Archaeology, LLC, for the Ashland County Water and Sewer District, Ashland, MT.

2001 *A Cultural Resource Inventory of 89 Acres for the Proposed White Sandy Beach Access Area, Lewis and Clark County, MT*; co-authored with L. M. Peterson, Rimrock Archaeology, LLC, for Legacy Consulting Services, Butte, MT.

2001 *A Cultural Resource Inventory of a Six-Acre Parcel Within and Around the Meadow Lake Recreation Area, Madison County, MT*; co-authored with L. M. Peterson, Rimrock Archaeology, LLC, for Legacy Consulting Services, Butte, MT.

2001 *An Intensive Cultural Resource Inventory of a 20-Acre Tract Leased to the South Dakota Army National Guard in the NE ¼ of Section 19, T1N R8E in Pennington County, South Dakota*; co-authored with L. M. Peterson, Rimrock Archaeology, LLC for Maxim Technologies, Inc., Rapid City, SD.

2001 *Nevada City and Virginia City Historic District (24MA723), Montana, 2001 Archaeological Projects*; co-authored with L. M. Peterson, Montana Heritage Preservation and Development Commission, Virginia City, MT.

2001 *Cultural Resource Testing and Evaluation of Prehistoric Sites Under Criterion D for Permit Extension Areas D and H and the West Permit Area, the Coteau Mine, Beulah, North Dakota.* Ethnoscience for the Coteau Properties Company, Beulah, ND.

2000 *Cultural Resource Inventory of Highway 2 Between Milepost 383.6 and 394, Hill and Blaine Counties, Montana*; co-authored with L. M. Peterson and B. Fandrich, Ethnoscience for the Montana Department of Transportation, Helena, MT.

2000 *Cultural Resource Testing and Evaluation Plan for Permit Extension Areas D and H and the West Permit Area, The Coteau Mine, Beulah, North Dakota*; co-authored with L.A. Peterson, S. Deaver and L. Litwinionek, Ethnoscience for the Coteau Properties Co., Beulah, ND.

2000 *Cultural Resource Inventory of Permit Areas D and H and the West Permit Area, the Coteau Mine, Beulah, North Dakota*; co-authored with L. Litwinionek and S. Walker-Kuntz, Ethnoscience for the Coteau Properties Co., Beulah, ND.

1999 *Cultural Investigations Along the Montana Segment of the Express Pipeline, Volume 7: Stone Ring Investigations Including the Lonesome Lake Traditional Cultural Property and Archaeological District Along the Express Pipeline in Montana*; co-authored with B. Fandrich, P. Walker-Kuntz and S. Walker-Kuntz, Ethnoscience for Express Pipeline Company, Calgary, Alberta.

1999 *Data Recovery at 32ME797 and 32ME1456, Mercer County, North Dakota*; co-authored with S. Walker-Kuntz, Ethnoscience for Coteau Properties Co., Beulah, ND.

1999 *A Cultural Resource Inventory of Allotment No. 3361-A, William Little Owl, On the Crow Reservation, Big Horn County, Montana*, Ethnoscience for the Bureau of Indian Affairs, Billings Area Office.

1999 *A Cultural Resource Inventory of Allotment No.914, Maud Door, On the Crow Reservation, Big Horn County, Montana,* Ethnoscience for the Bureau of Indian Affairs, Billings Area Office.

1998 *Survey and Testing of Portions of Sections 26 and 35, T146N R88W Within the North Mine Extension Area, Mercer County, North Dakota*; co-authored with S. Walker-Kuntz and B. Fandrich, Ethnoscience for the Coteau Properties Co., Beulah, ND.

1998 *Data Recovery at 32ME254, Mercer County, North Dakota*; co-authored with S. Winzler and L.M. Peterson, Ethnoscience for Coteau Properties Co., Beulah, ND.

1997 *Proposal for Data Recovery at 32ME254, Mercer County, North Dakota*; co-authored with L.A. Peterson, Ethnoscience for Coteau Properties Co., Beulah, ND.

1997 *BNI Coal Mine, Testing and Evaluation of 32OL286 and 32OL338, Two Prehistoric Sites Located Southwest of Center, North Dakota,* Ethnoscience for BNI Coal, Center, ND.

1996 *Data Recovery at 13 Sites Located in the North Mine Extension Area, Mercer County, North Dakota*; co-authored with K. Vander Steen, L.M. Peterson and J. Lieb, Ethnoscience for Coteau Properties Co., Beulah, ND.

1996 *Data Recovery at the Five Acre Western Tract of Site 32WE34 Wells County, North Dakota*, co-authored with L.A. Peterson, K. Vander Steen, and L. M. Peterson, Ethnoscience for Woodward Clyde Consultants, Denver, CO.

1996 *A Cultural Resource Inventory of Waste Area 4 in Section 1, T5S R17E of Stillwater County, Montana,* co-authored with L.A. Peterson, Ethnoscience for Washington Construction Company, Fishtail, MT.

1995 *A Cultural Resource Inventory of a Portion of Section 19, T2N R28E, Yellowstone County, Montana,* Ethnoscience for Yellowstone County Electric Co-op, Inc., Huntley, MT.

1995 *A Cultural Resource Inventory of Portions of Sections 1 and 2, T5S R17E; Sections 24 and 31, T4S R18E, Stillwater County, Montana,* Ethnoscience for Washington Construction Company, Fishtail, MT.

1994 *A Class III Cultural Resource Inventory of Portions of Sections 3 and 9, T31N R36E, Section 25, T32N R36E, and Sections 3, 7, 8, 10, 17, 18 and 19, T32N R37E in Valley County, Montana (BLM report # 94-MT-066-028),* Ethnoscience for Reliable Exploration, Inc. Billings, MT.

1994 *A Class III Cultural Resource Inventory of Section 16 of T34N R45E, Daniels County, Montana,* Ethnoscience for Western Geophysical, Englewood, CO.

1994 *Cultural Resource Inventory in the Change in the Point of Access to a Two-Track Road in Bighorn County, Montana,* Ethnoscience for Sue and Tim Murphy, Hardin, MT.

1994 *Testing and Evaluation of Prehistoric Sites within the North Mine Extension Area,* co-authored with L.A. Peterson, Ethnoscience for Coteau Properties Co., Beulah, ND.

1994 *A Management Plan for Cultural Resources Identified within the North Mine Extension Area,* co-authored with S. Deaver, L.A. Peterson and J. Brownell, Ethnoscience for Coteau Properties Co., Beulah, ND.

1994 *A Cultural Resource Inventory of the Falkirk Mine Riverdale Extension, McLean County, North Dakota,* co-authored with J. Brownell, Ethnoscience for the Falkirk Mining Company, Underwood, ND.

1994 *Coteau: A Cultural Resource Inventory of the North Mine Extension Area,* co-authored with J. Brownell and L.A. Peterson, Ethnoscience for Coteau Properties Co., Beulah, ND.

1991 *Kern River Pipeline Cultural Resource Inventory Report: Extra Workspace Request, Milepost 392.35 to 393.7, Spread 6A, Washington County, Utah,* co-authored with A. McDougall and L.M. Peterson, Utah Supplemental Report No. 29, Submitted to the Federal Energy Regulatory Commission, Washington, DC, Dames and Moore, Salt Lake City, UT.

1991 *Kern River Pipeline Cultural Resource Inventory Report: In-field Realignment, Milepost 391.0-391.7, Spread 6A, Washington County, Utah,* co-authored with D. Larson, Utah Supplemental Report No. 29, Submitted to the Federal Energy Regulatory Commission, Washington, DC, Dames and Moore, Salt Lake City, UT.

Papers Presented:

1995 *An Examination of Information Derived From Survey and Testing of Stone Ring Sites Within the North Mine Extension Area of the Coteau Prehistoric District, Central North Dakota,* 53rd Annual Plains Conference, Laramie, WY.

1992 *Snowstorms, Snafus, and Site Structure: An Investigation of Two Artifact Scatters Along the Kern River Pipeline South of Milford, Utah,* co-authored with L.M. Peterson and G. Woodall, Great Basin Anthropological Meetings, Boise, ID.

1988 *Chronology and Cultural Affiliation of the Beaverdam Creek Site, North-Central Oregon: Based on Projectile Point Analysis,* 41st Northwest Anthropological Conference, Tacoma, WA.

Publications

1991 *Trace Element Composition of Obsidian Artifacts from the Beaverdam Creek Site (35CR29), Central Oregon*, co-authored with J. Erlandson, R.E. Hughes, C.E. Skinner and M.L. Moss, "Current Archaeological Happenings in Oregon."

1985 *Reflectometer Reports on Human Pigmentation,* co-authored with G. Tasa and C. Murray, "Current Anthropology," 26(4):511-512.

Associations

1993-2004 Montana Archaeological Society

1993-2004 Plains Anthropological Society

1988-2004 Association of Oregon Archaeologists

1992-1995 Society for American Archaeology

1992-1994 Society for California Archaeology

1988 Pi Gamma Mu Honor Society for Social Sciences

Miscellaneous:

2000 Attended "Introduction to Section 106", Kansas City, MO, a training course jointly sponsored by the Advisory Council on Historic Preservation and the University of Nevada, Reno.

1987-1988 Graduate Teaching Fellow for Human Evolution, Sociobiology and Archaeology, University of Oregon.

CURRICULUM VITAE

Thor A. Olmanson
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Education

M.S. 2000. Multidisciplinary Studies/Anthropology. Minnesota State University at Mankato. Mankato, Minnesota 56002.

B.S. 1981. Environmental Ecology with emphasis on Human Ecology. Gustavus Adolphus College, St. Peter, MN 56082 (Geology/ Geography/Anthropology).

1981. Archaeological Field School. Kampsville Center for Archaeological Studies. Kampsville, Illinois.

1978. Archaeological Field School. Mankato State University. Mankato, MN. 56002

1977. Saint Peter High School. St. Peter, MN 56082

Summary of Experience

I have steadily gained expertise in Cultural Resource Management over a 25-year period since the completion of my first field school in 1978. I have had direct professional experience in Florida, Georgia, Iowa, Illinois, Indiana, Kentucky, Minnesota, North Dakota, South Dakota, and Wyoming. After gaining wide archaeological field experience and working in a supervisory capacity for the state of Minnesota for several years, I pursued a graduate degree in Anthropology. During this period, I extracurricularly designed and led an archaeological field school in the formal excavation of a Middle Woodland period habitation site in Central Minnesota. I later performed my Master's research in Belize, Central America, focusing upon middle-range archaeological theory through the study of closed-colony group settlement patterns. After receiving a Master of Science degree, I worked as a principal investigator on cultural resource management projects in Indiana for a year before opening a new CRM office in Kentucky. After two years of serving as the principal investigator in KY, with no input or assistance from the main office, I have since chosen to relocate to the western states. Throughout my career, I have successfully maintained high technical standards and professional competency which has met or exceeded both regional and national requirements. I have proven to be highly competent in the design and implementation of all levels of archaeological inquiry including: overall cultural resource inventories of large land areas ranging from a few acres to greater than 100 square mile parcels; effective evaluation testing of archaeological sites ranging from the Historic time period to sites greater than 8,000 years of age; and intensive site mitigations involving large-scale data recovery excavations. I have garnered broad experiences working in a variety of geographical environments including: prairies, agricultural lands, heavily wooded areas in the Midwest and in the Deep South, remote mountainous areas, and heavily disturbed urban and industrial areas – among others.

Professional Employment

2001-2003 **Principal Investigator.** Landmark Archaeological and Environmental Services, Inc. Columbia, Kentucky. I established an independent branch office and managed all aspects of office, laboratory, and field projects. I located projects, submitted bids, designed and performed projects, supervised field and laboratory staff, analyzed project results, prepared and submitted professional reports, and sought liaisons with state and federal review agencies. Full-time May 2001 to March 2003 (self-directed).

2000-2001 **Principal Investigator.** I designed and carried out all phases (I-III) of field projects in Indiana for Landmark Archaeological and Environmental Services, Inc. This position involved the full implementation of cultural resource projects in Indiana - including project design, survey and excavation, field and laboratory supervision of respective personnel, and the completion of personally authored project reports. Full-time March 2000 to May 2001 (self-directed).

1999-2000 **Project Director.** Powder Mountain 3-D Seismic Project. Rawlins District, Wyoming. This was a single contract involving archaeological reconnaissance along seismic testing lines in a 144 square mile public land area in the Great Basin/Colorado Plateau interface region of southern Wyoming. I coordinated up to 20 crew members in the field, completed site reports, and oversaw report completion. I assumed control of the project in November 1999 and brought it to completion in early January 2000 (60-80 hours per week - self-directed).

1999 **Archaeologist.** Loucks and Associates. Minnetonka, MN. I conducted archaeological survey, excavation, construction monitoring, and evaluation of archaeological sites for the Mille Lacs Band of Ojibwe in Minnesota. I also worked on island surveys in MN for the BLM – Full-time October/November 1999 (contract surveys).

1998-1999 **Principal Investigator:** I directed the independent archaeological investigation of a proposed housing development project near Lake Crystal, MN. This consisted of reconnaissance level survey of the land parcel, site identification, evaluation, and ultimate data recovery excavation of the Lilly Lake Site through the implementation of an archaeological field school and volunteer solicitation. Part-time May 1998 to May 1999.

1996 **Field Archaeologist**: Woodward-Clyde Federal Services. Reconnaissance level survey on six twenty-acre parcels near Albany, Georgia. 40+ hours per week – (contract) September 1996.

1990-1995 **Archaeologist I**: Minnesota Historical Society, Department of Archaeology. I directed statewide Phase I archaeological survey, performed numerous Phase II site evaluations, led a Phase III data recovery investigation, and oversaw laboratory analyses for MNDOT projects. I authored cultural resource management reports for formal submittal for all of my projects and edited other submissions for annual program project reports. Minnesota Trunk Highway Archaeological Reconnaissance Study. Full-time June 1990 to January 1995. Program Manager: Leslie D. Peterson (presently Red Lake Reservation Archaeologist in MN contact: (218) 679-2416 or cell # (500) 730-9449).

1989-1990 **Archaeological Assistant**: Minnesota Historical Society, Department of Archaeology. Archaeological survey, site evaluation, and report preparation. Minnesota Trunk Highway Archaeological Reconnaissance Study. Program Manager: Leslie D. Peterson (presently Red Lake Reservation Archaeologist in MN contact: (218) 679-2416 or cell # (500) 730-9449). Full-time May 1989 to June 1990.

1988 **Archaeological Assistant**: Minnesota Historical Society, Department of Archaeology. Reconnaissance level archaeological survey and site evaluation. Department of Natural Resources Water Access Cultural Resources Program. Program Manager: Pat Emerson (presently DNR Forestry Program Manager (612) 726-1171 email: patricia.emerson@mnhs.org). Full-time August through December 1988.

1985-1986 **Archaeological Technician:** Department of the Interior, Bureau of Land Management. Worland, Wyoming. GS-07. Major duties required the completion of independent cultural resource inventories throughout the Bighorn Basin. I also reviewed independent survey results to ensure compliance to antiquities permit stipulations; redesigned the Worland District cultural resource records system; and maintained communications with private industry personnel and the Wyoming State Historic Preservation Office. Worland District Archaeologist: Mary Lee Douthit (307-347-5100). Full-time Temporary mid-September 1985 to May 1986.

1985 **Field Archaeologist:** Project position for the Wyoming Office of State Archaeology, Laramie, Wyoming. I assisted in all aspects of archaeological data recovery on three prehistoric sites in the Shoshone National Forest near Yellowstone National Park. Project Director: Daniel Eakin (contact?). Full-time June through mid-September 1985.

1984 **Assistant State Parks Archaeologist:** Minnesota Historical Society, Minnesota Department of Natural Resources, St. Paul, MN. I was retained as an independent contractor to assist the State Parks Archaeologist in reconnaissance survey and site evaluations in MN State Parks. This included statewide survey, literature search, construction monitoring, data processing, artifact analysis, and site map preparation. Full-time April through September 1984. MN Parks Program Manager: David Radford (651-297-1153 email: dave.radford@dnr.state.mn.us).

1983-1984 **Museum Curator**: Nicollet County Historical Society, St. Peter, MN. I coordinated the organization and analysis of museum collections of historic and prehistoric artifacts. I designed interpretive exhibits, led tours, and helped to stimulate public involvement and volunteer participation in the reorganization and accessioning of specimens housed in this significant county museum. NCHS President: Burt Hoffman (retired). Part-time 20 hours per week December 1983 to April 1984.

1982-1983 **Assistant Archaeologist:** Impact Services, Inc., Mankato, MN. Resurvey, testing, and Phase III mitigations of 28 prehistoric sites (Woodland to Archaic) at Saylorville Lake, Iowa; and cultural resource reconnaissance survey on land parcels near Coralville Lake, Iowa. Responsibilities ranged from participation in field survey and excavations to laboratory work including: chemical soil analysis, constructing site maps, artifact analysis, and illustration of artifacts for inclusion in the final report. Full-time May 1982 to

December 1983. Principal Investigator: Pat Emerson (presently DNR Forestry Program Manager (612) 726-1171 email: patricia.emerson@mnhs.org).

1982 **Pedological Assistant**: Harlan P. Finney (retired), Certified Professional Soil Scientist, Minneapolis, MN. I assisted with numerous soil survey projects in Minnesota and Iowa. My duties included measuring slopes, analyzing soil structures, determining pedon descriptions, and recording general soil types and stratigraphy. Full-time March/April.

1978 **Field Archaeologist**: Impact Services, Inc., Mankato, MN. Phase I archaeological reconnaissance survey of approximately 200 miles of a proposed irrigation system corridor stemming from the Oahe Reservoir in North and South Dakota. Project Director: Kathleen Roetzel. Full-time June through September 1978.

Related Experience

1998 **Experiential Educator:** I conducted an archaeological field school near Lake Crystal, Minnesota during July and August for high school students of the Minnesota New Country School in Le Sueur, MN. Full-time July-August.

1981 **Teaching Assistant**: Gustavus Adolphus College, St. Peter, Minnesota. Archaeological Field School. Dr. Robert Douglas ((507) 933-7320 email: bdouglas@gac.edu). This course consisted of general classroom orientation lectures in St. Peter, MN, followed by excavations and instruction at the Kampsville Archaeological Complex in Illinois, and the excavation of a Weeden Island Culture site in Florida - in cooperation with the University of Florida at Gainesville. January Term 1981.

1980 **Research Assistant**: Gustavus Adolphus College, St. Peter, MN. I performed research and historical archaeology on the historic town site of Traverse Des Sioux along the Minnesota River near St. Peter, MN. Dr. Robert Douglas ((507) 933-7320 email: bdouglas@gac.edu). February to June 1980.

1980-1981 **Intern, Physical Development Sub-Commission:** Region Nine Development Commission, Mankato, MN. I prepared technical reports on current and alternative energy use, coordinated seminars, and compiled informational pamphlets for public distribution. I also assisted educators and public organizations in the application and preparation of various grant proposals. Craig Waldron (contact?). June 1980 to January 1981.

1976 **Reconstruction Assistant**: Agricultural Promotions Inc., Farmfest '76. We produced a reconstruction of a Hidatsa Indian farming village (circa 1500's) under the direction of Minnesota State University professor Michael Scullin (507-389-6504 email: michael.scullin@mankato.msus.edu). This consisted of the erection of a large Hidatsa earth lodge, the recreation of historic gardens using genetically correct seed sources and hide preparation, flint-knapping demonstrations, etc. during the event. May through September 1976.

Significant Publications, Manuscripts, Awards, and Presentations

2003 Olmanson, Thor A. with contributions by Jack Rossen and Colleen Kinnaman Wells. *Phase II Evaluation of Archaeological Sites 15Hk277, 15Hk278, 15Hk279, and 15Hk280: An Archaic Hilltop Site and Surrounding Rockshelters in Hopkins County, Kentucky.* Prepared for Island Fork Construction, Ltd., Madisonville, Kentucky and the Department of Surface Mining Reclamation Enforcement, Frankfort, Kentucky.

2002 Olmanson, Thor A. *Phase I Intensive Archaeological Investigation of a Proposed Access/Conveyor Corridor and Barge-Loading Platform Area along the Ohio River in McCracken County, Kentucky.* Prepared for the Louisville KY District U.S. Army Corps of Engineers. Landmark Archaeological and Environmental Services, Inc. Columbia, KY.

2001 Olmanson, Thor A. *Six Points Road Interchange Project: Report of Phase II Archaeological Investigations of Archaeological Sites 12Ma711, 12Ma714, and 12Ma733 in Marion County, Indiana.* Prepared for American Consulting, Inc. Indianapolis, Indiana (1 of 2). Landmark Archaeological and Environmental Services, Inc.

2001 Olmanson, Thor A. *Six Points Road Interchange Project: Report of Phase Ic Archaeological Reconnaissance Survey of Alluvial Soils in Hendricks County, Indiana.* Prepared for American Consulting, Inc. Indianapolis, Indiana (2 of 2). Landmark Archaeological and Environmental Services, Inc. (Phase Ic archaeological survey involves deep testing with heavy equipment).

2001 Olmanson, Thor A. *Greendale Levee Improvement Project: Report of Phase Ic Archaeological Reconnaissance Within the Floodplain of the Great Miami, Whitewater, and Ohio River Confluence Area in Dearborn County, Indiana.* Prepared for Facilities Construction Management, Lawrenceburg, Indiana. Landmark Archaeological and Environmental Services, Inc.

2000 Olmanson, Thor A. *Mennonites in Belize, Central America as Business Leaders and Tribal Escapists: Splinter Group Migration as a Means to Preserve Social Identity.* Master's Thesis based upon archival research and fieldwork in Belize, Central America. Minnesota State University, Mankato, MN. 164 pp. (this thesis involves middle-range archaeological theory).

1998 Recipient of the *David L. Andreas Scholarship Award* at Minnesota State University, Mankato. This award recognizes outstanding leadership and academic excellence.

1998 *Prehistory, Geography, and Geology of the Traverse des Sioux Area in St. Peter, MN.* Oral presentation delivered to an audience at the Treaty Site History Center in St. Peter, MN during Archaeology Week in June 1998.

1998 Mather, David, Thor Olmanson, Kelly Gragg-Johnson, and Lynn Schuster. "The Washington Creek Site (21ME14) and the Archaeology of the Prairie-Forest Border". *The Minnesota Archaeologist: Journal of the Minnesota Archaeological Society.* Omnibus Issue, Volumes 55-58 1996-1999.

1994 Olmanson, Thor A. and David Mather with contributions by Kelly Gragg and Lynn Schuster. *Final Report of Data Recovery Investigations at the Washington Creek Site, 21ME14, an American Indian Habitation Site on the Big Woods - Prairie Border in Meeker County,*

Minnesota. Washington Creek Site (21ME14) Phase III Archaeological Data Recovery Project, Minnesota Trunk Highway Archaeological Reconnaissance Study, Minnesota Historical Society. Report Submitted to the Minnesota Department of Transportation, St. Paul, MN. March 1994.

1994 Olmanson, Thor, Kent Skaar, Kent Bakken, and Patrick Nunnally
Cultural Resources Reconnaissance Survey and Site Evaluation Report MnDOT S.P. 5007-22 for Replacement of T.H. 105 Bridge 1951, 3.1 Miles North of the Iowa Border, Mower County. Minnesota Trunk Highway Archaeological Reconnaissance Study, Minnesota Historical Society. Report Submitted to the Minnesota Department of Transportation, St. Paul. June 1994.

1994 Olmanson, Thor and Patrick Nunnally
Archaeological Reconnaissance Survey of the Margins of the Kettle River Reservoir, and Assessment of Partial Removal of an Historic Dam in the Kettle River Sandstone Company Quarry Historic District, Banning State Park, Pine County, Minnesota. Minnesota State Park Cultural Resource Management Program, Minnesota Historical Society. Submitted to the Minnesota Department of Natural Resources and The Minnesota State Historic Preservation Office. December 1994.

1993 Skaar, Kent and Thor Olmanson
Archaeological Reconnaissance of the Proposed Location of the Traverse Des Sioux History Center Museum and a Single Lawcon Exchange Property. For the Nicollet County Historical Society. Report Submitted to the Minnesota State Historic Preservation Office and the Nicollet County Historical Society. October 1993.

1992 Peterson, Leslie D. and Thor Olmanson
Final Archaeological Reconnaissance and Site 21CE28 Evaluation Testing Report. Minnesota Trunk Highway Archaeological Reconnaissance Study, Minnesota Historical Society, St. Paul, Minnesota. March 1992.

1992 Watson Radford, Wanda and Thor Olmanson
Final Archaeological Survey and Site Evaluation Report: Proposed MnDOT S.P. 2804-27, T.H. 44 from Caledonia to Hokah, Houston County. Minnesota Trunk Highway Archaeological Reconnaissance Study, Minnesota Historical Society. Submitted to the Minnesota Department of Transportation, St. Paul. November 1992.

1992 Olmanson, Thor A., Wanda Watson Radford, and David J. Mather
Final Archaeological Survey and Site Assessment Report: Proposed Minnesota Department of Transportation S.P. 4705-29/30 and 8601-30 for Reconstruction of T.H. 12 from Darwin to Cokato, Meeker and Wright Counties. Minnesota Trunk Highway Archaeological Reconnaissance Study, Minnesota Historical Society. Report submitted to the Minnesota Department of Transportation, St. Paul. December 1992.

1991 Olmanson, Thor and Wanda Watson Radford
Preliminary Archaeological Survey and Site Assessment Report: Proposed MnDOT S.P. 7401-24 and 8104-25, T.H. 14, Waseca to Owatonna, Steele and Waseca Counties. Minnesota Trunk Highway Archaeological Reconnaissance Study, Minnesota Historical Society. Submitted to the Minnesota Department of Transportation, St. Paul.

1991 Peterson, Leslie D., Thor Olmanson, and Wanda Watson Radford (editors)
Editor and Contributor: *The Minnesota Trunk Highway Archaeological Reconnaissance Study Annual Report - 1990.* Minnesota Historical Society. Report submitted to the Minnesota Department of Transportation, St. Paul, MN.

1990 Peterson, Leslie D., Thor Olmanson, and Wanda Watson Radford (editors)
Editor and Contributor: *The Minnesota Trunk Highway Archaeological Reconnaissance Study Annual Report - 1989.* Minnesota Historical Society. Report submitted to the Minnesota Department of Transportation, St. Paul.

1985 Olmanson, Thor A.
An Ecological Investigation of the Minnesota River Valley at Traverse Des Sioux: the Geology and History, its Occupations and Exoduses. Prepared for, Gustavus Adolphus College, St. Peter, Minnesota. May 1985.

Other Qualifications

Proficiency in word-processing software such as MS Word, and WordPerfect.
Formal coursework in GIS applications using IDRISI and ArcView.
Valid KY State Driver License #O01-613-612 exp. 02-05-05.
Languages: English and Spanish.
Skilled in: chainsaw use, pumping equipment use, tractors, front-end loader, winches, firearms, bush mechanics, surveying equipment, etc.
Experienced in field and laboratory photography – including black & white darkroom processing and digital imaging using associated software, such as PhotoShop, and MS Picture It!
25+ years orienteering experience.

References

Dr. Robert Douglas, Professor of Geography
Gustavus Adolphus College
St. Peter, MN 56082
Email: bdouglas@gac.edu phone: (507) 933-7320

Dr. Paul Brown, Professor of Anthropology
Minnesota State University, Mankato
MSU Box 175 / P.O. Box 8400, Mankato, MN 56002-8400
email: paul.brown@mankato.msus.edu phone: (507) 389-6613

Professor Michael Scullin, Archaeologist
Minnesota State University, Mankato
MSU Box 175 / P.O. Box 8400, Mankato, MN 56002-8400
email: michael.scullin@mankato.msus.edu phone: (507) 389-1919

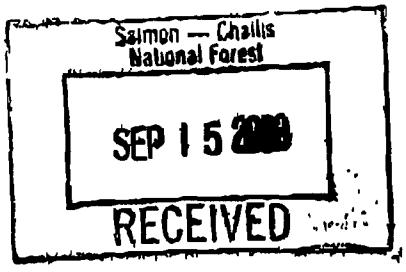
APPENDIX B

Endangered Species Act Coordination Documentation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
EASTERN IDAHO FIELD OFFICE - ES
4425 BURLEY DR., SUITE A
CHUBBUCK, IDAHO 83202
Telephone (208) 237-6975 Fax Number (208) 237-8213

TAKE PRIDE IN AMERICA



SEP 11 2003

Spike Thompson
Acting Supervisor
Salmon-Challis National Forest
50 Highway 93 South
Salmon, Idaho 83467

Subject: Request for Emergency Consultation for the Harmony Mine Site, located in Lemhi County, Idaho
File # 1050.1117 FWS # 1-4-03-I-0306

Dear Mr. Thompson:

The Fish and Wildlife Service (Serivce) is writing in response to your request for emergency consultation for removal of approximately 40,000 cubic yards of tailings from the Harmony Mine (Mine) site. On September 3, 2003 the Eastern Idaho Field Office of the Service was contacted via telephone by Robert Rose of the Salmon-Challis National Forest (Forest) requesting emergency consultation for the Mine. On September 8, 2003, the Service attended a site visit of the Mine with personnel from the Forest and the National Oceanic and Atmospheric Administration - Fisheries. The Forest, along with the Environmental Protection Agency (EPA), have proposed a time-critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act for the Mine. The Service's comments are provided in accordance with Section 7 of the Endangered Species Act (Act) of 1973, as amended.

The Harmony Mine site is an inactive (since 1931) copper mine located near the headwaters of Withington Creek, a tributary to the Lemhi River. Tailings (currently two piles) resulting from the mining operations had been historically deposited into the channel of an unnamed tributary leading to Withington Creek. Currently, tailings deposits present in the unnamed creek encompass a total area of approximately 10,000 square feet and a volume of 40,000 cubic yards. Additionally, mine tailing deposits were observed by EPA during their Superfund Technical Assessment and Response Team visit in the main stem of Withington Creek to a distance of approximately 2.4 miles downstream from the Mine. Samples taken by the United States Geological Survey in 1999 indicate elevated concentrations of contaminants (mainly copper) in the tailings (36,000 part per million (ppm) copper) at the Mine, and sediment (2,270 ppm) and water (52 parts per billion) 0.2 miles below the tailings piles.

The Service understands that on August 11, 2003, a fire (Withington Fire) started above the Mine site and burned approximately 10,500 acres until it was contained on August 22, 2003. The path of this fire burned through the Mine site and the surrounding area. As a result of the fire, the potential for landslides in the area are elevated. Concern exists that a catastrophic land slide may occur in the vicinity of the two tailings piles, possibly transporting the tailings downstream into the main stem of Withington Creek, and eventually into the Lemhi River.

Based on conversations with Robert Rose and Ray Henderson of the Forest, EPA and the Forest plan to remove the approximately 40,000 cubic yards of tailings in the creek bed, along with tailings located approximately 150 feet above the two large tailings piles near the former mill. These tailings, and associated debris also containing elevated contaminant concentrations, will be transported to another "high and dry" area, approximately ½ mile away on Forest land, where they will be placed, sloped to an appropriate ratio, and capped with a non-permeable synthetic liner. While the exact project plan has not yet been established, the Forest informed the Service of measures already identified to minimize adverse effects. These include:

- Installation of two sediment ponds (one upstream of the tailings piles, just below a haul-truck turnaround and one downstream of the tailings piles) to trap debris.
- Erosion control measures will be implemented on newly created and improved roads to reduce sedimentation into the creek.
- Re-seeding of any newly created roads.
- Re-routing of the unnamed creek during removal activities.

During our site visit we did not identify any additional measures that would minimize the effects to bull trout or bull trout critical habitat. However, the Service would like to be notified (via email or telephone call) of the commencement of any project-related activities, and to be kept informed of the progress of the proposed action as it proceeds from start to finish.

Please be advised that following completion of the removal action, the action agency should initiate consultation with the Service if listed species or (proposed) critical habitat have been adversely affected. Although consultation occurs after the response to the emergency, procedurally it is treated like any other consultation. However, the action agency should provide the following additional information to initiate consultation following the emergency:

- A description of the emergency,
- A justification for the expedited consultation, and
- an evaluation of the response to and the impacts of the emergency on affected species and their habitats, including documentation of how the Service's recommendations were implemented, and the results of implementation in minimizing take.

While the Service understands that the proposed action subject to this emergency consultation is solely the time-critical removal of the tailings, this does not preclude any future clean-up actions at this site. Due to the elevated concentrations of contaminants that may still be present

following the removal action (resulting from the remaining tailings at the Mine and the drainage of water from the abandoned mine adits into the creek), the Service is concerned about the long-term implications of potential contaminant deposition to the unnamed creek and Withington Creek from the Mine. The Service would appreciate a discussion of possible remedies or long-term solutions to minimize future adverse effects to fish and wildlife resources from the Mine.

The Service appreciates your conscientious efforts to comply with Section 7 of the Act and for notifying us early on in the project planning. If you have any questions regarding this letter, please contact Sandi Arena of this office at 208-237-6975 x 34.

Sincerely,

Deb Mignogno, Supervisor
Eastern Idaho Field Office

cc: NOAA-Fisheries - Salmon (J. Pisano)
FWS - Boise (S. Burch)
EPA - Boise (G. Weigel)



"Jan Pisano" <Jan.Pisano@noaa.gov>

09/15/2003 03:50 PM

To: Bob Rose <rwrose@fs.fed.us>, rhenderson@fs.fed.us
cc:
Subject: Emergency Consultation on Harmony Mine Removal Action

Ray and Bob: NOAA Fisheries is responding to the Salmon-Challis National Forest (SCNF) and Environmental Protection Agency (EPA) request for emergency consultation for the time-critical removal action for the Harmony Mine site.

NOAA Fisheries agrees the proposed action is an emergency and agrees to proceed with emergency consultation. Following the emergency, the EPA and SCNF should provide:

1) A description of the emergency;
2) A justification for the expedited consultation; and,
3) A biological assessment analyzing the effects of the response to and the impacts of the emergency on ESA listed Snake River Chinook salmon and Steelhead.

Thank you,

/s/ Janice Pisano
Team Leader
NOAA Fisheries Salmon Field Office

United States Department of Agriculture
Forest Service
Salmon-Challis National Forest
Salmon/Cobalt Ranger District
50 Hwy 93 S
Salmon, ID 83467

File Code: 2160/2800

Date: January 13, 2004

RECEIVED
MAR - 1 2004
By

Deb Mignogno
Fish and Wildlife Service
Eastern Idaho Field Office
4425 Burley Dr., Ste A
Chubbuck, Idaho 83202

Dear Ms. Mignogno:

Enclosed is a copy of the Final Report for the Harmony Minesite project and a copy of the EPA's Action Memorandum for the Time Critical Removal Action conducted at the site.

I believe these two documents including a CD with photo's of the activity from start to finish address your September 11 letter requesting a description of the emergency, justification for the emergency action and documentation of mitigation measures implemented.

The activity was successful in that the tailings material was removed, placed in a secure respository, and capped to prevent release of this material into the environment.

No further activities will be conducted under the authorities outlined in the Action Memorandum for this emergency action. Future activities within the watershed by the Forest Service will be conducted through the existing process for identifying, funding, and implementing projects after appropriate consultation has been completed.

For further information please do not hesitate to contact me at 208-756-5231.

Sincerely,

/s/Ray Henderson

RAY HENDERSON
Project Coordinator

Enclosures (3)

cc:
Jan Pisano, Salmon Office Supervisor, NOAA-Fisheries, 100 Courthouse Drive, Salmon
Greg Weigel, EPA, Idaho Operation Office, 1435 N. Orchard St., Boise, Idaho 83706
Bob Rose, SO

Harmony Minesite
Cleanup Operations

Final Report to NOAA Fisheries
And
US Fish and Wildlife Service

USDA Forest Service

Salmon-Challis National Forest

Prepared by: Robert Rose 11/21/03

ROBERT ROSE
Fisheries Biologist
Salmon-Challis National Forest

Date

INTRODUCTION

The Harmony Mine is a former copper mine and mill located in northeastern Lemhi County, Idaho, which ceased operations in 1931. Approximately 9,000 cubic yards of tailings materials associated with past mining operations, encompassing approximately 10,000 square feet, have been deposited into the channel of the Harmony Fork of Withington Creek, adjacent to the minesite. Copper, which is a CERCLA hazardous substance, is present at elevated concentrations up to 5,800 milligrams per kilogram in these tailings. The tailings pile is not contained and has partially collapsed into the stream channel. It appears that over one-half of the volume of material in the original tailings pile has been released, via failure of the tailings dam and stream erosion of the tailings pile area. Tailings deposits are visible in the creek bed for up to two and one-half miles downstream of the tailings piles. Copper and other substances, including arsenic and chromium, are additionally present in elevated concentrations (more than three times background levels) in sediments and wetlands downstream of the site.

In the past months the Withington Creek drainage was subjected to severe forest fires which completely destroyed the former mill and associated buildings and surrounding vegetation. The Withington Creek Fire destroyed almost all of the vegetative cover in the upper Withington Creek drainage at and above the mine site. A significant rain event in the drainage after the fire has already caused erosion and washouts at various locations around the mine site. The tailings are currently, and primarily during spring runoff, at risk of catastrophic slope failure resulting in mass loading of copper-laden tailings material to surface waters which ultimately discharge to the Lemhi and Salmon Rivers.

In the aftermath of the 2003 fire, the Idaho Department of Environmental Quality requested the Environmental Protection Agency to take emergency action to address conditions at the site. The Forest Service has a role at the site given that a portion of the tailings pile is located on Forest lands. In response to the threat of mobilization of tailings materials as a result of potential post-fire erosion and debris-flow events, the Salmon-Challis National Forest and the Environmental Protection Agency jointly proposed a time-critical removal action under authority of the Comprehensive Environmental Response, Compensation and Liability Act for the Harmony Minesite. A request was concurrently made to initiate emergency Section 7 Consultation with the US Fish and Wildlife Service. Project authorization was secured and tailings removal operations were implemented in October of 2003. This report describes specifics of the removal action, and short- and long-term effects on aquatic habitats and fisheries resources of the Withington Creek drainage. This report has been prepared in fulfillment of requirements of emergency Section 7 Consultation, and draws heavily from project design and work completion report information provided by both Herrera Consultants, Inc., and Environmental Quality Management (EQM) Contractors.

PROJECT AREA DESCRIPTION

Harmony Minesite

The Harmony minesite is located in the Withington Creek drainage in northeastern Lemhi County, Idaho, approximately 15 miles southeast of Salmon, Idaho. The private property consists of approximately 330 acres completely surrounded by the Salmon-Challis National Forest in Township 20 North, Range 22 East, Section 35. The site is accessed by Forest Service roads which are connected to Highway 28 between Salmon and Tendoy, Idaho.

The former mill building and bunkhouses are located on the east slope of the valley at an elevation of approximately 7,000 feet above sea level near the headwaters of the Harmony Fork of Withington Creek. Two former mine adits are located at an elevation of approximately 7,600 feet above sea level south of the mill buildings on the west slope of the valley. The total property area is 330 acres, but is comprised of two parcels: approximately 323.5 acres which includes the adits and subsurface workings in the upper drainage; and approximately 6.5 acres which includes the mill building and approximately 9,000 cubic yards of tailings materials located downslope within the Harmony Fork stream channel. The project area of approximately 12 acres is limited to the smaller parcel and the adjacent National Forest lands surrounding the private property.

Aquatic Habitats and Fish Species

Surface water features within the project area include an unnamed stream locally known as the Harmony Fork of Withington Creek, which flows at approximately 3.2 cubic feet per second through the middle of the tailings impacted area and various surface water drainages which contribute to surface water flow in the project area, including discharge from the adits (Ecology and Environment, 2000). The Harmony Fork is tributary to Withington Creek, which, in turn, is tributary to the Lemhi River. During a September 8, 2003 site review of the project area waters by Forest Service, NOAA Fisheries, and US Fish and Wildlife Service fisheries personnel, it was generally agreed that the waters of the Harmony Fork of Withington Creek do not currently support fish habitat for listed fish species. Due to the tributary's small size, high gradient, and general lack of holding water, it was not believed that waters within or immediately downstream of the project area currently provide suitable habitat for rearing or spawning of chinook salmon, steelhead, or bull trout (Personal communication with Jan Pisano, NOAA Fisheries, September 8, 2003).

While the Harmony Fork of Withington Creek is not believed to support significant fish habitat due to its small size and steep gradient, Forest Service, Bureau of Land Management, and Idaho Department of Fish and Game records indicate that mainstem Withington Creek downstream of the project area currently supports populations of rainbow trout and westslope cutthroat trout. Interviews with lower Withington Creek landowners in 2000 additionally indicated that the lower reaches of the stream may have

been historically utilized by chinook salmon, steelhead and bull trout, but that irrigation diversions to private lands have precluded use during the last thirty years (Letter from Bruce Smith, Salmon-Challis National Forest Fishery Biologist to Lilin Li, Ecology and Environment, Inc. regarding historical accounts of fish utilization in Withington Creek). These three species have been designated as federally Threatened under the Endangered Species Act (Office of the Federal Register. Vol. 57, No. 78; Vol. 62, No. 159; Vol. 63, No. 111)

Critical habitat has been designated for Snake River spring/summer chinook salmon (Office of the Federal Register, Vol. 58, No. 247), and includes all historically accessible waters of the Salmon River Drainage, including Withington Creek. Proposed critical habitat for the Upper Columbia River population segment of bull trout (Office of the Federal Register, Vol. 67, No. 230) includes specific waters of the Lemhi River drainage, although Withington Creek is not among those designated waters.

BACKGROUND

Previous Investigations

Due to the risks posed by the unconfined tailings materials, the Harmony Minesite has been the subject of numerous agency investigations and reviews. These investigations are summarized below:

During 1944, the Idaho Geological Survey conducted an extensive review of inactive of abandoned mines south of the Salmon River. The Harmony Mine was among the sites included in this review. According to the investigation, copper sulfide tailings were identified at the site and appeared very unstable. A pH measurement of the Harmony Fork of Withington Creek was collected and indicated a pH of 7.2. No other sampling was conducted at that time. Further assessment work was conducted in 1995 by the US Geological Survey, including surface water, sediment and tailings material sampling from the mill and tailings areas. Samples were analyzed for heavy metals. Results indicated concentrations of copper in all media at levels of concern.

The Idaho Department of Environmental Quality (IDEQ) conducted surface water sampling at the mine site in 1998 and 1999. Results indicated that dissolved concentrations of copper were up to 33 micrograms per liter, which exceeded the Idaho State Freshwater Chronic Criteria for aquatic life (IDAPA 250.02e. 1994; IDEQ, 1999; IDHW, 1999).

In 2000, the US Environmental Protection Agency (EPA) produced a preliminary Assessment/Site Investigation Report that documented a site visit and sampling conducted during 1999. The tailings pile was estimated at that time to contain 40,000 cubic yards of copper-laden materials. Tailings deposits were observed during that time extending approximately 2.4 miles downstream of the mill area. Sample results indicated

that several metals were detected at significant or elevated concentrations. Copper was detected at up to 5,000 milligrams per kilogram (mg/kg) in the tailings piles, 3,000 milligrams per kilogram in adjacent sediments, and 50 micrograms per liter in the waters of the Harmony Fork (Ecology and Environment, 2000).

Recent site visits were conducted after the forest fires had been extinguished in early September of 2003. During the first two weeks of September, the EPA Onsite Coordinator, the Forest Service Onsite Coordinator, representatives of the US Fish and Wildlife Service, START personnel and Emergency and Rapid Response Services personnel visited the site on multiple occasions to determine the necessity of a Removal Action and to provide a framework for a proposed action. It was determined that, since the private property did not have an appropriate location to accommodate the estimated volume of tailings in a stable environment within reasonable haul distance, an off-channel repository for tailings materials could only be located on Forest Service lands. Adverse haul was a serious consideration due to the instability of soils and rock debris on the steep slopes.

A recent Forest Service survey of the tailings revised the total volume of materials needing removal to 9,000 cubic yards.

On August 27, 2003, the EPA and Forest Service On-Scene Coordinators and DEQ representatives visited the Harmony Mine site to evaluate the risk of catastrophic failure of the tailings pile into the Harmony Fork of Withington Creek from flash flooding or spring runoff, as a result of a fire that occurred in the drainage in August of 2003, and consequent loss of vegetation in the drainage. The consensus was that if action is not taken immediately to stabilize the tailings prior to Winter 2003, it is likely that a failure would occur and cause mass loading of tailings into the Harmony Fork, which could impact water quality and endangered species habitat in the Lemhi and Salmon Rivers.

Conditions Necessitating Emergency Action

Conditions at the site met the criteria for at time-critical removal action as stated in the National Contingency Plan (NCP), 40 CFR Section 300.415, as follows:

> Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities

Threats to the Environment

Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations or the food chain (300.415(b)(2)(i). Aquatic food chain organisms in Withington Creek, the Lemhi River and the Salmon River are threatened by release of mine tailings with elevated metals concentrations. Dissolved copper is the primary contaminant of concern. Copper is particularly toxic to the aquatic food chain and juvenile salmonids. Contaminant concentrations in sediments in the Harmony Fork of

Withington Creek downstream of the tailings pile exceed the National Oceanic and Atmospheric Administration Freshwater Sediment Screening level for probable effect, meaning that contaminant concentrations would probably be detrimental to the majority of benthic species.

Actual or potential contamination of a drinking water supply or sensitive ecosystem (300.415(b)(2)(ii). Sensitive aquatic ecosystems in Withington Creek, the Lemhi River and the Salmon River are threatened by mass loading of copper-laden tailings from the site in the event that the tailings pile should fail during a high intensity storm event or upcoming spring runoff. The Harmony Fork of Withington Creek exhibits elevated concentrations of metals in sediments downstream of the tailings site. Copper concentrations in Withington Creek surface water exceed applicable water quality criteria. State water quality standards that apply to Withington Creek specify that it "shall be protected for beneficial uses, which include all recreation use in and on the water and the protection and propagation of fish, shellfish and wildlife, wherever attainable."

High levels of hazardous substances or pollutants in soils (300.415(b)(2)(iv). Concentrations of copper in tailings pile soils at the site are as high as 5,000 milligrams per kilogram.

The availability of other appropriate Federal or State response mechanisms to respond to the release (300.415(b)(2)(vii). There are no other appropriate Federal or State response mechanisms that have the resources to respond to this release.

Endangerment Determination

Actual or threatened releases of hazardous substances from this site may present and imminent and substantial endangerment to public health or the environment.

Expected Change in the Situation Should Action Be Delayed or Not Taken.

Delayed action would likely result in mass loading of copper-laden tailings from the site down the Harmony Fork and Withington Creek into the Lemhi River and possibly even to the Salmon River. This could result in a fish kill and long-term damage to protected chinook salmon, steelhead and bull trout, and other fish habitat."

PROJECT OBJECTIVES

The elevated concentrations of copper in all media sampled indicated that a threat of release of hazardous substances from the mine site present an imminent and substantial endangerment to the environment. To mitigate the identified hazards, the following emergency Removal Action objectives were developed. The selected alternative was used as the basis for developing the design approach.

Emergency Removal Action Objectives

- Conduct gross removal of tailings materials to prevent catastrophic slope failures and subsequent discharge of contaminated materials to the Harmony Fork of Withington Creek;

- Construct a repository to accommodate the tailings material with a rock cap barrier to minimized the bioavialabilty of copper to the environment;

- Provide erosion and sediment control during construction to prevent the discharge of sediments to the Harmony Fork of Withington Creek using Best Management Practices (BMPs) and other engineering controls;

- Reclaim all disturbed areas using Best Management Practices (BMPs) and other engineering controls to minimize erosion after the work is completed; and

- Minimize future operations and maintenance activities.

PROJECT DESIGN

Project design was developed by Herrera Environmental Consultants, Inc, of Seattle Washington. Design approach and criteria were based upon: previous engineering experience; coordination and a site visit conducted on September 9, 2003 with the United States Forest Service On-Scene Coordinator; background file reviews of previous investigations at the site; conversations between the US Environmental Protection Agency, the Superfund Technical Assessment and Response Team (START) and the Emergency and Rapid Response Services (ERRS); and input from representatives of the Idaho Department of Environmental Quality. The following section summarizes project design specifics, including Best Management Practices and mitigation guidelines, as identified in the Herrera report:

Site Preparation

All locations will be flagged in the field by the EPA and Forest Service On-Scene Coordinators prior to beginning work. Tailings removal boundaries will also be established using visual observation of the tailings (yellow fine-grained silty sands) and native materials (generally tan to brown sands and gravels) contact.

The Forest Service access road leading to the tailings pile will be improved to accommodate heavy equipment. A temporary road will also be constructed to access and exit the tailings piles and provide turnarounds. Disturbance will be kept to a minimum for all road work. BMPs will be implemented as appropriate, including by not limited to, installation of silt fences and/or wattles, and application of straw mulch and woody debris

salvaged during work activities.

Tailings Material Removal

Approximately 9,000 cubic yards of materials will be removed from approximately 200 linear feet of Harmony Fork downstream of the mill building. The material extends approximately 50 feet on either side of the channel. Contaminated materials will be excavated to the level of the underlying native material, as determined visually or to the extent practicable. To stabilize the slopes and minimize erosion, a minimum slope of 4:1 and a maximum slope of 2.5:1 will be utilized on both channel banks.

Following tailings removal, disturbed areas will be protected against erosion and to dissipate the energy of runoff, surface flow, and debris flows. It is anticipated that straw mulch, rock from borrow sources, and salvaged woody debris will be used. Two rock sources have been identified in the field; however, additional sources may be accessed and will be field located during the work period. Limited channel armor will also be used to further prevent erosion and further cutting during spring runoff. Large rocks, salvaged logs, and woody debris will be placed in the channel to encourage further woody debris recruitment and grade control in the creek.

Repository

Three repository options were identified during the site visits by the Forest Service Onsite Coordinator, the EPA Onsite Coordinator, and START and ERRS personnel. All locations are on Forest Service land. Repository 1, located approximately one mile east of the tailings was chosen as the preferred site. This site, with a measured extent of 400 feet by 150 feet, is accessed by the main Forest Service road via a temporary road associated with material removal activities. The other repository locations and all private land were determined not suitable due to insufficient footprint surface area, high susceptibility to surface water and debris flows, and adverse haul conditions.

The repository location will be prepared by clearing and grubbing the proposed area, approximately 400 feet long and 150 feet wide. The ground surface will then be compacted by heavy equipment to prepare the surface. All woody debris and rock will be saved for use as cover. Tailings materials will be brought to the area by haul truck and spread by a bulldozer using a maximum one foot lift. The material will be non-saturated and free of wood debris, large rock and other materials which could preclude compaction. Compaction will be attained by tracked equipment passes until the surface is firm and unyielding.

The repository will be located so that a minimum 100 foot buffer is maintained between the west toe of the slope and the Harmony Fork. The location of the haul road will be considered when constructing the repository to accommodate future site access. The repository will have the maximum footprint possible in the event that more than the

estimated 9,000 cubic yards of tailings material is removed from the mine site.

In order to optimize surface water sheet flow and minimize infiltration, a minimum slope of 4:1 and maximum slope of 3:1 will be used on all side slopes, with the exception of he ease side, which may be blended into the east valley slope. The repository may be stepped as the lifts are placed; however the maximum recommended step height is ten feet. The top of the repository should also slope to drain away from the repository with a minimum slope of four percent. These grades were chosen to allow for revegetation to the extent practicable.

If the repository is blended into the east valley slope, a wide trench will be constructed at the top of the repository to provide energy dissipation to minimize erosion from surface water and debris flows originating on the slope. Geotextile material, such as a four or six ounce woven fabric, may be used to provide a structural and/or barrier layer between the tailings material and the rock cap. The trench will include large coarse and durable rock placed on top of the rock cap to provide additional protection.

Rock Cap

Tailings placed in the repository will be isolated beneath a physical barrier of rock to minimize the bioavailability of copper and other detected metals by reducing infiltration, preventing erosion by surface water and debris flows, and preventing contact with humans and animals.

The rock cap will be constructed of a minimum of twenty-four inches of rock approximately eighteen inches or less in size obtained from the proposed borrow sources. The rock cap will be completed using a maximum one-foot lift and compacted using tracked equipment passes until the surface is firm and unyielding. As described earlier, to prevent erosion from surface water, trenches installed on the east slope or in other locations to convey surface flow should also have coarse and durable large rock placed directly on top of the rock cap.

Erosion and sediment control

Erosion and sediment controls will be implemented before and during work activities to minimize the introduction of sediments to the Harmony Fork and reduce pollutants and turbidity in stormwater runoff. All Removal Action construction activities will be managed to reduce the risk of pollution leaving the site. Site conditions may require additional measures or methodologies as deemed appropriate and necessary in the field. All BMPs, including filter fences and check dams, will be inspected daily and maintained, especially during rainfall events.

Diversion dikes, coffer dams, check dams, lined ditches, and other intercepting features will be used with or without polyethylene pipe throughout the project area to minimize

surface and groundwater interaction with the tailings piles. Flow from the Harmony Fork of Withington Creek, (maximum documented flow 3.2 cfs), the mine adit discharge, the unnamed creek, and all other surface water flow will be diverted around the tailings removal work area and discharged back to the Harmony Fork below the work area to minimize surface water flow in the creek during work operations. If polyethylene pipe is used, the pipe will be anchored to minimize disturbance and movement. An energy dissipater will be provided for outlet protection at the point of discharge.

Once operations have been completed, the diversion will be removed to allow flow back to its original course. A slug of turbidity should be anticipated.

A schedule of BMPs from the Idaho Catalog of Stormwater Best Management Practices and professional experience were utilized for selection of stormwater BMPs (IDEQ, 2003). The following general BMPs will be implemented either through the duration of the work, or periodically, as required:

General Construction Site Guidelines

BMP 1 – Erosion Prevention

All construction activities will comply with temporary erosion and sediment control plan measures.

- All erosion BMPs will be installed before construction begins.
- All exposed soils will be stabilized with material from a clean source, such as certified weed-free straw mulch.
- Permanent cover measures will include straw on exposed areas. Permanent seeding may be implemented.
- Erosion control matting or other stabilization will be placed on all finished slopes greater than 3:1.
- Access roads will be graded such that slopes will divert surface water off the entire road surface so that water does not concentrate in any specific location.

BMP 2 – Temporary Stream Crossing

- Temporary stream crossings will be used where practicable within the construction site.
- A bridge will be constructed across a stream using salvaged logs for short-term use by construction vehicles or heavy equipment.

- Provide a means for construction vehicles to cross streams without moving sediment to streams, and without damaging the streambed or channel, or causing flooding.

BMP 3 – Dust Control

The State of Idaho has applicable dust control requirements according to Idaho Administrative Code (IDAPA 58.01.01.650-651). These requirements will be met by implementing this BMP so that all reasonable precautions are taken to prevent particulate matter from becoming airborne.

- Dust control measures should be used where open dry areas of soil are anticipated on site. Mulching is an effective way of conserving moisture, preventing surface crusting, reducing runoff and erosion, and helping to establish vegetation.

- One or several dust control measures will be considered prior to clearing and grading.

- Water erosion measures incorporated into the project will indirectly prevent wind erosion.

The following methods of on-site dust control will be implemented to reduce migration of contaminated dusts into surface waters and wildlife habitats:

- Sprinkling – The site may be sprinkled with water until the surface is wet. Sprinkling is especially effective for dust control on haul roads and other traffic routes.

- Mulch – When properly applied, mulch (including gravel mulch) offers a fast, effective means of controlling dust.

BMP 4 – Spill Prevention

- An emergency spill response and containment kit will be located on the construction route.

- Any spilled material and used cleanup materials will be disposed of away from the job site at an IDEQ-approved disposal site.

- Fuel hoses, oil drums, oil or transfer valves and fittings, and any motorized unit used during project implementation will be inspected regularly for drips or leaks.

- All refueling or machinery maintenance operations will be conducted at a safe distance from the Harmony Fork.

Sediment Collection and Runoff Diversion

BMP 5 – Clearing Limits

- Clearing limits will be delineated, areas of in-water work isolated, and construction entrances and access roads stabilized.

- Disturbance of adjacent areas causing erosion and sedimentation will be minimized.

BMP 6 – Check Dams and Sediment Traps

- Suitable sediment traps will be installed during construction to filter stormwater runoff before it exits the project site, including but not limited to, sedimentation ponds, mulch, silt fencing, compost/straw wattles, hay bales, diversion ditches, vegetation buffer strips, and roughened surfaces.

BMP 7 – Outlet Protection

- Outlet protection will be employed for all stormwater flows designed to discharge into ditches or the Harmony Fork.

- Outlet protection shall reduce the speed of concentrated storm water flows, reduce erosion or scouring at storm water outlets, and lower the potential for downstream erosion, including but not limited to, stone or riprap outlet structures and armored scour holes installed below the discharge point.

BMP 8 – Infiltration and Land Application

- Infiltration facilities, such as sedimentation ponds, will be installed where appropriate to reduce discharge directly to surface soils. These facilities will allow the collected water to enter the underlying soil in a controlled manner to remove pollutants by settling, percolation, filtering, soil sorption, and degradation. Methods will include, but not be limited to, layers of coarse gravel, sand, or other filtering media to filter runoff before it infiltrates the soil.

Soil Stabilization for Slopes and Disturbed Areas

BMP 9 – Mulching

- Disturbed areas with exposed soils will be mulched with straw at the conclusion of construction activities to minimize erosion, prevent water quality degradation, and restore overall environmental functions.

BMP 10 – Mats and Blankets

- Biodegradable temporary cover measures may be installed to minimize the potential for erosion in areas with disturbed soils.

- Erosion control matting or other appropriate slope protection material will be installed on all finished slopes steeper than 3:1.

Reclamation

Reclamation efforts will be implemented after work activities are completed to minimize the introduction of sediments to the Harmony Fork and reduce pollutants and turbidity in stormwater runoff. Methods and materials will be similar to those described in the erosion and sediment control section, including but not limited to, mulching, surface roughing, installing water bars on access roads, obliterating temporary roads, etc.

Endangered Species Act

In order to support Section 7 Consultation of the federal Endangered Species Act of 1973, conservation measures have been included in project design. Conservation measures are designed to avoid or minimize impacts to plants and animals and their habitats.

- Avoid adverse impacts on wetland, stream and wildlife habitats and associated species.

- Preserve existing native shrubs and trees by clearing vegetation sparingly.

- Retain all salvaged trees in the Harmony Fork to compensate for the long-term loss of large woody debris recruitment potential. This involves leaving cut trees in the floodplain or stream channel to provide habitat.

OPERATIONS SUMMARY

The following summary of project implementation operations was derived from a "Work Report for Harmony Mine", produced by Environmental Quality Management (EQM), the primary project contractor:

EQM was directed on September 15, 2003 to respond to an emergency removal at the Harmony Mine Site by Greg Weigle, On-Scene Coordinator for the US Environmental Protection Agency, Region 10, Boise, Idaho.

Mobilization

EQM Project Manager Joe Ficek arrived in Salmon on September 18, 2003. Two crew members arrived the following day to transport several pieces of equipment to the job site. A site walk was completed by Ray Henderson of the Salmon-Challis National Forest, William Harding of Northwind Environmental, and Dave Brown of Herrera Environmental. The total work force for EQM would be four operators, four drivers, and two technicians.

EQM began work by improving the access road to the site, starting at the intersection located four-tenths miles northwest of the USFS-approved location for worksite office facilities. The road was only improved to the extent to allow safe access for required equipment and personnel. An area of approximately 70 feet long by 50 feet wide was graded and a rock pad was placed as a foundation for office trailers. One 40 foot by 10 foot trailer was used as office space and a second trailer was used for storage and as a lunchroom. A 45 kilowatt diesel generator provided power to the trailers. A lined and bermed area was constructed at the north end of the office trailer to accommodate a 1,000 gallon diesel tank.

Equipment

Equipment mobilized to the site included a D8R bulldozer with rippers, a D6R bulldozer with rippers, a six cubic yard rubber-tired loader, a 225 Hitachi excavator, a 300 Hatachi excavator, four 40 ton haul trucks, a 4,000 gallon water truck, a 300 gallon water truck, and a service/lube truck.

Haul Road and Excavation

The 1.3 miles of access road from the office area to the tailings site was graded and widened to approximately 14 feet to allow the 40 ton haul trucks to operate safely. The steep 25 percent slopes were graded to an acceptable operating grade of 23 percent. Reduction in grade increased the productivity of the haul trucks by over 100 cubic yards per hour. As construction of the access roads neared the tailings area, a decision was made to install a turnaround at the top of the tailings. This allowed the haul trucks to access the tailings piles, load and move to the top of the hill, and wait until all haul trucks were loaded to travel to the repository for offloading. An unnamed tributary that drained through tailings piles was diverted around the west side of the tailings.

Excavation of the tailings piles started on the west side of the creek. As excavation proceeded northward, a truck crossing was installed in the creek to allow the haul trucks to head downhill to the loading area, load out, and head directly up the hill. This increased safety and production of the haul trucks as they did not have to back down the 400 foot long ramp to the loading area. The excavator loaded the trucks with a 2.5 cubic yard (heaped) bucket. Ten buckets were loaded into the 740 Cat trucks (without tailgates) and eleven buckets were loaded into the D400 Cat trucks (with tailgates). Turnaround time for the haul trucks averaged 27 minutes per round. Approximately

15,646 cubic yards of loose excavated materials were transported to the repository between October 2 and October 11, under the following schedule:

October 2:	750 cubic yards	October 8:	2,488 cubic yards
October 3:	900 cubic yards	October 9:	2,392 cubic yards
October 4:	1,603 cubic yards	October 10:	2,053 cubic yards
October 6:	2,080 cubic yards	October 11:	1,300 cubic yards
October 7:	2,080 cubic yards		

After USFS surveyors completed their survey of the repository on October 11, the total in-place quantity was determined to be 10,000 cubic yards. Compaction according to the survey is slightly over 30 percent.

Repository

The repository location was the site preferred by the USFS and was the most suitable site for construction. An area measuring approximately 450 feet long by 200 feet wide (including east slopes) was grubbed and cleared of vegetation, large rock, track-walked and made ready for tailings deposit. As the pad was leveled and track-walked, a toe berm was constructed to ensure durability of repository slopes. Tailings deposits started at the northwest corner of the repository. The haul route into the repository was kept level at all times to allow the haul trucks maximum safety and productivity. Tailings were placed by D6 bulldozer in one-foot maximum lifts. Slopes were constructed to a maximum of 3:1 and track-walked by the dozer for compaction. As the tailings area increased, the dozer operator organized the trucks in a pattern to compact the placed tailings as dumping continued. Large rock and timber hauled from the tailings area was picked out and either placed upslope on the east side or used on the surrounding slope toes. After the tailings were placed, compacted, and the top of the tailings dressed to an average outslope of seven percent outslope from east to west, the first layer of cap rock was installed. The rock consisted of stone hauled from the switchback area on the haul road that lies approximately four-tenths of a mile south of the repository. The material matrix was composed mostly of rocks of four to 12 inches in size, with smaller amounts of rock as large as 18 inches. The rock was placed in one-foot thick lifts, track-walked by the D6 bulldozer, and compacted by the loaded haul trucks. Large and unacceptable materials were removed before compacting. Two feet of cap rock was applied to the entire area, including the 3:1 slopes, comprising 2,500 cubic yards of cap material. The cap rock was then covered with a lift of larger rock to protect the cap. This layer, comprising approximately 1,500 cubic yards of material, consisted of rocks ranging from eight to 24 inches in diameter. Timber slash was placed on all slopes, the repository top, and any disturbed areas surrounding the repository.

Repository Ditches

East Ditch

A ditch was installed on the east side of the repository approximately 35 feet upslope of

the rock cap. The east ditch averages six to eight feet wide by two feet deep by 440 feet long. The ditch was lined with available rock and slash. The ditch shoulders were compacted by excavator bucket and track-walking. The ditch terminates at the north end and spills directly onto a hillside which provides adequate topography to sheet the water flow and reduce scouring.

South Ditch

A ditch measuring six to eight feet wide by two feet deep by 190 feet long was installed on the south end of the repository. This ditch was also lined with rock found during excavation. The south ditch extended across the access road used during transport of tailings materials to the repository. The ditch terminates at the west end and allows water to sheet and filter through the existing vegetation.

Northwest Ditch

A third ditch was installed on the northwest end of the repository. This ditch was constructed to accommodate water flows from the top of the repository as well as waters from the south ditch. The northwest ditch measures six feet wide by two feet deep by 200 feet long and is lined with rock. The ditch berms were compacted and seeded with straw cover. This ditch discharges to an existing topography which allows the water to flow naturally toward the north and sheet flow toward the creek at a point approximately three-tenths of a mile from the discharge point.

Channel Reconstruction

After the tailings were removed from the channel area, restoration and reconstruction began. The slopes were graded and slashed with materials that had to be removed to access the tailings. A basin measuring approximately 160 feet long on the east side, 140 feet long on the west side and averaging 60 feet wide was constructed at the top of the channel above the tailings area. At the north end of this basin water will flow down a gentle slope lined with large rock measuring 36 inches in diameter and larger. This area is approximately 80 feet long and 60 feet wide, and as riprapped on both sides of the channel. Another 160 feet of the old channel was widened to a bottom width of 15 to 20 feet and lined with large rock. The next section downstream is located in the area of tailings removal. This section measures 250 feet long with at channel bottom width of 25 feet. The channel was armored with rock borrowed from a talus slope just west of the channel. Slash was placed on all reclaimed slopes and within the reconstructed channel to aid in sediment control. All of the areas that were disturbed during reconstruction were seeded, and straw was applied to promote revegetation.

Haul Road Reclamation

The haul road was reclaimed from the top of the work area to the main entrance to the mine site. The road was outsloped and the berm on the outside shoulder was removed.

Rolling water bars were installed from the top down to the switchback at intervals of 100 to 150 feet, as requested by the USFS. The switchback required the drainage on the south slope to be cleaned and regraded. A 15 foot wide swale was installed across the haul road to allow runoff water to cross the road and be directed to fit the existing drain pattern.

As road reclamation continued northward, additional water bars were installed at locations requiring runoff control. Haul road shoulders received seed and straw where adequate soil was present. All available straw bales were utilized for seed cover and sediment control.

SUMMARY OF EFFECTS OF PROJECT IMPLEMENTATION ON LISTED FISH AND CRITICAL HABITATS

The primary effect of project implementation has been to reduce both the short- and long-term risk of future migration of tailings materials from the Harmony Minesite to aquatic habitats within the mid- and lower reaches of Withington Creek, and potentially the Lemhi River. In this regard the project has provided a beneficial future effect to downstream habitats and fisheries resources by reducing threats to those resources.

While the primary goal of the Harmony Mine tailings removal was to reduce the threat of potential tailings migrations into aquatic habitats of the mid and lower portions of the Withington Creek drainage, project design and implementation additionally emphasized protection of existing aquatic resources both within and below the project area. The BMPs and mitigations employed in association with project implementation were designed to protect the integrity of both local and downstream aquatic resources.

Potential short-term impacts, primarily confined to the project work area where fisheries habitat quality and quantity is marginal to lacking, were related primarily to sediment production, stream temperature increase due to reduced shading, loss of woody debris recruitment potential, and adverse impacts to stream channel geometry and pool frequency and quality. Implementation of BMPs and site specific mitigation measures and reclamation actions identified in the Project Design and Operations Summary sections of this report have attenuated or precluded most of these potential effects, both within the immediate project work area, as well as to downstream fish habitats.

Despite the lack of a completed Environmental Baseline for the Withington Creek Subwatershed in either the 1993 Chinook Salmon BA or the 2003 Steelhead/Bull Trout BA., the level of effects of project implementation to fisheries habitats and resources within the Withington Creek drainage can be summarized based upon impacts to the various Pathways and Indicators as described below:

Pathways and Indicators

Subpopulation Size, Growth and Survival, Life History Diversity and Isolation, Persistence and Genetic Integrity (Bull Trout)

Due primarily to habitat fragmentation related to downstream irrigation withdrawals, bull trout do not currently utilize aquatic habitats within the Withington Creek drainage. Project activities therefore had no effect on bull trout subpopulation characteristics within the project area, or within downstream habitats in mainstem Withington Creek.

Temperature

Project operations were designed to minimize necessary vegetation removal. While clearing operations were conducted within the extent of PACFISH/INFISH RHCA zones, vegetation removal did not significantly impact existing shade function. Primary near-stream operations were conducted in the area of the existing tailings, where the toxic character of the materials precluded significant vegetation growth. Vegetation clearing conducted in association with haul road improvement and repository construction was conducted at distances from the stream channel such that tree removal was not impacting available shading. It is not believed that project operations had any measurable effect on existing stream temperature regimes within or below the project area.

Sediment

Threats to stream sedimentation were the most significant potential effect associated with project implementation. Project design, therefore, strongly emphasized implementation of mitigation measures to minimize sediment production and control or contain any sediment generated as a result of project activities. Reclamation actions further addressed restabilization of streambanks, reclamation of constructed haul roads, revegetation of disturbed areas, and control and on-site containment of sediment. As indicated in the Project Design section, however, a pulse of turbidity was anticipated in association with post-project removal of diversion pipes and reintroduction of flows into the Harmony Fork channel.

Unavoidable sediment-related impacts associated with project activities were largely limited to the immediate project area, which does not currently support sufficient fish habitat to support fish populations. Some short-term impacts to downstream waters were incurred as turbid water associated with the above-mentioned removal of diversion pipes passed through downstream reaches of Withington Creek. It is not anticipated that this turbidity pulse was of sufficient magnitude to significantly impact downstream fish populations or fish habitat in either the short- or long-term, however.

Chemical Contaminants/Nutrients

Removal of tailings from the Harmony Fork stream channel produced a beneficial effect to aquatic habitats by reducing both the short- and long-term risk of further migration of copper-laden tailings materials to downstream areas. Project design included specific requirements for fueling and fuel handling which further protected aquatic habitats from fuel or oil contamination associated with equipment operation.

Physical Barriers

Project activities did not produce any barriers or otherwise reduce existing fish migration opportunities within the drainage. Activities had no effect on existing migration barriers associated with seasonal irrigation withdrawals in the lower reaches of the stream.

Substrate Embeddedness

Effects associated with sediment production and deposition are addressed above under *Sediment.*

Large Woody Debris

Project design included retention or placement of large rocks, salvaged logs and woody debris slash in the Harmony Fork stream channel to encourage further woody debris recruitment. No short- or long-term reductions of existing woody debris are expected within or below the project area due to project implementation.

Pool Frequency and Quality

As indicated above, specific measures were employed to retain woody debris loading and promote future woody debris recruitment. These same measures served to promote formation of new pool features within the tailings removal area. Removal of tailings materials from the Harmony Fork stream channel has additionally reduced the risk of future filling of downstream pools due to mass movement of tailings materials.

Off Channel Habitat

Project activities occurred within the steep canyon confines of the Harmony Fork. Activities had no effect on off-channel habitat within the project area. Removal of tailings materials from the Harmony Fork stream channel has reduced the risk of future filling of downstream off channel habitats due to mass movement of tailings materials.

Refugia

As indicated above, project activities were conducted within the confines of a steep canyon. Activities had no effect on off-channel habitat within the project area. Removal of tailings materials from the Harmony Fork stream channel has reduced the risk of future filling of downstream off channel habitats due to mass movement of tailings materials.

Channel Width to Depth Ratio

Within the project area, the presence of in-channel tailings materials had altered the natural channel geometry characteristics of Harmony Creek stream channel. Removal of tailings materials from the channel, and subsequent reclamation has again altered channel geometry at the site. Reclamation actions were designed to reshape and stabilize the channel through regrading, seeding, slashing and installation of sediment control structures. However, some additional changes to channel geometery within and immediately below the tailings removal area would be expected as the stream readjusts to annual runoff flows. Downstream of the project area, removal of tailings materials from the Harmony Fork stream channel has reduced the risk of future impacts to existing channel geometry associated with mass movement of tailings along the streamcourse.

Streambank Conditions

Removal of tailings materials from the Harmony Fork stream channel has reduced the risk of future filling of downstream off channel habitats due to mass movement of tailings materials.

Floodplain Connectivity

Project activities were conducted within the steep confines of the Harmony Fork drainage, which does not lend itself to development of significant floodplain expanse. Implementation of project actions had no effect on this indicator within the Harmony Fork channel. Removal of tailings materials from the Harmony Fork stream channel has reduced threats to floodplain integrity in downstream reaches of Withington Creek from mass movement of tailings through the stream channel and across existing floodplains.

Change in Peak or Base Flows

Project design included minimizing required clearing and vegetation removal. The amount of vegetation affected in association with road reconstruction and clearing was not of sufficient magnitude to significantly affect either peak or base flows.

Increase in Drainage Network

Project actions did not result in any increase in the drainage network.

Road Density and Location

Current subwatershed road density is 0.8 mile per square mile for the entire subwatershed and 1.1 miles for Forest lands within the subwatershed. No new roads were constructed in association with project actions, and the project did not increase existing road density within the subwatershed.

Disturbance History

Nine tenths of one percent of the entire subwatershed, and 3.7 percent of the Salmon-Challis National Forest portion of the watershed is in stands less than 30 years old. Project activities, including removal of toxic tailings materials and construction of the tailings repository, did not significantly change the Equivalent Clearcut Area percentage for the subwatershed.

Riparian Conservation Areas

Project actions included vegetation clearing along haul roads and construction of a tailings repository within the 300 foot extent of the PACFISH/INFISH RHCA. However, the function (shade, LWD recruitment, etc) of the RHCA indicator was not degraded from existing conditions due to these actions.

Integration of Species and Habitat Conditions

Irrigation withdrawals within the lower reaches of the Withington Creek drainage have negatively impacted the stream's connectivity with the Lemhi River. No listed species currently utilize either project area waters within the Harmony Fork of Withington Creek, or suitable mainstem Withington Creek waters below the project area. Activities associated with Harmony Mine cleanup operations have had no direct effect on the current condition of this indicator. However, cleanup operations have substantially reduced the risk of future catastrophic transport of copper laden tailings materials to suitable fish habitat within downstream reaches of Withington Creek, and have, in that respect, resulted in a beneficial effect contributing to the potential for future reutilization of existing unoccupied habitats.

A CD disc containing photos of Harmony Mine cleanup operations is included. An index to the photos contained on the disc is included as an Appendix to this document.

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Appendix

Harmony Minesite Cleanup Photo Log

APPENDIX C

Photographic Documentation

Harmony Mine Removal Action
Photographic Log

Photo Number	Date	Time	Direction	By	Description
001	9/9/03	1030	E	PF	Panorama of repository 1 (looking south).
002	9/9/03	1030	SE	PF	Panorama of repository 1 (looking south).
003	9/9/03	1030	S	PF	Panorama of repository 1 (looking south).
004	9/9/03	1030	SW	PF	Panorama of repository 1 (looking south).
005	9/9/03	1030	W	PF	Panorama of repository 1 (looking south).
006	9/9/03	1035	W	PF	Panorama of repository 1 (looking north).
007	9/9/03	1035	N	PF	Panorama of repository 1 (looking north).
008	9/9/03	1035	E	PF	Panorama of repository 1 (looking north).
009	9/9/03	1100	E	PF	Rock source.
010	9/9/03	1100	N	PF	Haul road; rock south at right.
011	9/9/03	1100	NE	PF	Rock source at right; tributary in center.
012	9/9/03	1130	SW	PF	Mine adit.
013	9/9/03	1130	SW	PF	Mine adit.
014	9/9/03	1200	SE	PF	Panorama of repository 2 (looking south)
015	9/9/03	1200	S	PF	Panorama of repository 2 (looking south).
016	9/9/03	1200	S	PF	Panorama of repository 2 (looking south).
017	9/9/03	1200	SW	PF	Panorama of repository 2 (looking south).
018	9/9/03	1230	N	PF	Upper drainage, above tailings.
019	9/9/03	1230	N	PF	Upper drainage, above tailings.
020	9/9/03	1255	N	PF	Tailings piles, upper portion.
021	9/9/03	1300	E	PF	Former mill building.

Photo Number	Date	Time	Direction	By	Description
022	9/9/03	1300	E	PF	Former mill building.
023	9/9/03	1330	SE	PF	Erosion in tailings piles; Harmony Creek.
024	9/9/03	1400	S	PF	Proposed exit road.
025	9/9/03	1400	N	PF	Proposed exit road.
026	9/22/03	0955	NW	DB	Lower road adjacent to Harmony Creek during widening and improvement upstream of staging/office area.
027	9/23/03	0836	N	DB	Lower creek ford before improvement and BMPs.
028	9/23/03	0910	S	DB	Debris flow (center) and unnamed tributary (left); road beyond.
029	9/23/03	0920	NE	DB	Silt fence in unnamed tributary, downstream of road and debris flow.
030	9/23/03	1700	N	DB	Spreading rock on road at lower creek ford.
031	9/24/03	0900	SW	DB	Dry soil beneath approximately three feet of debris flow.
032	9/24/03	0945	SW	DB	Excavation of debris flow to improve road (center) and stockpile (right).
033	9/24/03	1600	W	DB	1;500 gallon fuel trailer and containment berms.
034	9/25/03	1000	NE	DB	View of tailings before any excavation.
035	9/25/03	1530	S	DB	Finished road across debris flow and beyond (unnamed tributary on left).
036	9/25/03	1531	SW	DB	View of stockpiled material that was removed from the debris flow during road construction.
037	9/25/03	1540	Down	DB	Woody debris in unnamed tributary channel after it was diverted back into its original course.
038	9/25/03	1545	SE	DB	Rock source at switchback.
039	9/26/03	1310	S	DB	View of road before improvement. Green flagging indicates cultural resources to be protected.
040	9/26/03	1320	N	DB	Felling trees for road widening and improvement.

Photo Number	Date	Time	Direction	By	Description
041	9/26/03	1450	N	DB	Road improvement. Felled trees placed along outside road edge to protect cultural resources and provide structure for the road.
042	9/26/03	1522	N	DB	Road improvement.
043	9/27/03	1121	SW	DB	Harmony Creek approximately 300 feet upstream of tailings.
044	9/27/03	1126	Down	DB	USDAFS survey marker placed in tailings (Corner 4 on survey).
045	9/27/03	1131	S	DB	Location of survey marker with respect to tailings.
046	9/27/03	1156	SE	DB	Location of survey marker with respect to tailings.
047	9/27/03	1254	NE	DB	View of debris flow from above switchback.
048	9/27/03	1552	NE	DB	Widening the road at the old mill building.
049	9/27/03	1708	SW	DB	Widening the road at the old mill building.
050	9/27/03	1824	NE	DB	Placing straw bales for sediment control in Harmony Creek above tailings.
051	9/29/03	1818	S	DB	Repository area cleared of timber.
052	9/30/03	0944	N	DB	Pipe being installed in the diversion channel.
053	9/30/03	0947	E	DB	Old mill building smoking and smoldering.
054	9/30/03	1209	N	DB	Excavation of trench for repository toe along the west side.
055	9/30/03	1213	SE	DB	Repository construction.
056	9/30/03	1423	W	DB	Diversion structure.
057	9/30/03	1452	SE	DB	Creek water exiting the diversion pipe.
058	9/30/03	1453	E	DB	Diverted creek discharging into historic exit from upper diversion channel.
059	9/30/03	1510	N	DB	Repository preparation continues.
060	10/1/03	1112	N	DB	View of rock filled trench at toe of repository.

Photo Number	Date	Time	Direction	By	Description
061	10/1/03	1357	NW	DB	Building road from truck turn around down into tailings (diversion channel in background).
062	10/1/03	1403	W	DB	Building road from truck turn around down into tailings.
063	10/1/03	1406	W	DB	Building road from truck turn around down into tailings.
064	10/1/03	1511	E	DB	Rock filled trench covered with filter fabric at toe of repository.
065	10/1/03	1511	E	DB	Close-up of rock filled trench covered with filter fabric at toe of repository.
066	10/2/03	1024	NE	DB	First load of tailings being loaded for transport to the repository.
067	10/2/03	1121	E	DB	40-ton haul truck transporting tailings to repository.
068	10/2/03	1125	N	DB	Compacting tailings in repository.
069	10/2/03	1314	S	DB	Drainage pipe placed in northwest corner of repository.
070	10/2/03	1316	SE	DB	Compacting tailings in repository.
071	10/2/03	1405	SE	DB	Excavating tailings (foundations of old mill in background).
072	10/2/03	1505	SW	DB	Excavating tailings and debris at old mill building as archaeologist monitors.
073	10/2/03	1905	Down	DB	Hydraulic oil on roadway at switchback.
074	10/3/03	1130	S	DB	Compacting tailings in repository.
075	10/3/03	1451	S	DB	Loading tailings and dust control on the west side of the creek.
076	10/3/03	1840	W	DB	Excavating tailings on the west side of the creek.
077	10/4/03	1136	N	DB	Area where lower sedimentation pond will be constructed.
078	10/4/03	1438	W	DB	Constructing lower sedimentation pond.
079	10/4/03	1454	N	DB	Constructing lower sedimentation pond.

Photo Number	Date	Time	Direction	By	Description
080	10/6/03	0924	NE	DB	Excavating tailings on the west side of the creek.
081	10/6/03	1855	E	KB	Decon of open cab D6 dozer.
082	10/7/03	1049	NW	KB	Loading tailings from west bank into haul truck.
083	10/7/03	1053	W	KB	West bank after removal of tailings
084	10/7/03	1110	NNE	KB	Panorama of east bank tailings.
085	10/7/03	1110	NE	KB	Panorama of east bank tailings.
086	10/7/03	1110	E	KB	Panorama of east bank tailings.
087	10/7/03	1110	SSE	KB	Panorama of east bank tailings.
088	10/7/03	1825	S	KB	Loading tailings from east bank into haul truck.
089	10/8/03	0932	N	KB	Compacting tailings in repository.
090	10/9/03	0854	N	KB	Overview of tailings removal area.
091	10/9/03	0922	N	KB	Haul truck of tailings pulling away as other haul trucks wait to be loaded.
092	10/9/03	1429	SE	KB	Grading repository.
093	10/9/03	1448	N	KB	Haul trucks dumping tailings in repository.
094	10/9/03	1452	NE	KB	Water truck watering road for dust control.
095	10/9/03	1623	SW	KB	Convoy of haul trucks approaching switchback.
096	10/9/03	1702	NE	KB	Loading haul trucks with tailings from east bank.
097	10/10/03	0842	N	KB	Overview of tailings removal area.
098	10/11/03	1211	W	KB	Refueling D8 dozer.
099	10/11/03	1216	S	KB	Channel after removal of tailings.
100	10/11/03	1220	NE	KB	East bank after removal of tailings.
101	10/11/03	1631	N	KB	Compacting tailings in repository.
102	10/11/03	1644	N	KB	Overview of tailings removal area.

Photo Number	Date	Time	Direction	By	Description
103	10/13/03	1043	N	KB	Compacting tailings in repository.
104	10/13/03	1102	SW	KB	Checking grade of repository.
105	10/13/03	1121	S	KB	Blading to clear road after snowfall.
106	10/13/03	1143	N	KB	Overview of tailings removal area.
107	10/13/03	1152	W	KB	Loading haul truck with rock for rock cover of repository.
108	10/13/03	1651	S	KB	Placing first lift of rock cover onto repository.
109	10/13/03	1747	S	KB	Rock lined ditch to northwest of repository.
110	10/13/03	1749	S	KB	Placing first lift of rock cover onto west slope of repository.
111	10/13/03	1750	S	KB	Placing and compacting first lift of rock cover on repository.
112	10/13/03	1751	Down	KB	Typical size of rock of repository rock cover.
113	10/13/03	1808	N	KB	Repository partially covered with rock cover.
114	10/13/03	1820	NW	KB	Stockpiled rock for use in channel near removal area.
115	10/14/03	1114	N	KB	Overview of tailings removal area.
116	10/14/03	1213	S	KB	Placing and compacting first lift of rock cover on repository.
117	10/15/03	1358	NE	KB	Rock placed in area where tailings were removed.
118	10/15/03	1411	S	KB	Historic debris flow caused by micro burst in late summer 2003.
119	10/15/03	1533	S	KB	Widening stream channel above tailings removal area.
120	10/15/03	1728	N	KB	Widening stream channel above tailings removal area.
121	10/16/03	1146	N	KB	Overview of tailings removal area and widened stream channel.
122	10/16/03	1213	NE	KB	Residual tailings (yellow) left at the base of the mill building.

Photo Number	Date	Time	Direction	By	Description
123	10/16/03	1435	NE	KB	Placing slash on access road above tailings removal area.
124	10/16/03	1452	S	KB	Tailings deposits (yellow) in Harmony Creek, west of repository.
125	10/17/03	1122	N	KB	Coarse and durable rock cover on repository.
126	10/17/03	1141	N	KB	View of tailings removal area with rock in channel and slash placed on disturbed soil.
127	10/17/03	1437	SW	EL	View of "blowout" on side of mine adit.
128	10/17/03	1439	NW	EL	Entrance to mine adit.
129	10/17/03	1444	NW	EL	View into mine adit.
130	10/17/03	1747	N	KB	Rock and slash placed in channel in tailings removal area.
131	10/17/03	1748	S	KB	Rock and slash placed in widened channel above tailings removal area.
132	10/17/03	1750	S	KB	Large rock placed at grade transition from basin to channel.
133	10/17/03	1751	S	KB	Basin above widened channel.
134	10/18/03	0830	N	KB	Using spill pads to control leak from off road diesel hose reel.
135	10/18/03	0930	SE	KB	Installing ditch east of repository.
136	10/18/03	0932	S	KB	Ditch to east of repository.
137	10/18/03	0934	Down	KB	Typical size of coarse and durable rock cover on repository.
138	10/20/03	0850	N	KB	Overview of tailings removal area after placement of rock, slash, straw mulch, and seed.
139	10/20/03	0851	S	KB	Basin above widened channel.
140	10/20/03	0854	NE	KB	Straw mulch, seed, and slash on east bank tailings removal area.

Photo Number	Date	Time	Direction	By	Description
141	10/20/03	1031	SE	KB	View of switchback after out sloping road and reclaiming rock source talus slope.
142	10/20/03	1034	S	KB	View of switchback after out sloping road and reclaiming rock source talus slope.
143	10/20/03	1558	N	KB	View of repository after all rock cover and slash placed.
144	10/20/03	1729	S	KB	Road at debris flow after out sloping.
145	10/20/03	1729	SE	KB	Road at debris flow after out sloping.
146	10/20/03	1730	NE	KB	Staging pad near stream crossing.

PF – Paula Fedirchuk
DB – Dave Brown
KB – Katie Bullock
EL – Earl Liverman


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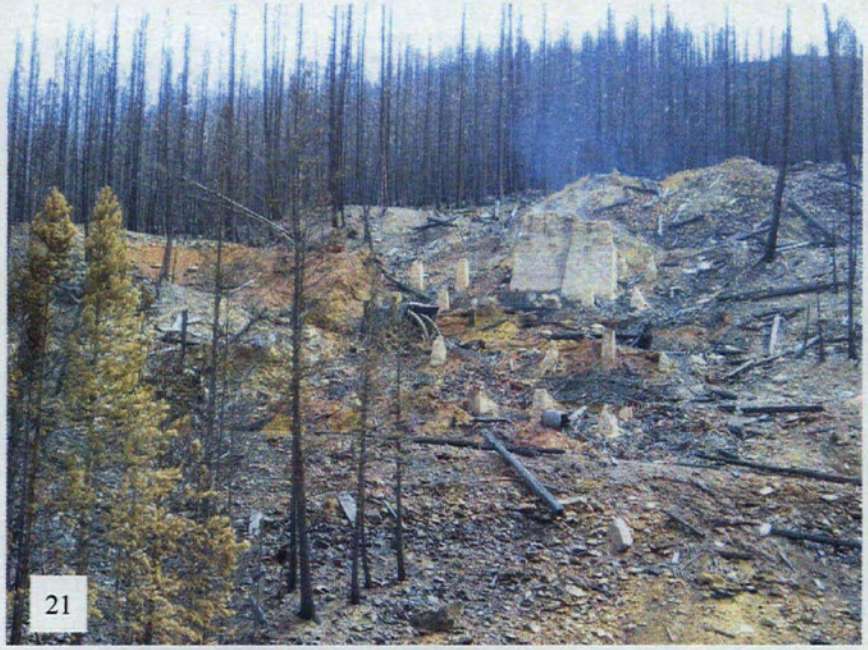

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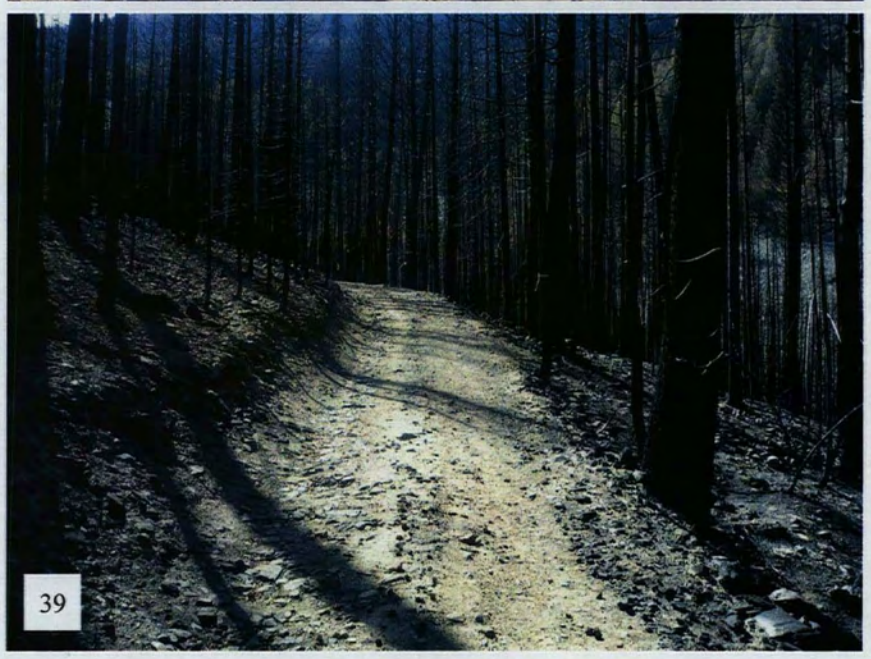

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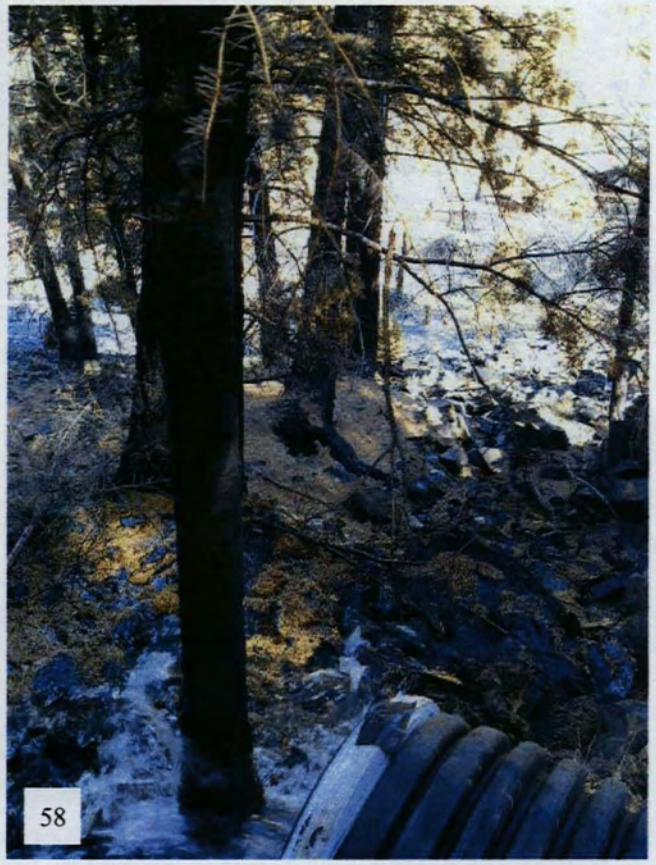

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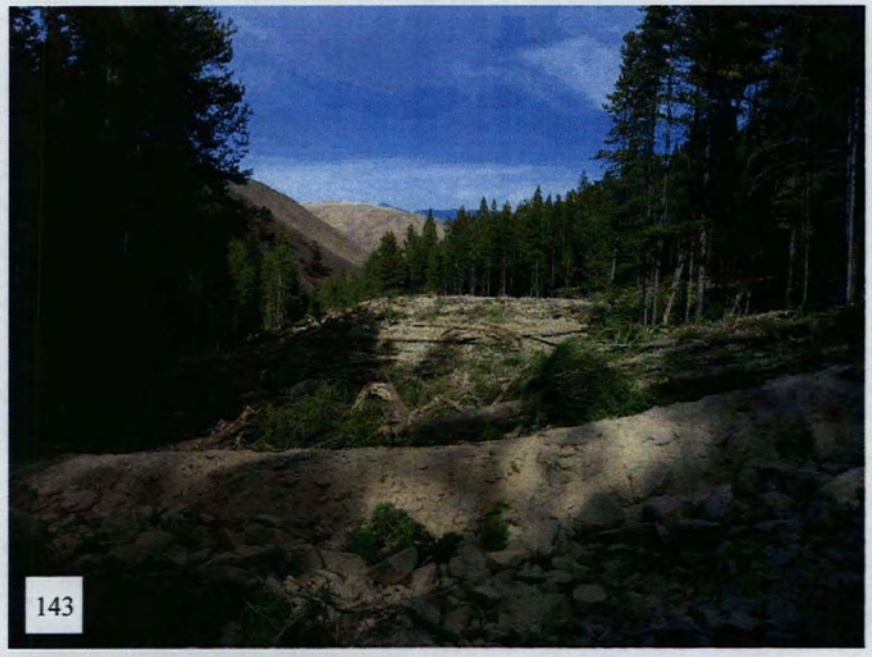

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APPENDIX D

EPA Action Memo and Pollution Reports

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
IDAHO OPERATIONS OFFICE
1435 N. Orchard St.
Boise, Idaho 83706

ACTION MEMORANDUM

SUBJECT: Request for Approval of Time-Critical Removal Action at Harmony Mine Site, Baker, Idaho

FROM: Greg Weigel
On-Scene Coordinator

TO: Michael F. Gearhard, Director
Environmental Cleanup Office

THRU: Chris Field, Manager
Emergency Response Unit

SSID: 10BN

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of a proposed time-critical removal action at the Harmony Mine Site (Site), Lemhi County, near Baker, Idaho. The Site is located on both private patented land and National Forest System administered public land. This proposed action is to address mine tailings with elevated concentrations of copper and other metals, and the threat of mass loading of tailings from the Site into Withington Creek and the Lemhi River.

II. SITE CONDITIONS AND BACKGROUND

The CERCLIS ID # for this site is IDSFN1002104. This Action Memorandum is for a proposed time-critical removal action.

A. Site Description

1. Removal site evaluation

EPA conducted a Preliminary Assessment/Site Inspection (PA/SI) at the Site in May, 2000. The PA/SI identified elevated concentrations of copper (up to 5,800 mg/kg), a CERCLA hazardous substance, and other metals including cobalt and selenium in mine tailings at the site.

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The South Fork of Withington Creek flows through the tailings pile. Surface water samples taken from Withington Creek downstream from the Site during the PA/SI, and subsequently by the Idaho Department of Environmental Quality (DEQ), consistently exceed applicable fresh water criteria for copper. On August 27, 2003, EPA and U.S. Forest Service (USFS) On-Scene Coordinators (OSCs), and DEQ representatives visited the Site to evaluate the risk of a catastrophic failure of the tailing pile into the South Fork of Withington Creek from flash flooding or spring runoff, as a result of a fire that occurred in the drainage in August 2003, and consequent loss of vegetative cover in the drainage. The consensus was that if action is not taken immediately to stabilize the tailings prior to Winter 2003, it is likely that a failure would occur and cause mass loading of tailings into Withington Creek, which could impact water quality and endangered species habitat in the Lemhi River and Salmon River.

2. Physical location

The Site is located near Baker, northeastern Lemhi County, approximately 15 miles southeast of Salmon, Idaho. The property is near the headwaters of Withington Creek. Access to the Site is via an unimproved extension to the Withington Creek road, approximately 9 miles from State Highway 28. The Site is located in Section 35, Township 20 North, Range 22 East. Coordinates are 45° 0' 55" North Latitude, 113° 49' 41" West Longitude.

3. Site characteristics

The Harmony Mine is a former copper mine and milling facility, which operated between 1916 and 1931. The Site has been inactive since 1931. The property consists of approximately 330 acres of private patented land surrounded by the Salmon-Challis National Forest (SCNF), and includes a large tailings pile which lies approximately 2/3 on the private land and 1/3 within the SCNF. The Site tailings pile is at approximately 7,000 feet elevation. Two wood dams were used as retention walls for the tailings pile. Both dams failed years ago (likely in the 1930s) and only a 3 foot high portion of each dam is still present. The South Fork of Withington Creek originates upstream of the tailings pile and flows through the center of the tailings pile. Withington Creek flows into the Lemhi River approximately 8 miles downstream of the Site. The Lemhi River flows an additional 10 miles to its confluence with the Salmon River.

The tailings pile is not contained and has partially collapsed into the stream channel. It appears that over one-half of the volume of material in the original tailings pile has been released, via failure of the tailings dam and stream erosion of the tailings pile. An estimated 40,000 cubic yards of tailings remain at the original tailings pile area. Tailings deposits are visible in the creek bed for up to 2.5 miles downstream of the tailings pile.

In August 2003, the Withington Creek forest fire destroyed almost all of the vegetative cover in the upper Withington Creek drainage at and above the Site. There has been one significant rain event in the drainage since the fire, which has already caused erosion and

washouts in various locations around the mine Site. It is likely that any subsequent high intensity storm event or high volume runoff this coming Spring could result in massive failure of the remaining tailings pile

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

Copper, which is a CERCLA hazardous substance, is present in elevated concentrations (up to 5,800 mg/kg) in Site tailings. Copper and other metals which are CERCLA hazardous substances, including arsenic and chromium, are present in elevated concentrations (more than 3 times background levels) in sediment and wetlands samples downstream of the site. Elevated concentrations of these metals in sediments and wetlands downstream of the Site are likely attributable to the Site, indicating that there has been a migration of hazardous substances from the Site down Withington Creek. As result of the fire in August 2003, there is a greatly increased threat and likelihood of a failure of the remaining tailings pile due to high intensity storm event, or high volume runoff this coming Spring.

5. NPL status

This is not a National Priorities List (NPL) site. No remedial activities are in progress or anticipated at this time. A PA/SI was conducted in 2000. A preliminary score has been developed under the Hazardous Ranking System that is above the 28.5 threshold for possible inclusion in the NPL.

6. Maps, pictures and other graphic representations

B. Other Actions to Date

EPA conducted a PA/SI at the Site in May 2000. There are no other known site investigation or cleanup actions that have been conducted at the Site.

C. State and Local Authorities' Roles

Idaho DEQ has requested EPA to take emergency action to address the Site. Neither DEQ nor Lemhi County have the resources necessary to adequately conduct stabilization and/or cleanup actions at the Site. As discussed elsewhere in this Action Memo, the Forest Service has a role at the Site given that a portion of the tailings pile is located on the Salmon-Challis National Forest.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Conditions at this site meet the criteria for a time-critical removal action as stated in the National Contingency Plan (NCP), 40 CFR Section 300.415, as follows:

A. Threats to the Environment

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations or the food chain (300.415(b)(2)(i)). Aquatic food chain organisms in Withington Creek, the Lemhi River and the Salmon River are threatened by release of mine tailings with elevated metals concentrations. Dissolved copper is the primary contaminant of concern. Copper is particularly toxic to aquatic food chain and juvenile salmonid organisms. Contaminant concentrations in sediments in Withington Creek downstream of the tailings pile exceed the National Oceanic and Atmospheric Administration Freshwater Sediment Screening level for probable effect, meaning that contaminant concentrations would probably be detrimental to the majority of benthic species.

2. Actual or potential contamination of a drinking water supply or sensitive ecosystem (300.415(b)(2)(ii)). Sensitive aquatic ecosystems in Withington Creek, the Lemhi River and the Salmon River are threatened by mass loading of copper-laden tailings from the Site should the tailings pile fail during a high intensity storm event or high volume runoff this coming Spring. Withington Creek presently has elevated concentrations of metals in sediments downstream of the Site. Copper concentrations in Withington Creek surface water exceed applicable water quality criteria. State water quality standards that apply to Withington Creek specify that it "shall be protected for beneficial uses, which includes all recreational use in and on the water and the protection and propagation of fish, shellfish, and wildlife, wherever attainable."

The Salmon River supports Chinook Salmon, an ESA listed species. All waters that drain into the Salmon River, except for those which are located above a natural migration barrier, have been listed by the National Marine Fisheries Service (NMFS) as critical habitat for chinook salmon recovery. Endangered Bull trout are also present in the Salmon River and many of its tributaries.

3. High levels of hazardous substances or pollutants in soils (300.415(b)(2)(iv)). Concentrations of copper in tailings pile soils at the site are as high as 5,000 mg/kg.

4. The availability of other appropriate Federal or State response mechanisms to respond to the release (300.415(b)(2)(vii)). There are no other appropriate Federal or State response mechanisms that have the resources to respond to this release.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this Site may present an imminent and substantial endangerment to public health or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed action description

The proposed action involves excavation and removal of an estimated 40,000 cubic yards of tailings from and adjacent to the creek channel and placement of those tailings into an engineered covered repository located on National Forest System land within the Salmon-Challis National Forest, pending an agreement with the Forest Service on siting of the repository on National Forest System land. The work will also require improvement to the existing Site access road and construction of a temporary creek crossing. Adverse weather may require that attempts be made to stabilize the tailings pile or a portion of the tailings pile in place via grading and placement of cover in the area generally where the tailings pile currently lies. This would be an emergency, backup alternative. With either alternative, a large sediment retention pond will be constructed below the tailings pile construction area to capture sedimentation as a result of construction activities. Disturbed areas will be reclaimed to an acceptable grade and revegetated.

2. Contribution to remedial performance

No long-term remedial actions are planned for this Site at this time. The proposed time-critical removal action to mitigate the threat of failure of the tailings pile and mass migration of metals-laden tailings from the Site would be consistent with any likely long-term remedy at the Site.

3. Description of alternative technologies

Engineering alternatives that have been considered include stabilizing the remaining tailings in place or removal to a repository to be constructed nearby but isolated from Withington Creek. Because the tailings pile is located in a very steep and narrow drainage, stabilization in place is not feasible.

4. Engineering Evaluation/Cost Analysis (EE/CA)

This proposed action is for time-critical removal action, and an EE/CA therefore is not required.

5. Applicable or relevant and appropriate requirements (ARARS)

The NCP requires that removal actions attain ARARs under federal or state environmental or facility siting laws to the extent practicable, considering the exigencies of the situation. The proposed removal action will attain or exceed ARARs, to the extent practicable, including Clean Water Act requirements, Endangered Species Act, National Historic Preservation Act, and state water quality standards. Below is a summary of potential Federal and State ARARs that have been identified or otherwise considered for this project:

a.) Clean Water Act, Section 404. Under Section 404 of the Clean Water Act, any discharge of dredged or fill material to a navigable water of the United States must meet the requirements of a permit issued by the U.S. Army Corps of Engineers (USACE). Construction of the proposed removal action may involve adding fill material to Withington Creek. Although a permit is not required under CERCLA Section 121(e), the substantive requirements of a permit would apply to the removal action. The OSC will notify and coordinate with the USACE District Engineer's office.

b.) Federal Water Quality Standards (40 CFR Part 131). 40 CFR Parts 131.33 and 131.36 provides federally promulgated water quality standards applicable to Kinnikinic Creek. The proposed removal action will help ensure that these standards are met to the greatest extent practicable.

c.) Clean Water Act, Section 303(d). Under Section 303(d) of the Clean Water Act, States are required to develop lists of impaired waters. The law requires that states establish Total Maximum Daily Loads (TMDLs) for these waters. A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and allocates pollutant loadings among point and nonpoint sources. Withington Creek is not listed by the State of Idaho on the 303d list. However, the data that has been collected for EPA's PA/SI could warrant placement of Withington Creek on the 303d list.

d.) Endangered Species Act, Section 7. The Endangered Species Act (ESA) requires that each federal agency ensure, through consultation, that any action authorized, funded, or carried out by that agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat for endangered or threatened species. All waters that drain into the Salmon River, except for those which are located above a natural migration barrier, have been listed by the National Marine Fisheries Service (NMFS) as critical habitat for chinook salmon recovery. Endangered Bull trout are also present in the Salmon River and many of its tributaries. EPA and the USFS will initiate consultation with the NMFS and the U.S. Fish and Wildlife

Service for the proposed action. It is anticipated that informal emergency consultation will be appropriate for this project.

e). National Historic Preservation Act, Section 106. The National Historic Preservation Act (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties. The State Historic Preservation Officer (SHPO) advises and assists Federal agencies in carrying out their section 106 responsibilities and cooperates with such agencies, to ensure that historic properties are taken into consideration. The USFS has assigned an archeologist to survey the Site and will coordinate with the SHPO regarding the proposed removal action. It is not anticipated that the proposed action will impact historic properties.

f.) Idaho Water Quality Standards(IDAPA 16.01.02). This rule designates uses which are to be protected in waters of the state and establishes standards of water quality protective of those uses. Restrictions are placed on human activities which may adversely affect water quality. State water quality standards do not include specific use designations for Withington Creek. By default, Withington Creek is protected for all beneficial uses, which includes recreational use and the protection and propagation of cold water aquatic life. Coordination with Idaho Department of Environmental Quality and Department of Fish and Game will ensure that applicable standards are met.

g.) Idaho Stream Channel Alteration Rules (IDAPA 37.03.07). These rules require that work which may alter a stream channel meet certain standards, as outlined in a permit. The standards which may be applicable to the proposed removal project include general construction procedures, use of riprap or gabions, installation of culverts and bridges, and removal of sand and gravel deposits. Coordination with the Idaho Department of Lands will ensure that these standards are properly considered.

6. Project Schedule

For planning purposes, it is projected that construction must be completed and all equipment demobilized by the end of October 2003 in order to avoid getting snowed in at the Site. To accomplish this, on-site construction must begin by no later than November, 18, 2003.

B. Estimated Costs

The estimated costs to complete the proposed project are itemized below:

TOTAL ESTIMATED COSTS		Requested Ceiling
1.	EXTRAMURAL COSTS	
	Regional Allowance Costs (ERRS)	750,000
	15% Contingency	115,000
	Subtotal, Regional Allowance	865,000
	Other Extramural Costs (START)	80,000
	Subtotal, Extramural Costs	945,000
2.	INTRAMURAL COSTS	
	Direct	25,000
	Indirect	30,000
	Subtotal, Intramural Costs	55,000
3.	TOTAL REMOVAL PROJECT CEILING	**$1,000,000**

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delayed action would likely result mass loading of copper-laden tailings from the Site down Withington Creek, into the Lemhi River and possibly even to the Salmon River, as a result of a catastrophic failure of the remaining tailings pile. This could result in fish kill and long-term damage to protected Chinook Salmon and other fish habitat.

VII. OUTSTANDING POLICY ISSUES

This removal action will address the tailings pile, two-thirds of which is located on private patented property and one-third of which is located on public land administered by the USFS.. The EPA and USFS have agreed that removal of these tailings are a high priority. Executive Order 12580 allows EPA to use funds from the Hazardous Substance Superfund to pay for removal actions for releases or threatened releases under the jurisdiction, custody, or control of Executive departments or agencies, such as the Forest Service, provided that such department or agency agree to reimburse the Superfund. EPA will use its contractor and oversight resources for the cleanup on both private and public lands, and the USFS will provide funding to EPA and in-kind services in support of the project that equal one-third of the extramural project cost (commensurate with the one-third of property that is USFS administered land). USFS has committed to providing $200,000 funding directly to EPA via a Reimbursement or Advance of Funds Agreement. Additionally, USFS will provide in-kind services with a value of at least $75,000. These services include a topographical site survey, an archeological site survey, and biological expertise and coordination of ESA consultation with NMFS and U.S. Fish and Wildlife Service.

Harmony Mine

Baker , ID - EPA Region X

POLREP #1 - Initiation of Action

All POLREPs for this site

On-Scene Coordinator - Greg Weigel

TC - Removal Action

9/26/2003

Report Number 1 of 4



Site Description

The Harmony Mine is a former copper mine and milling facility, which operated between 1916 and 1931. The Site has been inactive since 1931. The property consists of approximately 330 acres of private patented land surrounded by the Salmon-Challis National Forest (SCNF), and includes a large tailings pile which lies approximately 1/3 on the private land and 2/3 within the SCNF. The Site tailings pile is at approximately 7,000 feet elevation. The South Fork of Withington Creek originates upstream of the tailings pile and flows through the existing tailings pile. Withington Creek flows into the Lemhi River approximately 8 miles downstream of the Site. The Lemhi River flows an additional 10 miles to its confluence with the Salmon River.

The tailings pile is not contained and has partially collapsed into the stream channel. It appears that over one-half of the volume of material in the original tailings pile has been released, via failure of the tailings dam and stream erosion of the tailings pile. An estimated 10,000 to 20,000 cubic yards of tailings remain at the original tailings pile area.

The Site is located near Baker, northeastern Lemhi County, approximately 15 miles southeast of Salmon, Idaho. The property is near the headwaters of Withington Creek. Access to the Site is via an unimproved extension to the Withington Creek road, approximately 9 miles from State Highway 28.

In August 2003, the Withington Creek forest fire destroyed the vegetative cover in the upper Withington Creek drainage at and above the Site. There has been one significant rain event in the drainage since the fire, which has already caused erosion and washouts in various locations around the mine Site. It is likely that any subsequent high intensity storm event or high volume runoff this coming Spring could result in massive failure of the remaining tailings pile.

EPA and the USDA Forest Service are taking joint CERCLA Removal action to remove the existing tailings

pile to a secure repository approximately 1 mile below the mine site on land admistered by the Forest Service. Forest Service has provided approval for siting of the joint EPA/Forest Service repository.

Current Activities

Friday, 9/19/03
ERRS Response Manager arrived at site to scope project and identify local equipment. Subcontract archeologists (Northwind Environmental) arrive to begin archeological survey of areas that will be disturbed and identify areas that need to be protected.

Saturday, 2/20/03
Archeologists continue archeological survey work. 4 ERRS equipment operators and 1 field clerk mobilize to site.

Sunday, 2/21/03
Equipment delivered to site: 2 40-ton haul trucks; D8 bulldozer, D6 bulldozer, 966E wheel loader. 3 additional ERRS equipment operators/laborers mobilize to site. Archeologists continue archeological survey work. ERRS begin clearing of repository area and begin improvement of access road and staging area.

Monday, 2/22/03
EPA OSC mobilize to site. START project engineer mobilize to site. Personnel on site:
EPA OSC - 1
Forest Service OSC - 1
START Project Engineer - 1
ERRS contractor personnel - 9
Archeologist subcontractor - 2
ERRS continue widening and improving approximately 10,000 feet of road to mine site to allow 14' wide haul trucks to access safely. Archeologists finish archeological survey.

Tuesday, 2/23/03
Personnel on site:
EPA OSC - 1
FS OSC - 1
START Project Engineer - 1
ERRS contractor - 9
Road improvements progressed 2,000 feet to the vicinity of the debris flow. Rock was taken from talus slope and placed on constructed roads. The debris flow area turned out to be saturated and would not support heavy equipment. 2 office trailers and generator delivered to site. 300E excavator delivered to site.

Wednesday, 2/24/04
Personnel on site:
EPA OSC - 1
FS OSC - 1
START Project Engineer - 1

that they can be removed. Completed road construction to mine site.

Wednesday, 10/1/03
Personnel on site:
EPA OSC - 1
FS OSC - 1
START Project Engineer - 1
ERRS contractor - 9
Archeologist subcontractor - 1
Constructed road from mine site to access tailings pile. USFS crew surveyed constructed repository area. Received water truck on site.

Thursday, 10/2/03
Personnel on site:
EPA OSC - 1
FS OSC - 1
START Project Engineer - 1
ERRS contractor - 9
Archeologist subcontractor

EPA and FS OSCs conducted site visit for reporters from Salmon newspaper. Began hauling tailings from mine for placement into constructed tailings pile. Received second excavator and third 40-ton haul truck on site. Installed BMPs along toe and downgradient of repository. Spilled approximately 15 gallons of transmission oil onto haul road and in repository area when a line broke on haul truck. Reported spill to Idaho State Comm, and received approval from Idaho DEQ and from Forest Service to place excavated contaminated soil into tailings repository.

Next Steps

Haul tailings to repository. Estimate production rate of approximately 1,000 cy/day. Construct large sedimentation pond below tailings pile to capture runnoff from rain/storm events during construction.

Key Issues

Completion of the removal as designed is contingent upon seasonally mild weather. Early severe winter weather could force alternate plan for attempting to secure at least a portion of the tailings in place.

All POLREPs for this site

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Harmony Mine

Baker , ID - EPA Region X
POLREP #2
All POLREPs for this site

On-Scene Coordinator - Greg Weigel
TC - Removal Action

10/3/2003
Report Number 2 of 4



Site Description

The Harmony Mine is a former copper mine and milling facility, which operated between 1916 and 1931. The Site has been inactive since 1931. The property consists of approximately 330 acres of private patented land surrounded by the Salmon-Challis National Forest (SCNF), and includes a large tailings pile which lies approximately 1/3 on the private land and 2/3 within the SCNF. The Site tailings pile is at approximately 7,000 feet elevation. The South Fork of Withington Creek originates upstream of the tailings pile and flows through the existing tailings pile. Withington Creek flows into the Lemhi River approximately 8 miles downstream of the Site. The Lemhi River flows an additional 10 miles to its confluence with the Salmon River.

The tailings pile is not contained and has partially collapsed into the stream channel. It appears that over one-half of the volume of material in the original tailings pile has been released, via failure of the tailings dam and stream erosion of the tailings pile. An estimated 10,000 to 20,000 cubic yards of tailings remain at the original tailings pile area.

The Site is located near Baker, northeastern Lemhi County, approximately 15 miles southeast of Salmon, Idaho. The property is near the headwaters of Withington Creek. Access to the Site is via an unimproved extension to the Withington Creek road, approximately 9 miles from State Highway 28.

In August 2003, the Withington Creek forest fire destroyed the vegetative cover in the upper Withington Creek drainage at and above the Site. There has been one significant rain event in the drainage since the fire, which has already caused erosion and washouts in various locations around the mine Site. It is likely that any subsequent high intensity storm event or high volume runoff this coming Spring could result in massive failure of the remaining tailings pile.

EPA and the USDA Forest Service are taking joint CERCLA Removal action to remove the existing tailings

pile to a secure repository approximately 1 mile below the mine site on land admistered by the Forest Service. Forest Service has provided approval for siting of the joint EPA/Forest Service repository.

Current Activities

Friday, 9/26/03
Personnel on site:
EPA OSC - 1
FS OSC - 1
START Project Engineer - 1
ERRS contractor - 9
Archeologist subcontractor - 1
Continued road improvement to mine site. Cleaned out diversion ditch above tailings pile for placement of creek diversion pipe. Cleared repository area of timber. Conducted areological oversight of road construction adjacent to historically significant can dump area.

Saturday, 9/27/03
Personnel on site:
START Project Engineer - 1
ERRS contractor - 9
Approximately 2000 feet of road was improved today, including the road in the vicinity of the old mill building. 220 feet of 12-inch diameter pipe was staged in the diversion channel.

Sunday, 9/28/03
No site activity.

Monday, 9/29/03
Personnel on site:
EPA OSC - 1
FS OSC - 1
START Project Engineer - 1
ERRS contractor - 9
Archeologist subcontractor - 1
Installed 220 feet of 12" diversion pipe in the upper diversion channel. The remaining 360 feet of pipe was delivered late in the day and will be installed tomorrow. Felled trees and prepared bottom surface of approximately 80 feet by 300 feet in the repository area.

Tuesday, 9/30/03
Personnel on site:
EPA OSC - 1
FS OSC - 1
START Project Engineer - 1
ERRS contractor - 9
Installed remaining diversion pipe and diverted creek around and above tailings pile to dry out tailings so

ERRS contractor - 9
Excavated and stockpiled muck where debris flow crossed road. Diverted unnamed tributary to it's original channel so that it doesn't cross road. Continued road improvement 1,500 feet beyond debris flow to the switchback. Continued placing rock from talus slope on constructed roads. Fuel storage tank delivered to site. Constructed secondary containment for fuel storage.

Thursday, 9/25/03
Personnel on site:
EPA OSC - 1
FS OSC - 1
START Project Engineer - 1
ERRS contractor - 9
EPA and FS OSCs conducted site visit for Forest Supervisor and DEQ Regional Administrator. ERRS continued road improved addional 500 feet. Scoped what it'll take to divert creek around tailings pile and reviewed cultural features to be protected. Set repeater up on ridge to establish communications across site, from tailings pile to staging/office area.

Next Steps

Continue punching road through to access tailings pile. Should take another 3-4 days. Will complete creek diversion above tailings pile within a couple days. Finalize repository design with Project Engineer and FS OSC. Improve BMPs along constructed road near creek.

Key Issues

Completion of the removal as designed is contingent upon seasonally mild weather. Early severe winter weather could force alternate plan for attempting to secure at least a portion of the tailings in place.

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Harmony Mine

Baker , ID - EPA Region X
POLREP #3
All POLREPs for this site

On-Scene Coordinator - Greg Weigel
TC - Removal Action
Start Date: 9/19/2003

10/22/2003
Report Number 3 of 4



Site Description

The Harmony Mine is a former copper mine and milling facility, which operated between 1916 and 1931. The Site has been inactive since 1931. The property consists of approximately 330 acres of private patented land surrounded by the Salmon-Challis National Forest (SCNF), and includes a tailings pile of approximately 10,000 cubic yards, which lies approximately 1/3 on the private land and 2/3 within the SCNF. The Site is at approximately 7,000 feet elevation. The South Fork of Withington Creek originates upstream of the tailings pile and flows through the existing tailings pile. Withington Creek flows into the Lemhi River approximately 8 miles downstream of the Site.

In August 2003, the Withington Creek forest fire destroyed the vegetative cover in the upper Withington Creek drainage at and above the Site. There has been one significant rain event in the drainage since the fire, which has already caused erosion and washouts in various locations around the mine Site. It is likely that any subsequent high intensity storm event or high volume runoff this coming Spring would have resulted in massive failure of the remaining tailings pile.

EPA and the USDA Forest Service are taking joint CERCLA Removal action to remove the existing tailings pile to a secure repository approximately 1 mile below the mine site on land admistered by the Forest Service. Approval was provided by the USFS for siting of the repository on USFS administered land. On September 19, 2003, EPA contractor personnel, under direction of the EPA OSC, began mobilizing to the Site to begin this work.

Current Activities

10/3 to 10/20
Personnel on site (except for Sundays):
EPA OSC - 1
FS OSC - 1

START Project Engineer - 1
ERRS contractor - 10

Completed hauling of tailings from mine site to repository. Final volume of tailings in repository (compacted and prior to placement of rock cover) is approximately 10,000 cubic yards, based on USFS survey. Completed placement of rock cover on repository, including 2 feet of compacted rock and an additional 1 foot average of uncompacted course and durable rock. Completed placement of woody debris on repository and other disturbed areas. Completed grading of original tailings pile area to conform with natural grade, and reconstuction of hydrologically stable creek channel through original tailings pile area. Completed construction of basin above reconstructed creek channel to intercept possible debris flow. Completed construction of interception trench to south and east sides of repository, to intercept and divert around repository potential run-on from precipitation and snow melt. Completed out-sloping and installation of water bars on all constructed or improved haul roads. Began demobilization of equipment and personnel. Began seeding of disturbed areas.

Planned Removal Actions

Finish seeding of disturbed areas. Demobilize all remaining equipment and personnel from Site. All Site work will be completed by 10/24/03.

Key Issues

EPA OSC to calculate final costs, and EPA and USFS OSCs to document cost share between EPA and USFS. Cost split will be based on surface area of original tailings pile, with 31% of tailings pile surface area on private lands, and 69% on USFS administered lands. It is expected that the funding already provided by the USFS and services in kind, including the value of the permanent repository on USFS administered lands, will approximately match an equatable cost share.

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Harmony Mine

Baker , ID - EPA Region X
POLREP #4 - Final POLREP
All POLREPs for this site

On-Scene Coordinator - Greg Weigel
TC - Removal Action
Start Date: 9/19/2003

12/4/2003
Report Number 4 of 4



Site Description

The Harmony Mine is a former copper mine and milling facility, which operated between 1916 and 1931. The Site has been inactive since 1931. The property consists of approximately 330 acres of private patented land surrounded by the Salmon-Challis National Forest (SCNF), and includes a tailings pile of approximately 10,000 cubic yards, which lies approximately 1/3 on the private land and 2/3 within the SCNF. The Site is at approximately 7,000 feet elevation. The South Fork of Withington Creek originates upstream of the tailings pile and flows through the existing tailings pile. Withington Creek flows into the Lemhi River approximately 8 miles downstream of the Site.

In August 2003, the Withington Creek forest fire destroyed the vegetative cover in the upper Withington Creek drainage at and above the Site. There has been one significant rain event in the drainage since the fire, which has already caused erosion and washouts in various locations around the mine Site. It is likely that any subsequent high intensity storm event or high volume runoff this coming Spring would have resulted in massive failure of the remaining tailings pile.

EPA and the USDA Forest Service undertook joint CERCLA Removal action to remove the existing tailings pile to a secure repository approximately 1 mile below the mine site on land admistered by the Forest Service. Approval was provided by the USFS for siting of the repository on USFS administered land. On September 19, 2003, EPA contractor personnel, under direction of the EPA OSC, began mobilizing to the Site to begin this work. Site work was completed and all personnel demobilized on October 22, 2003.

Current Activities

All equipment and personnel demobilized from Site by 10/22/03. One ERRS contractor (local hire) returned on 11/5/2003 to complete seeding of disturbed areas.

Next Steps

START contractor to complete draft Removal Report. EPA OSC to complete memo to file describing cleanup cost share between EPA and Forest Service.

All POLREPs for this site

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APPENDIX E

Dust Mixture Permissible Exposure Limit Calculations

DUST EXPOSURE CALCULATION WORKSHEET					
DustLevel			Safety Factor for this site = 1		
	1	2	3	4	5
Chemical	Exposure Limit (mg/m3)	Maximum Soil Concentration (mg/kg)	Exposure Limit Based on Single Compound (EL Mix, mg/m3)	Dust Quotient for Each Compound (level/limit)	Problem from Single Compound (5mg/m3)/ELmix)
Aluminum	5	24,500	204.08	4.90E+03	0.025
Antimony	0.5	9.	5.56E+4	1.80E+01	0.000
Arsenic	0.01	69	144.09	6.94E+03	0.035
Barium	0.5	374	1,336.9	7.48E+02	0.004
Beryllium	0.002	1.7	1,176.47	8.50E+02	0.004
Cadmium	0.005	2.7	1,851.85	5.40E+02	0.003
Chromium	0.5	20	2.56E+4	3.90E+01	0.000
Cobalt	0.02	260	76.92	1.30E+04	0.065
Copper	1	36,000	27.78	3.60E+04	0.180
Lead	0.05	247	202.43	4.94E+03	0.025
Manganese	0.2	566	353.36	2.83E+03	0.014
Mercury	0.01	0.7	1.43E+4	7.00E+01	0.000
Nickel	1	71	1.41E+4	7.10E+01	0.000
Selenium	0.2	8.8	2.27E+4	4.40E+01	0.000
Silver	0.01	13	769.23	1.30E+03	0.007
Thallium	0.1	9.7	1.03E+4	9.70E+01	0.000
Vanadium	0.05	21	2,415.46	4.14E+02	0.002
Zinc	5	209	2.39E+4	4.18E+01	0.000
			Sum	7.28E+04	
Dust Exposure Level at Mixture PEL =			13.728		0.364

APPENDIX F

Laboratory Data and Data Validation Memorandum

Herrera Environmental Consultants, Inc.

Memorandum

To	Project File C00-01732-045
cc	Katie Bullock, Herrera Environmental Consultants
From	Gina Catarra and Rob Zisette, Herrera Environmental Consultants
Date	December 8, 2003
Subject	Metals Data Validation for Harmony Mine, TDD #03-09-0001

This memorandum presents a review of metals data collected from the Harmony Mine site located in Lemhi County, Idaho. Herrera Environmental Consultants collected 2 soil samples on September 9, 2003. STL Seattle of Tacoma, Washington analyzed the samples for priority pollutant metals using EPA Methods 6010B/7471 (USEPA 1996).

Sample Data Reviewed

Sample ID	Laboratory Sample ID	Matrix	Date/Time Sampled
RP-1	116223-1	Soil	09/09/03; 10:45
RS-1	116223-2	Soil	09/09/03; 13:10

The laboratory's performance was reviewed in accordance with quality control (QC) specifications outlined in the *Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan and Data Validation Procedures* (Guidance for Removal Activities) (USEPA 1990), the *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (Functional Guidelines) (USEPA 2002), and the specified analytical methods.

Quality control and raw laboratory data submitted by the laboratory were reviewed. Data qualifiers (flags) were added to the sample results in the laboratory reports. Data validation results are summarized below, followed by a summary of laboratory communications and definitions of data qualifiers.

Data Validation

Custody, Preservation, Holding Times, and Completeness—Acceptable

Sample custody was properly maintained from sample collection to receipt at the laboratory. The samples were properly preserved and were received intact at the laboratory. The reported samples were analyzed within the required holding time of 6 months (all metals except mercury) and 28 days (mercury) from the date of collection. The laboratory data package is complete and contains test results for all samples listed on the COC.

Temperature of the sample cooler (4.7 °C) at the time of laboratory receipt met the recommended temperature range of 2 to 6 °C.

Initial/Continuing Calibration—Acceptable

Initial and continuing calibrations were analyzed at the required frequency. Initial/continuing calibration verification (ICV/CCV) criteria (i.e., percent recovery value shall be within 80 to 120 percent for mercury and within 90 to 110 percent for all other metals) established by Guidance for Removal Activities were met for all target analytes.

Blank Analysis—Acceptable with Qualification

A method blank was digested and analyzed with the samples. The method blank did not contain reportable levels of metals.

Initial and continuing calibration blanks were analyzed at the required frequency. Initial and continuing calibration blank criteria (i.e., reported concentration shall be less than the method detection limit) met the control criteria for all samples with the exception noted below.

A continuing calibration blank result for copper exceeded the practical quantitation limit, indicating a potential high bias of copper concentrations for sample results. Copper results for samples RP-1 and RS-1 have been qualified as estimated (J) because the reported concentration of copper for both samples were less than 5 times greater than the blank concentration.

ICP Interference Check Sample Analysis—Acceptable

ICP interference check samples (ICP-ICS) were analyzed at the required frequency. ICP interference check sample criteria (i.e., percent recovery value shall be within 80 to 120 percent) established by Guidance for Removal Activities were met for all target analytes.

ICP Serial Dilution Analysis—Acceptable

ICP serial dilution results were reported for sample RP-1. ICP serial dilution criteria (i.e., relative percent difference between the sample and 5-fold dilution shall be less than or equal to 10 percent for analytes with reported concentrations 50 times greater than the method reporting limit) established by Functional Guidelines were met for all target compounds.

Matrix Spike Analysis—Acceptable

Matrix spike (MS) results were reported for sample RP-1. The percent recovery values met the control limits established by the laboratory, as shown in the following table.

Analyte	MS % Recovery	Laboratory % Recovery Limits
Arsenic	91	75-125
Antimony	82	75-125
Beryllium	90	75-125
Cadmium	103	75-125
Chromium	93	75-125
Copper	92	75-125
Lead	93	75-125
Mercury	88	75-125
Nickel	91	75-125
Selenium	89	75-125
Silver	90	75-125
Thallium	87	75-125
Zinc	110	75-125

Duplicate Analysis—Acceptable

Duplicate results were reported for sample RP-1. The relative percent difference (RPD) values for positive results met the control limits (i.e., less than 35 percent if both duplicate results are greater than five times the method reporting limit, or the difference shall be less than or equal to the method reporting limit if either duplicate result is less than five times the method reporting limit) established by Functional Guidelines, as shown in the following table.

Analyte	MRL (mg/kg)	RP-1 Result (mg/kg)	Duplicate Result (mg/kg)	Sample/Duplicate RPD	Sample/Duplicate Difference
Arsenic	1.31	7.5	7.6	1.3	N/A
Beryllium	0.262	0.52J	0.55J	N/A	0.03
Chromium	1.31	7.0	7.1	1.4	N/A
Copper	1.31	22	20	9.5	N/A
Lead	1.31	14	15	6.9	N/A
Mercury	0.00948	0.028	0.030	N/A	0.002
Nickel	1.31	7.8	7.7	1.3	N/A
Zinc	1.31	90	100	11	N/A

N/A = Not applicable

Field duplicate samples were not collected.

Laboratory Control Sample Analysis—Acceptable

Laboratory control samples were digested and analyzed at the required frequency. All percent recovery values met the laboratory control limits, as shown in the following table.

Analyte	LCS % Recovery	Laboratory % Recovery Limits
Arsenic	96	71-127
Antimony	99	0-216
Beryllium	90	82-118
Cadmium	89	83-119
Chromium	94	79-120
Copper	98	81-120
Lead	95	79-121
Mercury	103	66-138
Nickel	98	81-120
Selenium	95	66-134
Silver	14	0-210
Thallium	88	77-123
Zinc	88	80-120

Laboratory Reporting Limits—Acceptable with Qualification

Practical quantitation limits (PQLs) were not specified for this project. The PQLs reported by the laboratory are reasonable for the methods. The laboratory reported undetected analyte concentrations to the method reporting limit. The method reporting limit and the practical quantitation limit represent different levels of accuracy. Positive values less than the practical quantitation limits have been qualified (flagged) by the laboratory as estimated (J).

Overall Assessment of Data Quality

The usability of the data is based on the guidance documents listed above. Upon consideration of the information presented here, the data are acceptable as qualified for potential high copper results.

Laboratory Communications

The laboratory was not contacted regarding the metals analyses.

Definition of Data Qualifiers

The following data validation qualifiers were used in the review of this data set. These qualifiers are from the *Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan and Data Validation Procedures* (USEPA 1990).

J The associated numerical value is an estimated quantity because the reported concentrations were less than the required detection limits or quantity control criteria were not met.

U The material was analyzed for, but was not detected. The associated numerical value is the sample detection limit or the adjusted sample detection limit.

UJ The material was analyzed for, but was not detected. The reported detection limit is estimated because quality control criteria were not met.

N Presumptive evidence of presence of material.

NJ Presumptive evidence of the presence of the material at an estimated quantity.

R The sample results are rejected (the presence or absence of the analyte cannot be verified) due to serious deficiencies control criteria. Any reported value is unusable. Resampling or reanalysis is necessary for verification.

References

USEPA. 1990. Quality Assurance/Quality Control Guidance for Removal Activities. Sampling QA/QC Plan and Data Validation Procedures. Interim Final. U.S. Environmental Protection Agency, Environmental Response Team, Emergency Response Division, Office of Emergency and Remedial Response. Washington, D.C. EPA/540/G-90-004. April 1990.

USEPA. 1996. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846 Third Edition, Updates I, II, IIA, IIB, and III. Office of Solid Waste and Emergency Response. U.S. Environmental Protection Agency, Washington, D.C. December 1996.

USEPA. 2002. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. U.S. Environmental Protection Agency, Washington, D.C. EPA 540/R-01-008. July 2002.

116223 4.7

EPA FIELD SAMPLE DATA AND CHAIN OF CUSTODY SHEET

EPA Region 10
1200 Sixth Avenue
Seattle WA 98101

Case No.: 00-01732-045
Project Code: _____ Account: _____
Name/Location _____
Proj. Off.: PAUL A FEDISCHIN (EPA Lab Only, Leave Blank for Contract Lab) Tel.# 206-441-1080

☒ Enforcement/Custody
☒ Data Confidential
☐ Possible Toxic/Hazardous
☐ Data for STORET

Miscellaneous: FAX 24-HR TO PROJ OFF. @ 206-441-9108

Sampling Crew: AF

Recorder: AF (Signatures Required)

SOURCE CODE	Matrix: Oil	Water	Sediment	Tissue	Prsrvd (Y/N)	# CONTAINERS: Qt. Cubit	Gal. Cubit	16 oz.	8 oz.	120 ml.	40 ml.	Other	LAB NUMBER: Yr.	Wk	Seq	STORET STATION NUMBER	SAMPLING DATE & TIME: Yr	Mo	Dy	Time	TRAFFIC REPORT NUMBERS: Org.	Inorg.	SAMPLER'S INITIALS	STATION DESCRIPTION
48		X						1									03	09	09	1645			AF	RP-1 REPOSITORY 1
48		X						1									03	09	09	1310			AF	RS-1 ROCK SOURCE 1

PP METALS
EPA SW6010/747A

LAB NUMBER: Yr.	Wk	Seq	DEPTH	Unit	Type	COL MTD CD	QA CODE	TEMP DEG C	pH	CNDCTVTY umho/cm	COMPOSITE ONLY: ENDING DATE Mo.	Day	Time	Type	Freq

Condition of Samples upon Receipt at Lab:

Custody Seals Intact: ☐ yes ☐ no ☐ none

CHAIN OF CUSTODY RECORD

Relinquished by: (signature)	Received by: (signature)	Date/Time
	Reach STL	9/17/03 09:47
Relinquished by: (signature) Reach STL	Received by: (signature)	Date/Time 9-17-03 14:30
Relinquished by: (signature)	Received by: (signature)	Date/Time
Relinquished by: (signature)	Received by Mobile Lab For Field Analysis: (signature)	Date/Time
Dispatched by: (signature) Date/Time	Received for Lab by: (signature)	Date/Time
Method of Shipment		

Laboratory Copy White — Project Officer Copy Yellow — Field or Office Copy Pink

☆U.S. GOVERNMENT PRINTING OFFICE: 2001—692-366

★ Source Codes and Descriptions ★

Code	Description
00	Unspecified Source
01	Unknown Liquid Media (Drum/Tank)
02	Unknown Liquid Media (Spill Area)
03	Unknown Liquid Media (Waste Pond)
10	Water (General)
12	Ambient Stream/River
13	Lake/Reservoir
14	Estuary/Ocean
15	Spring/Seepage
16	Rain
17	Surface Runoff/Pond (General)
18	Irrigation Canal/Return Flow
20	Well (General)
21	Well (Industrial/Agricultural)
22	Well (Drinking Water Supply)
23	Well (Test/Observation)
24	Drinking Water Intake
25	Drinking Water (At Tap)
30	Effluent Wastewater (General)
31	Municipal Effluent
32	Municipal Inplant Waters
33	Sewage Runoff/Leachate
34	Industrial Effluent
35	Industrial Inplant Waters
36	Industrial Surface Runoff/Pond
37	Industrial Waste Pond
38	Landfill Runoff/Pond/Leachate
40	Sediment (General)
42	Bottom Sediment or Deposit
44	Sludge (General)
45	Sludge (Waste Pond)
46	Sludge (Drum/Tank)
48	Soil (General)
49	Soil (Spill/Contaminated Area)
50	Bore Hole Material
60	Air (General)
61	Ambient Air
62	Source or Effluent Air
63	Industrial or Workroom Air
64	Hi-Vol Filter
70	Tissue (General)
71	Fish Tissue
72	Shellfish Tissue
73	Bird Tissue
74	Mammal Tissue
75	Macroinvertebrate
76	Algae
77	Periphyton
78	Plant/Vegetation
80	Oil/Solvent (General)
81	Oil (Transformer/Capacitor)
82	Oil/Solvent (Drum/Tank)
83	Oil/Solvent (Spill Area)
84	Oil/Solvent (Waste Pond)
90	Commercial Product Formulation
95	Well Drill Water
96	Well Drill Mud
97	Well Sealing Material
98	Gravel Pack Material

★ Collection Method Codes ★

Code	Description
00	Unknown
10	Hand Grab
11	Plastic Bucket
12	Stainless Steel Bucket
13	Brass Kemmerer
14	PVC Kemmerer
15	D.O. Dunker
16	DH 48/DH 49 Integrating Sampler
17	Van Dorn Bottle
18	Glass Dip Tube
19	Other
20	Automatic Sampler (General)
21	ISCO Auto Sampler
22	Manning Auto Sampler
25	Well Point Sampler (Pump)
26	Stainless Steel Bailer (Hand)
30	Dredge (Unspecified)
31	Dredge (Peterson)
32	Dredge (Van Dorn)
33	Dredge (Van Veen)
34	Core
35	Freeze Core
40	Macroinvertebrate (Unspecified)
41	Picked by Hand
42	Kick Net
43	Surber
44	Modified Hess Type Sampler
45	Rock Basket
46	Hester Dandy Sampler
50	Fish (Unspecified)
51	Fish (Shocking)
52	Fish (Netting)
53	Fish (Hook & Line)
54	Fish (Poison)
60	Periphyton (Unspecified)
61	Rock Scraping
62	Glass Slides

★ Composite Codes ★

Type	Description
T	Time Composite
S	Space Composite
F	Flow Propotrioned Composite
B	Both Space & Time Composite

Freq	Description
C	Continuous
G	Grabs (# Unknown)
##	Number of Grabs

★ Depth Codes ★

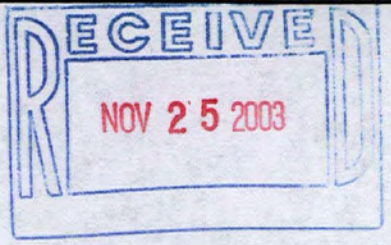
Unit	Description
F	Feet
M	Meters

Type	Description
-	Regular (Blank)
V	Vertically Integrated
B	Sample at Bottom

★ Quality Assurance Codes ★

Code	Description
FBLK	Field Blank Sample (Dist H_2O)
FXFR	Field Transfer Blank Sample
FTRS	Field Transport Blank Sample
FRXS	Field Reagent Sample
FRNS	Field Rinse Water Sample
FSPK	Field Spiked Sample
FDP1	Field Duplicate Sample #1
FDP2	Field Duplicate Sample #2
FSPL	Field Split Sample

SEVERN TRENT STL



STL Seattle
5755 8th Street East
Tacoma, WA 98424

Tel: 253 922 2310
Fax: 253 922 5047
www.stl-inc.com

TRANSMITTAL MEMORANDUM

REVISED: November 22, 2003

TO: Paula Fedirchuk
Herrera Environmental Consultants
2200 Sixth Ave., Ste. 1100
Seattle, WA 98121

PROJECT: 00-01732-045

REPORT NUMBER: 116223

TOTAL NUMBER OF PAGES: 75

Enclosed are the test results for two samples received at STL Seattle on September 17, 2003.

The report consists of this transmittal memo, analytical results, quality control summaries in CLP format, a copy of the chain-of-custody, a list of data qualifiers and analytical narrative when applicable, and a copy of any requested raw data.

Should there be any questions regarding this report, please contact me at (253) 922-2310.

Sincerely,

Katie Downie
Project Manager

This report is issued solely for the use of the person or company to whom it is addressed. Any use, copying or disclosure other than by the intended recipient is unauthorized. If you have received this report in error, please notify the sender immediately at 253-922-2310 and destroy this report immediately.

STL Seattle

Sample Identification:

Lab. No.	Client ID	Date/Time Sampled	Matrix
116223-1	RP-1 Repository 1	09-09-03 10:45	solid
116223-2	RS-1 Rocksource 1	09-09-03 13:10	solid

This report is issued solely for the use of the person or company to whom it is addressed. Any use, copying or disclosure other than by the intended recipient is unauthorized. If you have received this report in error, please notify the sender immediately at 253-922-2310 and destroy this report immediately.

SEVERN TRENT STL

STL Seattle
5755 8th Street East
Tacoma, WA 98424

Tel: 253 922 2310
Fax: 253 922 5047
www.stl-inc.com

ANALYTICAL NARRATIVE

Client: Herrera Environmental Consultants

Date: October 11, 2003

Project: 00-01732-045

Lab No.: 116223

Delivered By: STL Courier

Condition of samples upon receipt: Samples were received in good condition. Chain of custody was in order.

Sample Identification:

Lab. No.	Client ID	Date Sampled	Matrix
116223-1	RP-1 Repository 1	09-09-03	solid
116223-2	RS-1 Rocksource 1	09-09-03	solid

SAMPLE PREPARATION AND ANALYSIS

TOTAL METALS

Samples 116223-1 and 116223-2 were analyzed for antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium and zinc in accordance with EPA SW-846 Method 6010B and mercury in accordance with EPA SW-846 Method 7471A. Samples 116223-1 and 116223-2 were digested in accordance with EPA SW-846 Method 3051 on 09-17-03 as QC batch SP036 and analyzed on 09-18-03. Samples 116223-1 and 116223-2 were digested and analyzed for mercury in accordance with EPA SW-846 Method 7471A on 09-18-03 as QC batch ZS1424. The analyses were performed within the required holding time.

Beryllium was detected in samples 116223-1 and 116223-2 and mercury was detected in sample 116223-2 at levels that were above the method reporting limit (MRL) but below the practical quantitation limit (PQL). The values should be considered as estimates and have been flagged "J".

All quality control parameters were within acceptance limits.

No difficulties were encountered during the total metals analyses.

This report is issued solely for the use of the person or company to whom it is addressed. Any use, copying or disclosure other than by the intended recipient is unauthorized. If you have received this report in error, please notify the sender immediately at 253-922-2310 and destroy this report immediately.

CHAIN OF CUSTODY

DATA DELIVERABLES PACKAGE

TOTAL METALS DATA PACKAGE

U.S. EPA - CLP

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: STL-SEATTLE Contract: N/A

Lab Code: Case No.: N/A SAS No.: 116223 SDG No.: RP-1_REPOSITORY

SOW No.: ILM04.0

EPA Sample No.	Lab Sample ID
RP-1 REPOSITORY	116223-1
RP-1 REPOSITORY	116223-1D
RP-1 REPOSITORY	116223-1DD
RP-1 REPOSITORY	116223-1S
RP-1 REPOSITORY	116223-1SD
RS-1_ROCKSOURCE	116223-2

Were ICP interelement corrections applied ? Yes/No YES

Were ICP background corrections applied ? Yes/No YES
If yes - were raw data generated before application of background corrections ? Yes/No YES

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Name:

Date: Title:

STL Seattle

Client Name	Herrera Environmental Consultants
Client ID:	RP-1 REPOSITORY 1
Lab ID:	116223-01
Date Received:	9/17/03
Date Prepared:	9/17/03
Date Analyzed:	9/18/03
Dilution Factor	1
% Solids	75.69

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MRL	Flags
Arsenic	7.47	2.62	1.31	
Antimony	ND	13.1	6.55	
Beryllium	0.521	0.524	0.262	J
Cadmium	ND	1.31	0.655	
Chromium	7.05	2.62	1.31	
Copper	22.4 J	2.62	1.31	
Lead	14.2	2.62	1.31	
Nickel	7.77	2.62	1.31	
Selenium	ND	13.1	6.55	
Silver	ND	2.62	1.31	
Thallium	ND	13.1	6.55	
Zinc	90.4	2.62	1.31	

gpc 11/21/03

60000

STL Seattle

Client Name	Herrera Environmental Consultants
Client ID:	RP-1 REPOSITORY 1
Lab ID:	116223-01
Date Received:	9/17/03
Date Prepared:	9/18/03
Date Analyzed:	9/18/03
Dilution Factor	1
% Solids	75.69

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MRL	Flags
Mercury	0.0279	0.019	0.00948	

gpc 11/21/03

STL Seattle

Client Name	Herrera Environmental Consultants
Client ID:	RS-1 ROCKSOURCE 1
Lab ID:	116223-02
Date Received:	9/17/03
Date Prepared:	9/17/03
Date Analyzed:	9/18/03
Dilution Factor	1
% Solids	76.78

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MRL	Flags
Arsenic	3.24	2.5	1.25	
Antimony	ND	12.5	6.25	
Beryllium	0.351	0.5	0.25	J
Cadmium	ND	1.25	0.625	
Chromium	2.82	2.5	1.25	
Copper	18.3 J	2.5	1.25	
Lead	12.3	2.5	1.25	
Nickel	3.25	2.5	1.25	
Selenium	ND	12.5	6.25	
Silver	ND	2.5	1.25	
Thallium	ND	12.5	6.25	
Zinc	26.3	2.5	1.25	

gpe 11/21/03

STL Seattle

Client Name	Herrera Environmental Consultants
Client ID:	RS-1 ROCKSOURCE 1
Lab ID:	116223-02
Date Received:	9/17/03
Date Prepared:	9/18/03
Date Analyzed:	9/18/03
Dilution Factor	1
% Solids	76.78

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	MRL	Flags
Mercury	0.014	0.0208	0.0104	J

gpc 11/21/03

U.S. EPA - CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: STL-SEATTLE Contract: N/A

Lab Code: Case No.: N/A SAS No.: 116223 SDG No.: RP-1_REPOSITORY

Initial Calibration Source: ENVIR.RESOURCE

Continuing Calibration Source: LEEMAN_LABS

Concentration Units: ug/L

Analyte	Initial Calibration True	Found	%R(1)	Continuing Calibration True	Found	%R(1)	Found	%R(1)	M
Aluminum									
Antimony	4000.0	3988.79	99.7	5000.0	4778.54	95.6	4721.07	94.4	P
Arsenic	2000.0	1982.41	99.1	5000.0	4802.22	96.0	4803.22	96.1	P
Barium									
Beryllium	20.0	20.35	101.8	500.0	490.77	98.2	483.83	96.8	P
Cadmium	200.0	202.75	101.4	500.0	489.99	98.0	480.88	96.2	P
Calcium									
Chromium	100.0	102.46	102.5	500.0	488.08	97.6	488.46	97.7	P
Cobalt									
Copper	200.0	204.42	102.2	500.0	492.08	98.4	483.86	96.8	P
Iron									
Lead	500.0	519.26	103.9	5000.0	4894.55	97.9	4840.30	96.8	P
Magnesium									
Manganese									
Mercury	4.0	4.23	105.8	5.0	4.63	92.6	4.92	98.4	AV
Nickel	400.0	422.35	105.6	500.0	492.83	98.6	490.60	98.1	P
Potassium									
Selenium	4000.0	4262.64	106.6	5000.0	4873.55	97.5	4839.11	96.8	P
Silver	1000.0	1023.34	102.3	500.0	495.14	99.0	485.30	97.1	P
Sodium									
Thallium	4000.0	4346.41	108.7	5000.0	4938.19	98.8	4932.39	98.6	P
Vanadium									
Zinc	200.0	202.20	101.1	500.0	485.09	97.0	477.31	95.5	P
Cyanide									

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

gpe 12/1/03

U.S. EPA - CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: STL-SEATTLE Contract: N/A

Lab Code: Case No.: N/A SAS No.: 116223 SDG No.: RP-1_REPOSITORY

Initial Calibration Source:

Continuing Calibration Source: LEEMAN_LABS

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony				5000.0	4618.73	92.4	4619.75	92.4	P
Arsenic				5000.0	4736.61	94.7	4707.07	94.1	P
Barium									
Beryllium				500.0	477.38	95.5	479.93	96.0	P
Cadmium				500.0	478.92	95.8	476.56	95.3	P
Calcium									
Chromium				500.0	480.09	96.0	478.28	95.7	P
Cobalt									
Copper				500.0	513.52	102.7	489.45	97.9	P
Iron									
Lead				5000.0	4795.41	95.9	4781.55	95.6	P
Magnesium									
Manganese									
Mercury				5.0	5.10	102.0			AV
Nickel				500.0	482.55	96.5	480.65	96.1	P
Potassium									
Selenium				5000.0	4791.57	95.8	4770.06	95.4	P
Silver				500.0	481.03	96.2	483.61	96.7	P
Sodium									
Thallium				5000.0	4862.91	97.3	4807.68	96.2	P
Vanadium									
Zinc				500.0	474.70	94.9	471.85	94.4	P
Cyanide									

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

gjc 12/1/03

STL Seattle

Lab ID:	Method Blank - SP036
Date Received:	-
Date Prepared:	9/17/03
Date Analyzed:	9/18/03
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	MRL	Flags
Arsenic	ND	2	1	
Antimony	ND	10	5	
Beryllium	ND	0.4	0.2	
Cadmium	ND	1	0.5	
Chromium	ND	2	1	
Copper	ND	2	1	
Lead	ND	2	1	
Nickel	ND	2	1	
Selenium	ND	10	5	
Silver	ND	2	1	
Thallium	ND	10	5	
Zinc	ND	2	1	

9/18 11/21/03

STL Seattle

Lab ID:	Method Blank - ZS1424
Date Received:	-
Date Prepared:	9/18/03
Date Analyzed:	9/18/03
Dilution Factor	1

Mercury by CVAA - USEPA Method 7471

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	MRL	Flags
Mercury	ND	0.02	0.01	

gpc 11/21/03

00016

3
BLANKS

Lab Name: STL-SEATTLE_____ Contract: N/A

Lab Code: Case No.: N/A SAS No.: 116223 SDG No.: RP-1_REPOS

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony	5.3	U	7.5	B	5.3	U	5.3	U	1.060	U	P
Arsenic	1.9	B	1.8	U	-2.4	B	6.6	B	0.360	U	P
Barium											
Beryllium	-0.2	B	0.1	U	0.1	U	0.1	U	0.020	U	P
Cadmium	-0.2	B	-0.2	B	0.1	U	-0.3	B	-0.033	B	P
Calcium											
Chromium	-0.5	B	0.1	U	0.2	B	-0.1	B	-0.028	B	P
Cobalt											
Copper	2.1	B	-3.7	B	-5.7	B	24.8	B	-0.931	B	P
Iron											
Lead	3.3	U	3.3	U	3.3	U	3.3	U	0.660	U	P
Magnesium											
Manganese											
Mercury	0.1	U	-0.1	B	0.1	U	0.1	U	0.005	U	AV
Nickel	0.5	B	-0.7	B	-0.5	B	-0.7	B	-0.121	B	P
Potassium											
Selenium	11.6	U	11.6	U	11.6	U	11.6	U	2.320	U	P
Silver	-1.8	B	0.5	U	-0.5	B	-1.1	B	-0.125	B	P
Sodium											
Thallium	-2.7	B	2.1	U	2.2	B	-2.9	B	0.420	U	P
Vanadium											
Zinc	2.2	B	-2.1	B	-2.1	B	-1.0	B	-0.251	B	P
Cyanide											

qpc 12/1/03

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3
BLANKS

Lab Name: STL-SEATTLE Contract: N/A

Lab Code: Case No.: N/A SAS No.: 116223 SDG No.: RP-1_REPOS

Preparation Blank Matrix (soil/water): ___

Preparation Blank Concentration Units (ug/L or mg/kg):

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony			5.3	U							P
Arsenic			1.8	U							P
Barium											
Beryllium			0.1	U							P
Cadmium			-0.2	B							P
Calcium											
Chromium			-0.3	B							P
Cobalt											
Copper			3.9	B							P
Iron											
Lead			3.3	U							P
Magnesium											
Manganese											
Mercury											
Nickel			-0.7	B							P
Potassium											
Selenium			11.6	U							P
Silver			-0.7	B							P
Sodium											
Thallium			2.1	U							P
Vanadium											
Zinc			-1.6	B							P
Cyanide											

qpc 12/1/03

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ICP INTERFERENCE CHECK SAMPLE

Lab Name: STL-SEATTLE_____ Contract:N/A_____

Lab Code: Case No.:N/A__ SAS No.:116223 SDG No.:RP-1_REPOSITORY

ICP ID Number: OPTIMA_3200_DV ICS Source: PLASMA_CHEM

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	%R	Final Found Sol. A	Final Found Sol. AB	%R
Aluminum								
Antimony								
Arsenic		10000		10373.1	103.7		9429.3	94.3
Barium								
Beryllium		1000		1011.0	101.1		925.6	92.6
Cadmium		3000		2813.6	93.8		2516.9	83.9
Calcium								
Chromium		3000		2980.1	99.3		2725.9	90.9
Cobalt								
Copper		3000		2848.4	94.9		2602.1	86.7
Iron								
Lead		10000		9551.4	95.5		8608.7	86.1
Magnesium								
Manganese								
Mercury								
Nickel		3000		2746.7	91.6		2502.0	83.4
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc		3000		2739.5	91.3		2458.5	82.0

gpc 12/1/03

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STL Seattle

Matrix Spike Report

Client Sample ID:	RP-1 REPOSITORY 1
Lab ID:	116223-01
Date Prepared:	9/17/03
Date Analyzed:	9/18/03
QC Batch ID:	SP036

Metals by ICP - USEPA Method 6010

Parameter Name	Sample Result (mg/kg)	Spike Amount (mg/kg)	MS Result (mg/kg)	MS % Rec.	Flag
Arsenic	7.47	1020	935	91	
Antimony	0	764	630	82	
Beryllium	0.52	25.5	23.3	90	
Cadmium	0	25.5	26.3	103	
Chromium	7	102	102	93	
Copper	22	127	140	92	
Lead	14	255	250	93	
Nickel	7.8	255	240	91	
Selenium	0	1020	904	89	
Silver	0	153	137	90	
Thallium	0	1020	890	87	
Zinc	90	255	371	110	

gpc 11/21/03

STL Seattle

Matrix Spike Report

Client Sample ID:	RP-1 REPOSITORY 1
Lab ID:	116223-01
Date Prepared:	9/18/03
Date Analyzed:	9/18/03
QC Batch ID:	ZS1424

Mercury by CVAA - USEPA Method 7471

Parameter Name	Sample Result (mg/kg)	Spike Amount (mg/kg)	MS Result (mg/kg)	MS % Rec.	Flag
Mercury	0.0279	0.236	0.236	88	

gpc 11/21/03

STL Seattle

Blank Spike/Blank Spike Duplicate Report

Lab ID:	ZS1424
Date Prepared:	9/18/03
Date Analyzed:	9/18/03
QC Batch ID:	ZS1424

Mercury by CVAA - USEPA Method 7471

Compound Name	Blank Result (mg/kg)	Spike Amount (mg/kg)	BS Result (mg/kg)	BS % Rec.	BSD Result (mg/kg)	BSD % Rec.	RPD	Flag
Mercury	0	0.2	0.186	93	0.19	95	2.1	

9/22 11/21/03

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5B

POST DIGEST SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

RP-1 REPOSITORY

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.: 116223 SDG No.: RP-1_REPOS

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									NR
Antimony		2256.60		6.45	B	3000.0	75.0		P
Arsenic		3696.17		28.49		4000.0	91.7		P
Barium									NR
Beryllium		90.49		1.99	B	100.0	88.5		P
Cadmium		93.57		2.47	B	100.0	91.1		P
Calcium									NR
Chromium		423.71		26.89		400.0	99.2		P
Cobalt									NR
Copper		471.88		85.33		500.0	77.3		P
Iron									NR
Lead		967.40		54.09		100.0	913.3		P
Magnesium									NR
Manganese									NR
Mercury									NR
Nickel		935.82		29.64	B	1000.0	90.6		P
Potassium									NR
Selenium		3593.46		11.60	U	4000.0	89.8		P
Silver		110.00		0.50	U	100.0	110.0		P
Sodium									NR
Thallium		3629.85		2.10	U	4000.0	90.7		P
Vanadium									NR
Zinc		1165.50		344.84		1000.0	82.1		P
Cyanide									NR

Comments:

qpe 12/1/03

STL Seattle

Duplicate Report

Client Sample ID:	RP-1 REPOSITORY 1
Lab ID:	116223-01
Date Prepared:	9/17/03
Date Analyzed:	9/18/03
QC Batch ID:	SP036

Metals by ICP - USEPA Method 6010

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Arsenic	7.5	7.6	-1.3	
Antimony	0	0	NC	
Beryllium	0.52	0.55	-5.6	
Cadmium	0	0	NC	
Chromium	7	7.1	-1.4	
Copper	22	20	9.5	
Lead	14	15	-6.9	
Nickel	7.8	7.7	1.3	
Selenium	0	0	NC	
Silver	0	0	NC	
Thallium	0	0	NC	
Zinc	90	100	-11.0	

qpc 11/21/03

STL Seattle

Duplicate Report

Client Sample ID:	RP-1 REPOSITORY 1
Lab ID:	116223-01
Date Prepared:	9/18/03
Date Analyzed:	9/18/03
QC Batch ID:	ZS1424

Mercury by CVAA - USEPA Method 7471

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Mercury	0.028	0.03	-6.9	

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Laboratory Control Sample

Lab ID:	RSP036
Date Prepared:	9/17/03
Date Analyzed:	9/18/03
QC Batch ID:	SP036

Metals by ICP - USEPA Method 6010

Parameter Name	Sample Result (mg/kg)	True Value (mg/kg)	Lower Limit (mg/kg)	Upper Limit (mg/kg)	Flag
Arsenic	110	114	81.5	145	Pass
Antimony	150	152	0	329	Pass
Beryllium	120	133	109	157	Pass
Cadmium	91	102	84.5	121	Pass
Chromium	160	171	135	206	Pass
Copper	110	112	90.4	134	Pass
Lead	99	104	81.8	126	Pass
Nickel	120	122	98.4	146	Pass
Selenium	160	169	111	227	Pass
Silver	11	78.6	0	165	Pass
Thallium	150	171	132	210	Pass
Zinc	170	194	155	233	Pass

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STL Seattle

Laboratory Control Sample

Lab ID:	RZS1424
Date Prepared:	9/18/03
Date Analyzed:	9/18/03
QC Batch ID:	ZS1424

Mercury by CVAA - USEPA Method 7471

Parameter Name	Sample Result (mg/kg)	True Value (mg/kg)	Lower Limit (mg/kg)	Upper Limit (mg/kg)	Flag
Mercury	9.7	9.41	6.19	13	Pass

sjc 11/21/03

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ICP SERIAL DILUTIONS

EPA SAMPLE NO.

RP-1 REPOSITORY

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.: 116223 SDG No.: RP-1_REPOS

Matrix (soil/water): SOIL Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum							NR
Antimony	6.45	B	26.50	U	100.0		P
Arsenic	28.49		22.35	B	21.6		P
Barium							NR
Beryllium	1.99	B	1.78	B	10.6		P
Cadmium	2.47	B	0.50	U	100.0		P
Calcium							NR
Chromium	26.89		27.20	B	1.2		P
Cobalt							NR
Copper	85.33		51.36	B	39.8	E	P
Iron							NR
Lead	54.09		50.29		7.0		P
Magnesium							NR
Manganese							NR
Mercury							NR
Nickel	29.64	B	29.41	B	0.8		P
Potassium							NR
Selenium	11.60	U	58.00	U			P
Silver	0.50	U	2.50	U			P
Sodium							NR
Thallium	2.10	U	10.50	U			P
Vanadium							NR
Zinc	344.84		359.03		4.1		P

gpc 12/1/03

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INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.: 116223 SDG No.: RP-1_REPOSI

ICP ID Number: Date: 04/14/03

Flame AA ID Number:

Furnace AA ID Number: PS200

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		NR
Antimony			60		NR
Arsenic			10		NR
Barium			200		NR
Beryllium			5		NR
Cadmium			5		NR
Calcium			5000		NR
Chromium			10		NR
Cobalt			50		NR
Copper			25		NR
Iron			100		NR
Lead			3		NR
Magnesium			5000		NR
Manganese			15		NR
Mercury	9930.50		0.2	0.1	AV
Nickel			40		NR
Potassium			5000		NR
Selenium			5		NR
Silver			10		NR
Sodium			5000		NR
Thallium			10		NR
Vanadium			50		NR
Zinc			20		NR
Cyanide			10		NR

Comments:

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INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.: 116223 SDG No.: RP-1_REPOSI

ICP ID Number: OPTIMA_3200_DV Date: 03/27/03

Flame AA ID Number:

Furnace AA ID Number:

Analyte	Wavelength (nm)	Background	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		NR
Antimony	206.84		60	5.3	P
Arsenic	188.98		10	1.8	P
Barium			200		NR
Beryllium	313.11		5	0.1	P
Cadmium	226.50		5	0.1	P
Calcium			5000		NR
Chromium	267.72		10	0.1	P
Cobalt			50		NR
Copper	324.75		25	1.5	P
Iron			100		NR
Lead	220.35		3	3.3	P
Magnesium			5000		NR
Manganese			15		NR
Mercury			0.2		NR
Nickel	231.60		40	0.1	P
Potassium			5000		NR
Selenium	196.03		5	11.6	P
Silver	338.29		10	0.5	P
Sodium			5000		NR
Thallium	190.80		10	2.1	P
Vanadium			50		NR
Zinc	213.86		20	0.3	P
Cyanide			10		NR

Comments:

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11A

ICP INTERELEMENT CORRECTION FACTORS (ANNUALLY)

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.:116223 SDG No.: RP-1_RE

ICP ID Number:OPTIMA_3200_DV Date: 04/14/03

Analyte	Wave-length (nm)	Interelement Correction Factors for : Al	Ca	Fe	Mg
Aluminum					
Antimony	206.84	0.0000910	0.0000090	0.0000291	-0.0000002
Arsenic	188.98	0.0000610	0.0000050	-0.0000410	-0.0001750
Barium					
Beryllium	313.11	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	226.50	0.0000034	-0.0000006	0.0000365	-0.0000071
Calcium					
Chromium	267.72	0.0000000	0.0000000	0.0000000	0.0000000
Cobalt					
Copper	324.75	0.0000000	0.0000000	0.0000000	0.0000000
Iron					
Lead	220.35	-0.0000082	-0.0000042	0.0001685	0.0000038
Magnesium					
Manganese					
Mercury					
Nickel	231.60	0.0000000	0.0000000	0.0000000	0.0000000
Potassium					
Selenium	196.03	0.0001725	-0.0000381	-0.0002560	0.0000120
Silver	338.29	0.0000107	0.0000135	0.0000010	0.0000004
Sodium					
Thallium	190.80	0.0000690	0.0000010	-0.0000501	0.0000310
Vanadium					
Zinc	213.86	0.0000000	0.0000000	0.0000000	0.0000000

Comments:

Sample Prep Log Sheet - 9/17/03

Metals Digestion Log

Extraction Date					
QCBatch ID	SP036				
Sample Matrix	solid				
	Soil Digestion Block (220.1)				
MS Spike No.	GPS#1 : 1001-08-01	Weighed By/Date			
	GPS#2 : 1001-06-08	FW 9/17/03			
	STD C: 1001-06-10	Comments			
HCl Lot No.	S003				
Nitric Acid Lot No.	S005				
H2O2 Lot No.	N/A	Spike Witness Signature/Date	9-17-03		

QC Sample Type	QC Identifier	Sample Wt (g)	Final Vol (ml)		Spike Vol (mL)
Method Blank	SP036	0.2500	50		
Duplicate	116223r1	0.2550	50		
Duplicate-2	116223r1	0.2585	50		
Blank Spike	sSP036	0.2500	50		1
Blank Spike Duplicate	dSP036	0.2500	50		1
Matrix Spike	116223s1	0.2593	50		1
Matrix Spike Duplicate	116223d1	0.2590	50		1
Matrix Spike-2					
Matrix Spike Duplicate-2					
LCS					
ERA		0.2568	50		

Sample	Client Sample ID	Sample Weight (g)	Final Volume (ml)		
116223-1	RP-1 Repository 1	0.2520	50		
116223-2	RS-1 Rocksource 1	0.2604	50		
116198-1	Pond Soil 1	0.2894	50		
116198-2	Pond Sample 2	0.2516	50		
116198-3	Pond Sample 3	0.2665	50		
116198-4	Pond Sample 4	0.2776	50		
116198-5	Pond Sample 5	0.2688	50		
116198-6	Pond Sample 6	0.2599	50		
116198-7	Pond Sample 7	0.2871	50		
116198-8	Pond Sample 8	0.2702	50		

Printed - 9/18/03

Mercury Digestion Log

QCBatch ID	ZS1424
Sample Matrix	solid
Hg Spike/Stds Soln Lot #	B2095013
ERA/Chk Stds Spike Soln	8-151hg
H2SO4 Lot #	5912
HNO3 Lot #	6565
HCL Lot #	6706
SnCl2 Lot #	5324
KMnO4 Lot #	5811
K2S2O8 Lot #	3167
NaCl Lot #	6818
Hydroxylamine Sulfate Lot #	5805
Digestion Procedure	7471A

Weighed By/Date JAT/9-18-03

Extracted By/Date

Comments

Spike Witness Signature/Date Jam 9-18-03

QC Sample Type	QC Identifier	Sample Weight (g)	Final Volume (ml)	MS/BS spike amt (ml)	Standards
Method Blank	ZS1424	0.5000	50		Blank ppb
Duplicate	116223r1	0.5104	50		0.1 ppb
Duplicate-2	116223d1	0.6971	50		2.0 ppb
Blank Spike	sZS1424	0.5000	50	1	5.0 ppb
Blank Spike Duplicate	dZS1424	0.5000	50	1	10.0 ppb
Matrix Spike	116223s1	0.5608	50	1	20.0 ppb
Matrix Spike Duplicate	116223d1	0.5459	50	1	100
Matrix Spike-2					
Matrix Spike Duplicate-2					
ERA	D034-540	0.1034	50		

Sample	Client Sample ID	Sample Weight (g)	Final Volume (ml)	Comments	Check Stds
116223-1	RP-1 Repository	0.5405	50	100	Blank ppb
116223-2	S-1 Rocksource	0.6274	50	100	5.0 ppb
116229-2	B-1-8	0.5675	50	100	2.0 ppb
116229-6	B-1-30	0.6622	50	100	4.0 ppb
116123-1	psoil Stockpile #	0.5978	50	100	
116124-1	psoil Stockpile #	0.6825	50	100	
116125-1	psoil Stockpile #	0.6328	50	100	
116126-1	psoil Stockpile #	0.5699	50	100	Bath Temp
116127-1	psoil Stockpile #	0.5521	50	100	
116128-1	psoil Stockpile #	0.5842	50	100	
116129-1	psoil Stockpile #	0.5507	50	100	
116130-1	psoil Stockpile #	0.5761	50	100	
116131-1	psoil Stockpile #	0.6251	50	100	
116132-1	psoil Stockpile #	0.5243	50	100	
116201-1	Sample #1	0.6051	50	100	
116201-2	Sample #2	0.5449	50	100	
116231-1	030903 RFR-1	0.5236	50	100	
116231-2	030904 RFR-2	0.5121	50	100	
116185-7	03-20 Oil	0.5174	50	100	

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ANALYSIS RUN LOG

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.:116223 SDG No.:RP-1_REPOS

Instrument ID Number:OPTIMA_3200_DV Method:P

Start Date: 09/18/03 End Date:09/18/03

EPA Sample No.	D/F	Time	% R	Analytes: ALL	SBS	ABA	BAE	CCD	CAR	CRO	CUE	FEB	MGN	MNG	HGI	K	SE	AG	NAL	T	V	ZN	CN
S	1.00	1110																					
S	1.00	1130																					
ICV	1.00	1134			X	X	X	X	X	X	X		X		X	X	X		X		X		
ICB	1.00	1146			X	X	X	X	X	X	X		X		X	X	X		X		X		
ICSA	1.00	1210																					
ICSAB	1.00	1216				X		X	X	X	X		X		X							X	
CCV	1.00	1241			X	X	X	X	X	X	X		X		X	X	X		X		X		
CCB	1.00	1244			X	X	X	X	X	X	X		X		X	X	X		X		X		
PBS	1.00	1246			X	X	X	X	X	X	X		X		X	X	X		X		X		
RP-1 REPOSIT	1.00	1249			X	X	X	X	X	X	X		X		X	X	X		X		X		
RP-1 REPOSIT	1.00	1251			X	X	X	X	X	X	X		X		X	X	X		X		X		
RP-1 REPOSIT	1.00	1254			X	X	X	X	X	X	X		X		X	X	X		X		X		
RP-1 REPOSIT	1.00	1257			X	X	X	X	X	X	X		X		X	X	X		X		X		
RP-1 REPOSIT	1.00	1301			X	X	X	X	X	X	X		X		X	X	X		X		X		
RP-1 REPOSIT	1.00	1303			X	X	X	X	X	X	X		X		X	X	X		X		X		
RP-1_REPOSIT	1.00	1305			X	X	X	X	X	X	X		X		X	X	X		X		X		
LCSS	1.00	1307			X	X	X	X	X	X	X		X		X	X	X		X		X		
ZZZZZZ	1.00	1311																					
CCV	1.00	1313			X	X	X	X	X	X	X		X		X	X	X		X		X		
CCB	1.00	1315			X	X	X	X	X	X	X		X		X	X	X		X		X		
ZZZZZZ	1.00	1318																					
RS-1 ROCKSOU	1.00	1320			X	X	X	X	X	X	X		X		X	X	X		X		X		
ZZZZZZ	1.00	1323																					
ZZZZZZ	1.00	1327																					
ZZZZZZ	1.00	1330																					
ZZZZZZ	1.00	1333																					
ZZZZZZ	1.00	1337																					
ZZZZZZ	1.00	1340																					
ZZZZZZ	1.00	1343																					
CCV	1.00	1346			X	X	X	X	X	X	X		X		X	X	X		X		X		
CCB	1.00	1348			X	X	X	X	X	X	X		X		X	X	X		X		X		
ZZZZZZ	1.00	1350																					

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ANALYSIS RUN LOG

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.:116223 SDG No.:RP-1_REPOS

Instrument ID Number:OPTIMA_3200_DV Method:P_

Start Date: 09/18/03 End Date:09/18/03

EPA Sample No.	D/F	Time	% R	Analytes																						
				ALB	ASA	BAE	BED	CDA	CRO	CCU	FE	PBG	MGN	HGI	NI	KE	SGA	NAL	TL	V	ZN	CN				
ZZZZZZ	1.00	1353																								
ZZZZZZ	1.00	1356																								
LCSS	1.00	1359		X	X	X	X	X	X	X	X	X		X		X	X	X	X		X					
LCSS	1.00	1401		X	X	X	X	X	X	X	X	X		X		X	X	X	X		X					
LCSS	1.00	1404		X	X	X	X	X	X	X	X	X		X		X	X	X	X		X					
ZZZZZZ	1.00	1407																								
CCV	1.00	1410		X	X	X	X	X	X	X	X	X		X		X	X	X	X		X					
CCB	1.00	1412		X	X	X	X	X	X	X	X	X		X		X	X	X	X		X					
ICSA	1.00	1414																								
ICSAB	1.00	1416			X	X	X	X	X	X	X	X		X							X					

14
ANALYSIS RUN LOG

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.:116223 SDG No.:RP-1_REPOS

Instrument ID Number:PS200 Method:AV

Start Date: 09/18/03 End Date:09/18/03

EPA Sample No.	D/F	Time	% R	Analytes
S	1.00	1506		X
S	1.00	1509		X
S	1.00	1511		X
S	1.00	1513		X
S	1.00	1516		X
S	1.00	1518		X
S	1.00	1520		X
S	1.00	1522		X
S	1.00	1525		X
S	1.00	1527		X
S	1.00	1530		X
S	1.00	1533		X
[illegible]	1.00	1535		X
[illegible]	1.00	1538		X
S	1.00	1540		X
S	1.00	1543		X
S	1.00	1545		X
S	1.00	1547		X
ICB	1.00	1622		X
ZZZZZZ	1.00	1624		
ZZZZZZ	1.00	1626		
ICV	1.00	1629		X
CCV	1.00	1833		X
CCB	1.00	1835		X
PBS	1.00	1838		X
RP-1 REPOSIT	1.00	1840		X
RP-1 REPOSIT	1.00	1842		X
RP-1 REPOSIT	1.00	1845		X
RP-1 REPOSIT	1.00	1849		X
RP-1_REPOSIT	1.00	1851		X
LCSS	1.00	1853		X
LCSS	1.00	1856		X

000036

14
ANALYSIS RUN LOG

Lab Name: STL-SEATTLE Contract:N/A

Lab Code: Case No.:N/A SAS No.:116223 SDG No.:RP-1_REPOS

Instrument ID Number:PS200 Method:AV

Start Date: 09/18/03 End Date:09/18/03

EPA Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
LCSS	1.00	1858																X									
ZZZZZZ	1.00	1901																									
CCV	1.00	1903																X									
CCB	1.00	1906																X									
RS-1_ROCKSOU	1.00	1908																X									
CCV	1.00	1931																X									
CCB	1.00	1933																X									

DATA QUALIFIER DEFINITIONS

SEVERN TRENT STL

STL Seattle
5755 8th Street East
Tacoma, WA 98424

Tel: 253 922 2310
Fax: 253 922 5047
www.stl-inc.com

DATA QUALIFIERS AND ABBREVIATIONS

B1: This analyte was detected in the associated method blank. The analyte concentration was determined not to be significantly higher than the associated method blank (less than ten times the concentration reported in the blank).

B2: This analyte was detected in the associated method blank. The analyte concentration in the sample was determined to be significantly higher than the method blank (greater than ten times the concentration reported in the blank).

C1: Second column confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be < 40%.

C2: Second column confirmation was performed. The RPD between the results on the two columns was evaluated and determined to be > 40%. The higher result was reported unless anomalies were noted.

C3: Second analysis confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be $\leq$ 30%.

C4: Second analysis confirmation was performed. The RPD between the results on the two columns was evaluated and determined to be > 30%. The original analysis was reported unless anomalies were noted.

M: GC/MS confirmation was performed. The result derived from the original analysis was reported.

D: The reported result for this analyte was calculated based on a secondary dilution factor.

E: The concentration of this analyte exceeded the instrument calibration range and should be considered an estimated quantity.

J: The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.

MCL: Maximum Contaminant Level

MDL: Method Detection Limit

MRL: Method Reporting Limit

N: See analytical narrative

ND: Not Detected

PQL: Practical Quantitation Limit

X1: Contaminant does not appear to be "typical" product. Elution pattern suggests it may be _____.

X2: Contaminant does not appear to be "typical" product.

X3: Identification and quantitation of the analyte or surrogate was complicated by matrix interference.

X4: RPD for duplicates was outside advisory QC limits. The sample was re-analyzed with similar results. The sample matrix may be nonhomogeneous.

X4a: RPD for duplicates outside advisory QC limits due to analyte concentration near the method practical quantitation limit/detection limit.

X5: Matrix spike recovery was not determined due to the required dilution.

X6: Recovery and/or RPD values for matrix spike(/matrix spike duplicate) outside advisory QC limits. Sample was re-analyzed with similar results.

X7: Recovery and/or RPD values for matrix spike(/matrix spike duplicate) outside advisory QC limits. Matrix interference may be indicated based on acceptable blank spike recovery and/or RPD.

X7a: Recovery and/or RPD values for this spiked analyte outside advisory QC limits due to high concentration of the analyte in the original sample.

X8: Surrogate recovery was not determined due to the required dilution.

X9: Surrogate recovery outside advisory QC limits due to matrix interference.

QC ACCEPTANCE LIMITS

STL Seattle - Method QC Limits

Total Metals by ICP - USEPA Method 6010

Record Number : 534
Analysis Method : 6010
Matrix : Soil
Preparation Method : 3050B

Blank Spike Recovery

Antimony	80 - 120%
Arsenic	80 - 120%
Beryllium	80 - 120%
Cadmium	80 - 120%
Chromium	80 - 120%
Copper	80 - 120%
Lead	80 - 120%
Nickel	80 - 120%
Selenium	80 - 120%
Silver	80 - 120%
Thallium	80 - 120%
Zinc	80 - 120%

Duplicate RPD

Antimony	=<35% RPD
Arsenic	=<35% RPD
Beryllium	=<35% RPD
Cadmium	=<35% RPD
Chromium	=<35% RPD
Copper	=<35% RPD
Lead	=<35% RPD
Nickel	=<35% RPD
Selenium	=<35% RPD
Silver	=<35% RPD
Thallium	=<35% RPD
Zinc	=<35% RPD

Matrix Spike Recovery

Antimony	75 - 125%
Arsenic	75 - 125%
Beryllium	75 - 125%
Cadmium	75 - 125%
Chromium	75 - 125%
Copper	75 - 125%
Lead	75 - 125%
Nickel	75 - 125%
Selenium	75 - 125%
Silver	75 - 125%
Thallium	75 - 125%
Zinc	75 - 125%

Mercury by CVAA - USEPA Method 7471

Record Number : 552
Analysis Method : 7471
Matrix : Soil

Blank Spike Recovery		
Mercury	75 - 125%	=<25% RPD
Duplicate RPD		
Mercury		=<35% RPD
Matrix Spike Recovery		
Mercury	75 - 125%	

Sequence No.: 1
Sample ID: Calib Blank 1
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 1
Date Collected: 9/18/03 11:10:09 AM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:55:50 PM,

Mean Data: Calib Blank 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Conc.	Calib Units
Lu 261.542	645682.2	5750.05	0.89%	100.00	%
Sc 361.383	1300176.1	12046.16	0.93%	100.0	%
As 188.979†	14.4	0.91	6.31%	[0.00]	mg/L
Ba 233.527†	-963.9	14.83	1.54%	[0.00]	mg/L
Cd 226.502†	197.4	7.45	3.77%	[0.00]	mg/L
Cr 267.716†	483.7	44.48	9.20%	[0.00]	mg/L
Pb 220.353†	203.7	0.79	0.39%	[0.00]	mg/L
Se 196.026†	-45.8	2.23	4.87%	[0.00]	mg/L
Ag 328.068†	2349.2	15.80	0.67%	[0.00]	mg/L
Cu 327.393†	1197.5	69.72	5.82%	[0.00]	mg/L
Ni 231.604†	-63.0	5.73	9.10%	[0.00]	mg/L
Zn 206.200†	-376.9	7.21	1.91%	[0.00]	mg/L
Be 313.107†	7919.0	156.65	1.98%	[0.00]	mg/L
Sb 206.836†	132.9	5.28	3.98%	[0.00]	mg/L
Tl 190.801†	61.4	4.00	6.52%	[0.00]	mg/L

Sequence No.: 2
Sample ID: High Standard
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 2
Date Collected: 9/18/03 11:30:16 AM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:55:51 PM,

Mean Data: High Standard

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Conc.	Calib Units
Lu 261.542	700608.9	2713.66	0.39%	108.5	%
Sc 361.383	1424464.8	4100.16	0.29%	109.6	%
As 188.979†	33779.4	213.35	0.63%	[20.0]	mg/L
Ba 233.527†	162849.6	925.81	0.57%	[2.00]	mg/L
Cd 226.502†	312740.1	307.45	0.10%	[2.00]	mg/L
Cr 267.716†	221633.7	187.71	0.08%	[2.00]	mg/L
Pb 220.353†	215706.4	941.08	0.44%	[20.0]	mg/L
Se 196.026†	42403.5	278.17	0.66%	[20.0]	mg/L
Ag 328.068†	434772.6	567.44	0.13%	[2.00]	mg/L
Cu 327.393†	283682.9	501.35	0.18%	[2.00]	mg/L
Ni 231.604†	100157.7	562.04	0.56%	[2.00]	mg/L
Zn 206.200†	72216.5	355.82	0.49%	[2.00]	mg/L
Be 313.107†	14960606.0	95424.15	0.64%	[2.00]	mg/L
Sb 206.836†	73246.2	338.62	0.46%	[20.0]	mg/L
Tl 190.801†	45580.8	200.42	0.44%	[20.0]	mg/L

Sequence No.: 3
Sample ID: ICV
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 3
Date Collected: 9/18/03 11:34:24 AM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:55:52 PM,

Mean Data: ICV

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	714362.2	110.6	%	0.96				0.86%
Sc 361.383	1448180.2	111.4	%	1.07				0.96%
As 188.979†	3348.2	1.982	mg/L	0.0563	1.982	mg/L	0.0563	2.84%
QC value within limits for As 188.979 Recovery = 99.12%								
Ba 233.527†	4325.0	0.0531	mg/L	0.00082	0.0531	mg/L	0.00082	1.55%

QC value within limits for Ba 233.527 Recovery = 106.23%						
Cd 226.502†	31704.5	0.2028 mg/L	0.00322	0.2028 mg/L	0.00322	1.59%
QC value within limits for Cd 226.502 Recovery = 101.38%						
Cr 267.716†	11354.2	0.1025 mg/L	0.00175	0.1025 mg/L	0.00175	1.71%
QC value within limits for Cr 267.716 Recovery = 102.46%						
Pb 220.353†	5600.4	0.5193 mg/L	0.00905	0.5193 mg/L	0.00905	1.74%
QC value within limits for Pb 220.353 Recovery = 103.85%						
Se 196.026†	9037.5	4.263 mg/L	0.0722	4.263 mg/L	0.0722	1.69%
QC value within limits for Se 196.026 Recovery = 106.57%						
Ag 328.068†	222461.0	1.023 mg/L	0.0009	1.023 mg/L	0.0009	0.09%
QC value within limits for Ag 328.068 Recovery = 102.33%						
Cu 327.393†	28995.1	0.2044 mg/L	0.00012	0.2044 mg/L	0.00012	0.06%
QC value within limits for Cu 327.393 Recovery = 102.21%						
Ni 231.604†	21150.9	0.4224 mg/L	0.00632	0.4224 mg/L	0.00632	1.50%
QC value within limits for Ni 231.604 Recovery = 105.59%						
Zn 206.200†	7301.1	0.2022 mg/L	0.00191	0.2022 mg/L	0.00191	0.95%
QC value within limits for Zn 206.200 Recovery = 101.10%						
Be 313.107†	152196.5	0.0203 mg/L	0.00005	0.0203 mg/L	0.00005	0.24%
QC value within limits for Be 313.107 Recovery = 101.73%						
Sb 206.836†	14608.2	3.989 mg/L	0.0720	3.989 mg/L	0.0720	1.81%
QC value within limits for Sb 206.836 Recovery = 99.72%						
Tl 190.801†	9905.6	4.346 mg/L	0.0544	4.346 mg/L	0.0544	1.25%
QC value within limits for Tl 190.801 Recovery = 108.66%						

All analytes passed QC.

Sequence No.: 4 **Autosampler Location: 1**
Sample ID: ICB **Date Collected: 9/18/03 11:46:07 AM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:55:54 PM,**

Mean Data: ICB

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Y 261.542	739070.6	114.5	%	0.49				0.43%
Sc 361.383	1488947.8	114.5	%	0.52				0.45%
As 188.979†	3.3	0.0019	mg/L	0.00208	0.0019	mg/L	0.00208	107.04%
QC value within limits for As 188.979 Recovery = Not calculated								
Ba 233.527†	145.5	0.0018	mg/L	0.00007	0.0018	mg/L	0.00007	4.13%
QC value within limits for Ba 233.527 Recovery = Not calculated								
Cd 226.502†	-32.2	-0.0002	mg/L	0.00003	-0.0002	mg/L	0.00003	16.26%
QC value within limits for Cd 226.502 Recovery = Not calculated								
Cr 267.716†	-50.1	-0.0005	mg/L	0.00030	-0.0005	mg/L	0.00030	66.66%
QC value within limits for Cr 267.716 Recovery = Not calculated								
Pb 220.353†	-34.9	-0.0032	mg/L	0.00030	-0.0032	mg/L	0.00030	9.39%
QC value within limits for Pb 220.353 Recovery = Not calculated								
Se 196.026†	3.1	0.0015	mg/L	0.00301	0.0015	mg/L	0.00301	203.74%
QC value within limits for Se 196.026 Recovery = Not calculated								
Ag 328.068†	-399.8	-0.0018	mg/L	0.00021	-0.0018	mg/L	0.00021	11.53%
QC value within limits for Ag 328.068 Recovery = Not calculated								
Cu 327.393†	291.4	0.0021	mg/L	0.00041	0.0021	mg/L	0.00041	20.03%
QC value within limits for Cu 327.393 Recovery = Not calculated								
Ni 231.604†	26.3	0.0005	mg/L	0.00003	0.0005	mg/L	0.00003	6.36%
QC value within limits for Ni 231.604 Recovery = Not calculated								
Zn 206.200†	80.8	0.0022	mg/L	0.00012	0.0022	mg/L	0.00012	5.42%
QC value within limits for Zn 206.200 Recovery = Not calculated								
Be 313.107†	-1219.5	-0.0002	mg/L	0.00001	-0.0002	mg/L	0.00001	5.14%
QC value within limits for Be 313.107 Recovery = Not calculated								
Sb 206.836†	11.5	0.0031	mg/L	0.00266	0.0031	mg/L	0.00266	84.64%
QC value within limits for Sb 206.836 Recovery = Not calculated								
Tl 190.801†	-6.2	-0.0027	mg/L	0.00161	-0.0027	mg/L	0.00161	58.87%
QC value within limits for Tl 190.801 Recovery = Not calculated								

All analytes passed QC.

Sequence No.: 5 **Autosampler Location: 7**
Sample ID: ICSA **Date Collected: 9/18/03 12:10:45 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**

Dilution: Data Type: Reprocessed on 9/18/03 3:55:56 PM,

Mean Data: ICSA

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	692372.6	107.2	%	0.22				0.21%
Sc 361.383	1384129.8	106.5	%	0.81				0.76%
As 188.979†	37.3	0.0221	mg/L	0.00268	0.0221	mg/L	0.00268	12.17%
QC value within limits for As 188.979 Recovery = Not calculated								
Ba 233.527†	-2456.6	-0.0302	mg/L	0.00021	-0.0302	mg/L	0.00021	0.69%
QC value within limits for Ba 233.527 Recovery = Not calculated								
Cd 226.502†	-2899.2	-0.0185	mg/L	0.00023	-0.0185	mg/L	0.00023	1.27%
QC value within limits for Cd 226.502 Recovery = Not calculated								
Cr 267.716†	-283.9	-0.0026	mg/L	0.00009	-0.0026	mg/L	0.00009	3.39%
QC value within limits for Cr 267.716 Recovery = Not calculated								
Pb 220.353†	54.4	0.0050	mg/L	0.00081	0.0050	mg/L	0.00081	16.01%
QC value within limits for Pb 220.353 Recovery = Not calculated								
Se 196.026†	-18.0	-0.0085	mg/L	0.00127	-0.0085	mg/L	0.00127	14.91%
QC value within limits for Se 196.026 Recovery = Not calculated								
Ag 328.068†	-372.1	-0.0017	mg/L	0.00027	-0.0017	mg/L	0.00027	15.48%
QC value within limits for Ag 328.068 Recovery = Not calculated								
Cu 327.393†	-3084.9	-0.0217	mg/L	0.00070	-0.0217	mg/L	0.00070	3.22%
QC value within limits for Cu 327.393 Recovery = Not calculated								
Ni 231.604†	-75.5	-0.0015	mg/L	0.00004	-0.0015	mg/L	0.00004	2.91%
QC value within limits for Ni 231.604 Recovery = Not calculated								
Zn 206.200†	-212.0	-0.0059	mg/L	0.00016	-0.0059	mg/L	0.00016	2.72%
QC value within limits for Zn 206.200 Recovery = Not calculated								
Be 313.107†	1067.7	0.0001	mg/L	0.00000	0.0001	mg/L	0.00000	3.15%
QC value within limits for Be 313.107 Recovery = Not calculated								
Sb 206.836†	45.4	0.0124	mg/L	0.00171	0.0124	mg/L	0.00171	13.77%
QC value within limits for Sb 206.836 Recovery = Not calculated								
Tl 190.801†	134.7	0.0591	mg/L	0.00207	0.0591	mg/L	0.00207	3.50%
QC value within limits for Tl 190.801 Recovery = Not calculated								

All analytes passed QC.

Sequence No.: 6 Autosampler Location: 8
Sample ID: ICSAB Date Collected: 9/18/03 12:16:55 PM
Analyst:
Sample Wt: Sample Prep Volume:
Dilution: Data Type: Reprocessed on 9/18/03 3:55:57 PM,

Mean Data: ICSAB

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	687319.2	106.4	%	0.06				0.06%
Sc 361.383	1363760.9	104.9	%	0.66				0.63%
As 188.979†	17519.9	10.37	mg/L	0.086	10.37	mg/L	0.086	0.83%
QC value within limits for As 188.979 Recovery = 103.73%								
Ba 233.527†	237457.2	2.916	mg/L	0.0041	2.916	mg/L	0.0041	0.14%
QC value within limits for Ba 233.527 Recovery = 97.21%								
Cd 226.502†	439967.6	2.814	mg/L	0.0033	2.814	mg/L	0.0033	0.12%
QC value within limits for Cd 226.502 Recovery = 93.79%								
Cr 267.716†	330249.0	2.980	mg/L	0.0036	2.980	mg/L	0.0036	0.12%
QC value within limits for Cr 267.716 Recovery = 99.34%								
Pb 220.353†	103014.6	9.551	mg/L	0.0194	9.551	mg/L	0.0194	0.20%
QC value within limits for Pb 220.353 Recovery = 95.51%								
Se 196.026†	10925.7	5.153	mg/L	0.0497	5.153	mg/L	0.0497	0.96%
QC value within limits for Se 196.026 Recovery = 103.06%								
Ag 328.068†	715998.4	3.294	mg/L	0.0040	3.294	mg/L	0.0040	0.12%
QC value within limits for Ag 328.068 Recovery = 109.79%								
Cu 327.393†	404021.8	2.848	mg/L	0.0035	2.848	mg/L	0.0035	0.12%
QC value within limits for Cu 327.393 Recovery = 94.95%								
Ni 231.604†	137549.8	2.747	mg/L	0.0001	2.747	mg/L	0.0001	0.00%
QC value within limits for Ni 231.604 Recovery = 91.56%								
Zn 206.200†	98917.6	2.739	mg/L	0.0047	2.739	mg/L	0.0047	0.17%
QC value within limits for Zn 206.200 Recovery = 91.32%								
Be 313.107†	7562372.1	1.011	mg/L	0.0063	1.011	mg/L	0.0063	0.62%
QC value within limits for Be 313.107 Recovery = 101.10%								

Sb 206.836†	38078.0	10.40 mg/L	0.070	10.40 mg/L	0.070	0.67%
QC value within limits for Sb 206.836 Recovery = 103.97%						
Tl 190.801†	21556.0	9.458 mg/L	0.0450	9.458 mg/L	0.0450	0.48%
QC value within limits for Tl 190.801 Recovery = 94.58%						

2 analytes passed QC.

Reprocessing Begun
Logged In Analyst: Seattle_inst_Metals Technique: ICP Continuous

Results Data Set (original): 091803
Results Library (original): D:\pe\administrator\Results\Results.mdb
Results Data Set (reprocessed): sp036
Results Library (reprocessed): D:\pe\administrator\Results\Results.mdb

Sequence No.: 1 Autosampler Location: 5
Sample ID: CCV Date Collected: 9/18/03 12:41:57 PM
Analyst:
Sample Wt: Sample Prep Volume:
Dilution: Data Type: Reprocessed on 9/18/03 3:57:11 PM,

Mean Data: CCV

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	757608.6	101.4	%	3.64				3.59%
Sc 361.383	1557731.7	103.4	%	3.69				3.57%
As 188.979†	9592.5	4.802	mg/L	0.2304	4.802	mg/L	0.2304	4.80%
QC value within limits for As 188.979 Recovery = 96.04%								
Ba 233.527†	46589.8	0.4850	mg/L	0.02111	0.4850	mg/L	0.02111	4.35%
QC value within limits for Ba 233.527 Recovery = 97.00%								
Cd 226.502†	90123.4	0.4900	mg/L	0.02119	0.4900	mg/L	0.02119	4.33%
QC value within limits for Cd 226.502 Recovery = 98.00%								
Cr 267.716†	63467.2	0.4881	mg/L	0.02148	0.4881	mg/L	0.02148	4.40%
QC value within limits for Cr 267.716 Recovery = 97.62%								
Pb 220.353†	62418.7	4.895	mg/L	0.2170	4.895	mg/L	0.2170	4.43%
QC value within limits for Pb 220.353 Recovery = 97.89%								
Se 196.026†	12233.3	4.874	mg/L	0.2067	4.874	mg/L	0.2067	4.24%
QC value within limits for Se 196.026 Recovery = 97.47%								
Ag 328.068†	126583.3	0.4951	mg/L	0.02131	0.4951	mg/L	0.02131	4.30%
QC value within limits for Ag 328.068 Recovery = 99.03%								
Cu 327.393†	82015.0	0.4921	mg/L	0.02041	0.4921	mg/L	0.02041	4.15%
QC value within limits for Cu 327.393 Recovery = 98.42%								
Ni 231.604†	29114.7	0.4928	mg/L	0.02231	0.4928	mg/L	0.02231	4.53%
QC value within limits for Ni 231.604 Recovery = 98.57%								
Zn 206.200†	20572.4	0.4851	mg/L	0.02083	0.4851	mg/L	0.02083	4.29%
QC value within limits for Zn 206.200 Recovery = 97.02%								
Be 313.107†	4317932.9	0.4908	mg/L	0.02108	0.4908	mg/L	0.02108	4.30%
QC value within limits for Be 313.107 Recovery = 98.15%								
Sb 206.836†	20676.3	4.779	mg/L	0.2187	4.779	mg/L	0.2187	4.58%
QC value within limits for Sb 206.836 Recovery = 95.57%								
Tl 190.801†	13212.5	4.938	mg/L	0.1897	4.938	mg/L	0.1897	3.84%
QC value within limits for Tl 190.801 Recovery = 98.76%								

All analytes passed QC.

Sequence No.: 2 Autosampler Location: 6
Sample ID: CCB Date Collected: 9/18/03 12:44:16 PM
Analyst:
Sample Wt: Sample Prep Volume:
Dilution: Data Type: Reprocessed on 9/18/03 3:57:47 PM,

Mean Data: CCB

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	767764.9	102.8	%	4.93				4.79%
Sc 361.383	1545821.8	102.6	%	4.97				4.84%
As 188.979†	3.5	0.0017	mg/L	0.00078	0.0017	mg/L	0.00078	44.92%
QC value within limits for As 188.979 Recovery = Not calculated								
Ba 233.527†	20.9	0.0002	mg/L	0.00041	0.0002	mg/L	0.00041	187.33%
QC value within limits for Ba 233.527 Recovery = Not calculated								
Cd 226.502†	-29.3	-0.0002	mg/L	0.00003	-0.0002	mg/L	0.00003	20.37%
QC value within limits for Cd 226.502 Recovery = Not calculated								
Cr 267.716†	11.4	0.0001	mg/L	0.00009	0.0001	mg/L	0.00009	105.70%

QC value within limits for Cr 267.716 Recovery = Not calculated

Pb 220.353†		0.3	0.0000	mg/L	0.00080	0.0000	mg/L	0.00080 >999.9%

QC value within limits for Pb 220.353 Recovery = Not calculated

196.026†		4.7	0.0019	mg/L	0.00146	0.0019	mg/L	0.00146 78.54%

QC value within limits for Se 196.026 Recovery = Not calculated

Ag 328.068†		-80.0	-0.0003	mg/L	0.00074	-0.0003	mg/L	0.00074 235.69%

QC value within limits for Ag 328.068 Recovery = Not calculated

Cu 327.393†		-624.3	-0.0037	mg/L	0.00094	-0.0037	mg/L	0.00094 25.18%

QC value within limits for Cu 327.393 Recovery = Not calculated

Ni 231.604†		-43.5	-0.0007	mg/L	0.00017	-0.0007	mg/L	0.00017 22.61%

QC value within limits for Ni 231.604 Recovery = Not calculated

Zn 206.200†		-90.3	-0.0021	mg/L	0.00050	-0.0021	mg/L	0.00050 23.64%

QC value within limits for Zn 206.200 Recovery = Not calculated

Be 313.107†		374.8	0.0000	mg/L	0.00005	0.0000	mg/L	0.00005 122.92%

QC value within limits for Be 313.107 Recovery = Not calculated

Sb 206.836†		32.5	0.0075	mg/L	0.00040	0.0075	mg/L	0.00040 5.31%

QC value within limits for Sb 206.836 Recovery = Not calculated

Tl 190.801†		-4.6	-0.0017	mg/L	0.00081	-0.0017	mg/L	0.00081 47.12%

QC value within limits for Tl 190.801 Recovery = Not calculated

All analytes passed QC.

Sequence No.: 3 **Autosampler Location: 9**
Sample ID: mb sp036 **Date Collected: 9/18/03 12:46:41 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:57:49 PM,**

Mean Data: mb sp036

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	771457.2	103.3	%	2.36				2.29%
Sc 361.383	1559274.8	103.5	%	2.34				2.26%
As 188.979†	0.3	0.0001	mg/L	0.00031	0.0001	mg/L	0.00031	231.37%
[illegible] 233.527†	45.0	0.0005	mg/L	0.00020	0.0005	mg/L	0.00020	41.81%
[illegible]d 226.502†	-30.5	-0.0002	mg/L	0.00000	-0.0002	mg/L	0.00000	2.69%
Cr 267.716†	-18.2	-0.0001	mg/L	0.00011	-0.0001	mg/L	0.00011	75.13%
Pb 220.353†	-9.1	-0.0007	mg/L	0.00031	-0.0007	mg/L	0.00031	43.51%
Se 196.026†	4.9	0.0019	mg/L	0.00073	0.0019	mg/L	0.00073	37.51%
Ag 328.068†	-159.3	-0.0006	mg/L	0.00013	-0.0006	mg/L	0.00013	20.84%
Cu 327.393†	-775.7	-0.0047	mg/L	0.00022	-0.0047	mg/L	0.00022	4.82%
Ni 231.604†	-35.9	-0.0006	mg/L	0.00018	-0.0006	mg/L	0.00018	29.88%
Zn 206.200†	-53.3	-0.0013	mg/L	0.00016	-0.0013	mg/L	0.00016	12.65%
Be 313.107†	-86.2	0.0000	mg/L	0.00002	0.0000	mg/L	0.00002	209.59%
Sb 206.836†	7.1	0.0016	mg/L	0.00126	0.0016	mg/L	0.00126	76.80%
Tl 190.801†	-5.1	-0.0019	mg/L	0.00031	-0.0019	mg/L	0.00031	16.09%

Sequence No.: 4 **Autosampler Location: 10**
Sample ID: 116223-1-1/5 **Date Collected: 9/18/03 12:49:00 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:57:50 PM,**

Mean Data: 116223-1-1/5

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	791482.6	106.0	%	0.67				0.63%
Sc 361.383	1619786.9	107.5	%	1.25				1.16%
As 188.979†	8.9	0.0045	mg/L	0.00173	0.0045	mg/L	0.00173	38.74%
Ba 233.527†	41034.9	0.4272	mg/L	0.00599	0.4272	mg/L	0.00599	1.40%
Cd 226.502†	12.4	0.0001	mg/L	0.00005	0.0001	mg/L	0.00005	67.90%
Cr 267.716†	707.3	0.0054	mg/L	0.00062	0.0054	mg/L	0.00062	11.33%
Pb 220.353†	128.3	0.0101	mg/L	0.00009	0.0101	mg/L	0.00009	0.94%
[illegible]e 196.026†	6.2	0.0025	mg/L	0.00263	0.0025	mg/L	0.00263	105.98%
[illegible]g 328.068†	-261.5	-0.0010	mg/L	0.00018	-0.0010	mg/L	0.00018	17.35%
Cu 327.393†	1711.9	0.0103	mg/L	0.00040	0.0103	mg/L	0.00040	3.94%
Ni 231.604†	347.5	0.0059	mg/L	0.00011	0.0059	mg/L	0.00011	1.93%
Zn 206.200†	3045.2	0.0718	mg/L	0.00090	0.0718	mg/L	0.00090	1.26%

Be 313.107†	3130.9	0.0004	mg/L	0.00002	0.0004	mg/L	0.00002 5.35%
Sb 206.836†	1.2	0.0003	mg/L	0.00158	0.0003	mg/L	0.00158 563.90%
Tl 190.801†	-14.3	-0.0054	mg/L	0.00026	-0.0054	mg/L	0.00026 4.80%

Sequence No.: 5 **Autosampler Location: 11**
Sample ID: 116223-1 **Date Collected: 9/18/03 12:51:23 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:57:53 PM,**

Mean Data: 116223-1

Analyte	Mean Corrected Intensity	Conc.	Calib Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	794869.9	106.4	%	1.21				1.13%
Sc 361.383	1658632.9	110.1	%	2.97				2.70%
As 188.979†	56.9	0.0285	mg/L	0.00203	0.0285	mg/L	0.00203	7.13%
Ba 233.527†	200171.4	2.084	mg/L	0.0749	2.084	mg/L	0.0749	3.59%
Cd 226.502†	454.7	0.0025	mg/L	0.00008	0.0025	mg/L	0.00008	3.17%
Cr 267.716†	3496.2	0.0269	mg/L	0.00086	0.0269	mg/L	0.00086	3.18%
Pb 220.353†	689.8	0.0541	mg/L	0.00175	0.0541	mg/L	0.00175	3.23%
Se 196.026†	17.9	0.0071	mg/L	0.00092	0.0071	mg/L	0.00092	12.92%
Ag 328.068†	-261.3	-0.0010	mg/L	0.00056	-0.0010	mg/L	0.00056	54.38%
Cu 327.393†	14222.2	0.0853	mg/L	0.00271	0.0853	mg/L	0.00271	3.17%
Ni 231.604†	1750.8	0.0296	mg/L	0.00062	0.0296	mg/L	0.00062	2.10%
Zn 206.200†	14624.6	0.3448	mg/L	0.00943	0.3448	mg/L	0.00943	2.73%
Be 313.107†	17491.0	0.0020	mg/L	0.00010	0.0020	mg/L	0.00010	5.10%
Sb 206.836†	27.9	0.0065	mg/L	0.00052	0.0065	mg/L	0.00052	8.12%
Tl 190.801†	-43.7	-0.0163	mg/L	0.00183	-0.0163	mg/L	0.00183	11.22%

Sequence No.: 6 **Autosampler Location: 12**
Sample ID: 116223-1d **Date Collected: 9/18/03 12:54:36 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:57:54 PM,**

Mean Data: 116223-1d

Analyte	Mean Corrected Intensity	Conc.	Calib Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	787112.6	105.4	%	1.64				1.55%
Sc 361.383	1631327.7	108.3	%	1.79				1.65%
As 188.979†	58.3	0.0292	mg/L	0.00234	0.0292	mg/L	0.00234	8.01%
Ba 233.527†	201982.7	2.103	mg/L	0.0538	2.103	mg/L	0.0538	2.56%
Cd 226.502†	412.8	0.0022	mg/L	0.00006	0.0022	mg/L	0.00006	2.63%
Cr 267.716†	3551.3	0.0273	mg/L	0.00066	0.0273	mg/L	0.00066	2.43%
Pb 220.353†	717.3	0.0562	mg/L	0.00101	0.0562	mg/L	0.00101	1.79%
Se 196.026†	14.8	0.0059	mg/L	0.00109	0.0059	mg/L	0.00109	18.45%
Ag 328.068†	-245.0	-0.0010	mg/L	0.00005	-0.0010	mg/L	0.00005	5.49%
Cu 327.393†	12789.4	0.0767	mg/L	0.00120	0.0767	mg/L	0.00120	1.56%
Ni 231.604†	1756.3	0.0297	mg/L	0.00060	0.0297	mg/L	0.00060	2.03%
Zn 206.200†	16362.4	0.3858	mg/L	0.00819	0.3858	mg/L	0.00819	2.12%
Be 313.107†	18618.1	0.0021	mg/L	0.00007	0.0021	mg/L	0.00007	3.17%
Sb 206.836†	21.6	0.0050	mg/L	0.00094	0.0050	mg/L	0.00094	18.90%
Tl 190.801†	-44.0	-0.0164	mg/L	0.00174	-0.0164	mg/L	0.00174	10.57%

Sequence No.: 7 **Autosampler Location: 13**
Sample ID: 116223-1dd **Date Collected: 9/18/03 12:57:48 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:57:56 PM,**

Mean Data: 116223-1dd

Analyte	Mean Corrected Intensity	Conc.	Calib Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	779369.5	104.3	%	0.77				0.74%
Sc 361.383	1613463.5	107.1	%	1.81				1.69%

As 188.979†	55.6	0.0278	mg/L	0.00177	0.0278	mg/L	0.00177	6.35%
Ba 233.527†	190587.8	1.984	mg/L	0.0498	1.984	mg/L	0.0498	2.51%
Cd 226.502†	395.8	0.0022	mg/L	0.00006	0.0022	mg/L	0.00006	2.72%
[illegible] 267.716†	3616.3	0.0278	mg/L	0.00059	0.0278	mg/L	0.00059	2.10%
[illegible] 220.353†	764.5	0.0599	mg/L	0.00159	0.0599	mg/L	0.00159	2.66%
Se 196.026†	15.7	0.0063	mg/L	0.00019	0.0063	mg/L	0.00019	3.10%
Ag 328.068†	-236.0	-0.0009	mg/L	0.00034	-0.0009	mg/L	0.00034	36.57%
Cu 327.393†	13303.6	0.0798	mg/L	0.00156	0.0798	mg/L	0.00156	1.96%
Ni 231.604†	1735.2	0.0294	mg/L	0.00067	0.0294	mg/L	0.00067	2.28%
Zn 206.200†	15621.8	0.3684	mg/L	0.00776	0.3684	mg/L	0.00776	2.11%
Be 313.107†	17373.8	0.0020	mg/L	0.00008	0.0020	mg/L	0.00008	4.01%
Sb 206.836†	12.3	0.0029	mg/L	0.00080	0.0029	mg/L	0.00080	28.09%
Tl 190.801†	-46.8	-0.0175	mg/L	0.00075	-0.0175	mg/L	0.00075	4.29%

Sequence No.: 8 **Autosampler Location: 14**
Sample ID: 116223-1s **Date Collected: 9/18/03 1:01:00 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:57:58 PM,**

Mean Data: 116223-1s

Analyte	Mean Corrected Intensity	Conc.	Calib Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	792035.0	106.0	%	1.59				1.50%
Sc 361.383	1662260.4	110.4	%	0.91				0.82%
As 188.979†	7333.7	3.671	mg/L	0.0185	3.671	mg/L	0.0185	0.50%
Ba 233.527†	621886.4	6.474	mg/L	0.0673	6.474	mg/L	0.0673	1.04%
Cd 226.502†	19016.3	0.1034	mg/L	0.00053	0.1034	mg/L	0.00053	0.51%
Cr 267.716†	52088.7	0.4006	mg/L	0.00145	0.4006	mg/L	0.00145	0.36%
Pb 220.353†	12513.3	0.9812	mg/L	0.00221	0.9812	mg/L	0.00221	0.22%
Se 196.026†	8907.9	3.549	mg/L	0.0041	3.549	mg/L	0.0041	0.12%
Ag 328.068†	137215.8	0.5367	mg/L	0.00610	0.5367	mg/L	0.00610	1.14%
Cu 327.393†	91309.9	0.5478	mg/L	0.00690	0.5478	mg/L	0.00690	1.26%
[illegible] 231.604†	55739.1	0.9435	mg/L	0.00124	0.9435	mg/L	0.00124	0.13%
[illegible] 206.200†	61805.7	1.457	mg/L	0.0026	1.457	mg/L	0.0026	0.18%
Be 313.107†	805886.1	0.0916	mg/L	0.00096	0.0916	mg/L	0.00096	1.05%
Sb 206.836†	10692.3	2.471	mg/L	0.0121	2.471	mg/L	0.0121	0.49%
Tl 190.801†	9349.1	3.494	mg/L	0.0195	3.494	mg/L	0.0195	0.56%

Sequence No.: 9 **Autosampler Location: 15**
Sample ID: 116223-1sd **Date Collected: 9/18/03 1:03:15 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:57:59 PM,**

Mean Data: 116223-1sd

Analyte	Mean Corrected Intensity	Conc.	Calib Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	801251.2	107.3	%	1.05				0.98%
Sc 361.383	1681015.4	111.6	%	1.68				1.50%
As 188.979†	7257.6	3.633	mg/L	0.0705	3.633	mg/L	0.0705	1.94%
Ba 233.527†	578031.1	6.017	mg/L	0.0791	6.017	mg/L	0.0791	1.31%
Cd 226.502†	17480.2	0.0950	mg/L	0.00152	0.0950	mg/L	0.00152	1.60%
Cr 267.716†	51573.3	0.3966	mg/L	0.00824	0.3966	mg/L	0.00824	2.08%
Pb 220.353†	12075.9	0.9469	mg/L	0.01611	0.9469	mg/L	0.01611	1.70%
Se 196.026†	8751.3	3.486	mg/L	0.0441	3.486	mg/L	0.0441	1.26%
Ag 328.068†	138639.2	0.5423	mg/L	0.00714	0.5423	mg/L	0.00714	1.32%
Cu 327.393†	91441.6	0.5486	mg/L	0.00839	0.5486	mg/L	0.00839	1.53%
Ni 231.604†	55107.0	0.9328	mg/L	0.01924	0.9328	mg/L	0.01924	2.06%
Zn 206.200†	52315.2	1.234	mg/L	0.0267	1.234	mg/L	0.0267	2.17%
Be 313.107†	814652.9	0.0926	mg/L	0.00138	0.0926	mg/L	0.00138	1.49%
Sb 206.836†	10390.2	2.401	mg/L	0.0486	2.401	mg/L	0.0486	2.02%
Tl 190.801†	9344.0	3.492	mg/L	0.0743	3.492	mg/L	0.0743	2.13%

Sequence No.: 10 **Autosampler Location: 16**
Sample ID: 116223-1ps **Date Collected: 9/18/03 1:05:31 PM**

Analyst:
Sample Wt:
Dilution:
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:01 PM,

Mean Data: 116223-1ps

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	768309.9	102.9	%	1.10				1.07%
Sc 361.383	1619425.5	107.5	%	0.90				0.84%
As 188.979†	7383.2	3.696	mg/L	0.0630	3.696	mg/L	0.0630	1.70%
Ba 233.527†	529575.9	5.513	mg/L	0.0581	5.513	mg/L	0.0581	1.05%
Cd 226.502†	17210.6	0.0936	mg/L	0.00170	0.0936	mg/L	0.00170	1.81%
Cr 267.716†	55097.1	0.4237	mg/L	0.00846	0.4237	mg/L	0.00846	2.00%
Pb 220.353†	12337.0	0.9674	mg/L	0.02187	0.9674	mg/L	0.02187	2.26%
Se 196.026†	9020.1	3.593	mg/L	0.0789	3.593	mg/L	0.0789	2.20%
Ag 328.068†	28121.7	0.1100	mg/L	0.00166	0.1100	mg/L	0.00166	1.51%
Cu 327.393†	78649.6	0.4719	mg/L	0.00675	0.4719	mg/L	0.00675	1.43%
Ni 231.604†	55285.7	0.9358	mg/L	0.01847	0.9358	mg/L	0.01847	1.97%
Zn 206.200†	49427.8	1.165	mg/L	0.0215	1.165	mg/L	0.0215	1.85%
Be 313.107†	796132.6	0.0905	mg/L	0.00112	0.0905	mg/L	0.00112	1.24%
Sb 206.836†	9764.1	2.257	mg/L	0.0493	2.257	mg/L	0.0493	2.18%
Tl 190.801†	9711.9	3.630	mg/L	0.0942	3.630	mg/L	0.0942	2.60%

Sequence No.: 11
Sample ID: lcs-soil
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 17
Date Collected: 9/18/03 1:07:48 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:03 PM,

Mean Data: lcs-soil

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
[illegible] 261.542	792924.6	106.2	%	1.97				1.86%
[illegible] 361.383	1641659.6	109.0	%	3.39				3.11%
As 188.979†	1069.5	0.5354	mg/L	0.01499	0.5354	mg/L	0.01499	2.80%
Ba 233.527†	155957.0	1.623	mg/L	0.0501	1.623	mg/L	0.0501	3.09%
Cd 226.502†	85636.3	0.4656	mg/L	0.01464	0.4656	mg/L	0.01464	3.14%
Cr 267.716†	106501.7	0.8190	mg/L	0.02505	0.8190	mg/L	0.02505	3.06%
Pb 220.353†	6446.0	0.5055	mg/L	0.01614	0.5055	mg/L	0.01614	3.19%
Se 196.026†	2057.9	0.8198	mg/L	0.02492	0.8198	mg/L	0.02492	3.04%
Ag 328.068†	12718.5	0.0497	mg/L	0.00865	0.0497	mg/L	0.00865	17.38%
Cu 327.393†	88610.7	0.5316	mg/L	0.01720	0.5316	mg/L	0.01720	3.24%
Ni 231.604†	36613.0	0.6197	mg/L	0.01984	0.6197	mg/L	0.01984	3.20%
Zn 206.200†	36724.4	0.8660	mg/L	0.02708	0.8660	mg/L	0.02708	3.13%
Be 313.107†	5512889.8	0.6266	mg/L	0.03152	0.6266	mg/L	0.03152	5.03%
Sb 206.836†	3397.6	0.7852	mg/L	0.02031	0.7852	mg/L	0.02031	2.59%
Tl 190.801†	2034.0	0.7602	mg/L	0.02498	0.7602	mg/L	0.02498	3.29%

Sequence No.: 12
Sample ID: mb sp036
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 18
Date Collected: 9/18/03 1:11:08 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:04 PM,

Mean Data: mb sp036

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	767447.1	102.7	%	0.50				0.49%
Sc 361.383	1555396.9	103.3	%	1.16				1.12%
As 188.979†	0.9	0.0004	mg/L	0.00057	0.0004	mg/L	0.00057	130.69%
Ba 233.527†	58.6	0.0006	mg/L	0.00008	0.0006	mg/L	0.00008	13.06%
Cd 226.502†	2143.6	0.0117	mg/L	0.00442	0.0117	mg/L	0.00442	37.97%
[illegible] 267.716†	50.4	0.0004	mg/L	0.00065	0.0004	mg/L	0.00065	166.62%
Pb 220.353†	324.5	0.0254	mg/L	0.00724	0.0254	mg/L	0.00724	28.44%
Se 196.026†	5.2	0.0021	mg/L	0.00121	0.0021	mg/L	0.00121	58.05%
Ag 328.068†	-23.9	-0.0001	mg/L	0.00008	-0.0001	mg/L	0.00008	89.11%

Cu 327.393†	10453.8	0.0627 mg/L	0.00478	0.0627 mg/L	0.00478	7.62%
Ni 231.604†	4.4	0.0001 mg/L	0.00008	0.0001 mg/L	0.00008	105.45%
Zn 206.200†	1519.3	0.0358 mg/L	0.00445	0.0358 mg/L	0.00445	12.42%
[illegible] 313.107†	390.7	0.0000 mg/L	0.00001	0.0000 mg/L	0.00001	21.99%
206.836†	58.0	0.0134 mg/L	0.00179	0.0134 mg/L	0.00179	13.38%
Tl 190.801†	137.4	0.0514 mg/L	0.01043	0.0514 mg/L	0.01043	20.31%

Sequence No.: 13 **Autosampler Location: 5**
Sample ID: CCV **Date Collected: 9/18/03 1:13:31 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:06 PM,**

Mean Data: CCV

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	769040.1	103.0	%	3.58				3.48%
Sc 361.383	1594156.3	105.8	%	3.45				3.26%
As 188.979†	9594.5	4.803	mg/L	0.2025	4.803	mg/L	0.2025	4.22%
QC value within limits for As 188.979 Recovery = 96.06%								
Ba 233.527†	46535.2	0.4844	mg/L	0.02008	0.4844	mg/L	0.02008	4.15%
QC value within limits for Ba 233.527 Recovery = 96.88%								
Cd 226.502†	88447.1	0.4809	mg/L	0.02106	0.4809	mg/L	0.02106	4.38%
QC value within limits for Cd 226.502 Recovery = 96.18%								
Cr 267.716†	63516.4	0.4885	mg/L	0.02069	0.4885	mg/L	0.02069	4.24%
QC value within limits for Cr 267.716 Recovery = 97.69%								
Pb 220.353†	61726.9	4.840	mg/L	0.2112	4.840	mg/L	0.2112	4.36%
QC value within limits for Pb 220.353 Recovery = 96.81%								
Se 196.026†	12146.8	4.839	mg/L	0.2304	4.839	mg/L	0.2304	4.76%
QC value within limits for Se 196.026 Recovery = 96.78%								
Ag 328.068†	124068.4	0.4853	mg/L	0.02069	0.4853	mg/L	0.02069	4.26%
QC value within limits for Ag 328.068 Recovery = 97.06%								
Cu 327.393†	80645.8	0.4839	mg/L	0.02077	0.4839	mg/L	0.02077	4.29%
QC value within limits for Cu 327.393 Recovery = 96.77%								
[illegible]i 231.604†	28983.1	0.4906	mg/L	0.02050	0.4906	mg/L	0.02050	4.18%
QC value within limits for Ni 231.604 Recovery = 98.12%								
Zn 206.200†	20242.5	0.4773	mg/L	0.02067	0.4773	mg/L	0.02067	4.33%
QC value within limits for Zn 206.200 Recovery = 95.46%								
Be 313.107†	4256825.1	0.4838	mg/L	0.02010	0.4838	mg/L	0.02010	4.15%
QC value within limits for Be 313.107 Recovery = 96.77%								
Sb 206.836†	20427.7	4.721	mg/L	0.2196	4.721	mg/L	0.2196	4.65%
QC value within limits for Sb 206.836 Recovery = 94.42%								
Tl 190.801†	13197.0	4.932	mg/L	0.1915	4.932	mg/L	0.1915	3.88%
QC value within limits for Tl 190.801 Recovery = 98.65%								

All analytes passed QC.

Sequence No.: 14 **Autosampler Location: 6**
Sample ID: CCB **Date Collected: 9/18/03 1:15:51 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:07 PM,**

Mean Data: CCB

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	767098.6	102.7	%	3.04				2.96%
Sc 361.383	1537557.1	102.1	%	3.28				3.21%
As 188.979†	-4.8	-0.0024	mg/L	0.00074	-0.0024	mg/L	0.00074	30.70%
QC value within limits for As 188.979 Recovery = Not calculated								
Ba 233.527†	36.1	0.0004	mg/L	0.00032	0.0004	mg/L	0.00032	84.69%
QC value within limits for Ba 233.527 Recovery = Not calculated								
Cd 226.502†	-16.9	-0.0001	mg/L	0.00005	-0.0001	mg/L	0.00005	52.22%
QC value within limits for Cd 226.502 Recovery = Not calculated								
[illegible]r 267.716†	27.9	0.0002	mg/L	0.00008	0.0002	mg/L	0.00008	38.44%
QC value within limits for Cr 267.716 Recovery = Not calculated								
Pb 220.353†	-8.1	-0.0006	mg/L	0.00092	-0.0006	mg/L	0.00092	144.62%
QC value within limits for Pb 220.353 Recovery = Not calculated								

Se 196.026†	2.1	0.0008 mg/L	0.00046	0.0008 mg/L	0.00046	53.74%
QC value within limits for Se 196.026 Recovery = Not calculated						
Ag 328.068†	-137.6	-0.0005 mg/L	0.00041	-0.0005 mg/L	0.00041	77.03%
QC value within limits for Ag 328.068 Recovery = Not calculated						
327.393†	-957.6	-0.0057 mg/L	0.00083	-0.0057 mg/L	0.00083	14.44%
QC value within limits for Cu 327.393 Recovery = Not calculated						
Ni 231.604†	-31.4	-0.0005 mg/L	0.00011	-0.0005 mg/L	0.00011	21.03%
QC value within limits for Ni 231.604 Recovery = Not calculated						
Zn 206.200†	-87.7	-0.0021 mg/L	0.00036	-0.0021 mg/L	0.00036	17.63%
QC value within limits for Zn 206.200 Recovery = Not calculated						
Be 313.107†	302.2	0.0000 mg/L	0.00004	0.0000 mg/L	0.00004	101.92%
QC value within limits for Be 313.107 Recovery = Not calculated						
Sb 206.836†	21.3	0.0049 mg/L	0.00235	0.0049 mg/L	0.00235	47.72%
QC value within limits for Sb 206.836 Recovery = Not calculated						
Tl 190.801†	5.8	0.0022 mg/L	0.00080	0.0022 mg/L	0.00080	36.85%
QC value within limits for Tl 190.801 Recovery = Not calculated						

All analytes passed QC.

Sequence No.: 15
Sample ID: mb sp036
Analyst:
Sample Wt:
Dilution:

Autosampler Location: 19
Date Collected: 9/18/03 1:18:19 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:09 PM,

Mean Data: mb sp036

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	768637.6	102.9	%	3.51				3.41%
Sc 361.383	1556720.3	103.4	%	3.86				3.74%
As 188.979†	-5.4	-0.0027	mg/L	0.00163	-0.0027	mg/L	0.00163	60.69%
Ba 233.527†	50.0	0.0005	mg/L	0.00036	0.0005	mg/L	0.00036	68.97%
Cd 226.502†	-30.8	-0.0002	mg/L	0.00001	-0.0002	mg/L	0.00001	5.43%
Cr 267.716†	-36.7	-0.0003	mg/L	0.00028	-0.0003	mg/L	0.00028	97.95%
[illegible]b 220.353†	-29.2	-0.0023	mg/L	0.00048	-0.0023	mg/L	0.00048	21.17%
[illegible]e 196.026†	1.9	0.0008	mg/L	0.00257	0.0008	mg/L	0.00257	338.00%
Ag 328.068†	-277.2	-0.0011	mg/L	0.00018	-0.0011	mg/L	0.00018	16.69%
Cu 327.393†	-1109.7	-0.0067	mg/L	0.00037	-0.0067	mg/L	0.00037	5.56%
Ni 231.604†	-43.3	-0.0007	mg/L	0.00010	-0.0007	mg/L	0.00010	14.11%
Zn 206.200†	-64.6	-0.0015	mg/L	0.00035	-0.0015	mg/L	0.00035	23.24%
Be 313.107†	-142.7	0.0000	mg/L	0.00004	0.0000	mg/L	0.00004	275.92%
Sb 206.836†	-4.9	-0.0011	mg/L	0.00197	-0.0011	mg/L	0.00197	173.52%
Tl 190.801†	1.0	0.0004	mg/L	0.00191	0.0004	mg/L	0.00191	516.45%

Sequence No.: 16
Sample ID: 116223-2
Analyst:
Sample Wt:
Dilution:

Autosampler Location: 20
Date Collected: 9/18/03 1:20:43 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:11 PM,

Mean Data: 116223-2

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	797061.0	106.7	%	1.25				1.17%
Sc 361.383	1664943.4	110.5	%	4.55				4.12%
As 188.979†	25.9	0.0130	mg/L	0.00083	0.0130	mg/L	0.00083	6.40%
Ba 233.527†	99183.7	1.032	mg/L	0.0438	1.032	mg/L	0.0438	4.25%
Cd 226.502†	46.9	0.0003	mg/L	0.00007	0.0003	mg/L	0.00007	27.09%
Cr 267.716†	1468.3	0.0113	mg/L	0.00067	0.0113	mg/L	0.00067	5.92%
Pb 220.353†	625.6	0.0491	mg/L	0.00275	0.0491	mg/L	0.00275	5.61%
Se 196.026†	3.4	0.0013	mg/L	0.00022	0.0013	mg/L	0.00022	16.57%
Ag 328.068†	-376.4	-0.0015	mg/L	0.00024	-0.0015	mg/L	0.00024	16.34%
Cu 327.393†	12178.8	0.0731	mg/L	0.00278	0.0731	mg/L	0.00278	3.80%
Ni 231.604†	767.2	0.0130	mg/L	0.00060	0.0130	mg/L	0.00060	4.59%
[illegible]n 206.200†	4466.1	0.1053	mg/L	0.00461	0.1053	mg/L	0.00461	4.38%
Be 313.107†	12361.5	0.0014	mg/L	0.00011	0.0014	mg/L	0.00011	7.78%
Sb 206.836†	26.8	0.0062	mg/L	0.00084	0.0062	mg/L	0.00084	13.60%
Tl 190.801†	-4.9	-0.0018	mg/L	0.00220	-0.0018	mg/L	0.00220	119.43%

Sequence No.: 17
Sample ID: 116198-1
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 21
Date Collected: 9/18/03 1:23:58 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:14 PM,

Mean Data: 116198-1

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	789038.7	105.6	%	0.89				0.84%
Sc 361.383	1695140.4	112.5	%	3.39				3.01%
As 188.979†	47378.7	23.72	mg/L	0.726	23.72	mg/L	0.726	3.06%
Ba 233.527†	16630.4	0.1731	mg/L	0.00510	0.1731	mg/L	0.00510	2.95%
Cd 226.502†	6517.7	0.0354	mg/L	0.00109	0.0354	mg/L	0.00109	3.07%
Cr 267.716†	53552.6	0.4118	mg/L	0.01431	0.4118	mg/L	0.01431	3.47%
Pb 220.353†	58767.7	4.608	mg/L	0.1404	4.608	mg/L	0.1404	3.05%
Se 196.026†	22.6	0.0090	mg/L	0.00042	0.0090	mg/L	0.00042	4.66%
Ag 328.068†	8979.1	0.0351	mg/L	0.00136	0.0351	mg/L	0.00136	3.89%
Cu 327.393†	1098983.6	6.594	mg/L	0.2551	6.594	mg/L	0.2551	3.87%
Ni 231.604†	3711.3	0.0628	mg/L	0.00196	0.0628	mg/L	0.00196	3.12%
Zn 206.200†	46395.0	1.094	mg/L	0.0370	1.094	mg/L	0.0370	3.39%
Be 313.107†	757.9	0.0001	mg/L	0.00004	0.0001	mg/L	0.00004	48.87%
Sb 206.836†	3070.9	0.7097	mg/L	0.02276	0.7097	mg/L	0.02276	3.21%
Tl 190.801†	45.4	0.0170	mg/L	0.00176	0.0170	mg/L	0.00176	10.38%

Sequence No.: 18
Sample ID: 116198-2
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 22
Date Collected: 9/18/03 1:27:17 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:15 PM,

Mean Data: 116198-2

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	787010.6	105.4	%	1.46				1.39%
Sc 361.383	1694955.7	112.5	%	2.66				2.37%
As 188.979†	62098.9	31.09	mg/L	1.102	31.09	mg/L	1.102	3.54%
Ba 233.527†	9088.4	0.0946	mg/L	0.00238	0.0946	mg/L	0.00238	2.51%
Cd 226.502†	7106.2	0.0386	mg/L	0.00151	0.0386	mg/L	0.00151	3.90%
Cr 267.716†	92052.2	0.7079	mg/L	0.02585	0.7079	mg/L	0.02585	3.65%
Pb 220.353†	30615.3	2.401	mg/L	0.0865	2.401	mg/L	0.0865	3.60%
Se 196.026†	9.4	0.0037	mg/L	0.00196	0.0037	mg/L	0.00196	52.49%
Ag 328.068†	13059.4	0.0511	mg/L	0.00205	0.0511	mg/L	0.00205	4.01%
Cu 327.393†	540780.4	3.245	mg/L	0.0831	3.245	mg/L	0.0831	2.56%
Ni 231.604†	2874.5	0.0487	mg/L	0.00139	0.0487	mg/L	0.00139	2.85%
Zn 206.200†	171140.8	4.035	mg/L	0.1374	4.035	mg/L	0.1374	3.41%
Be 313.107†	986.3	0.0001	mg/L	0.00002	0.0001	mg/L	0.00002	19.50%
Sb 206.836†	7249.5	1.675	mg/L	0.0459	1.675	mg/L	0.0459	2.74%
Tl 190.801†	49.8	0.0186	mg/L	0.00221	0.0186	mg/L	0.00221	11.90%

Sequence No.: 19
Sample ID: 116198-3
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 23
Date Collected: 9/18/03 1:30:37 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:16 PM,

Mean Data: 116198-3

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	787432.7	105.4	%	1.04				0.99%
Sc 361.383	1722216.5	114.3	%	1.76				1.54%
As 188.979†	54995.0	27.53	mg/L	0.741	27.53	mg/L	0.741	2.69%
Ba 233.527†	8631.8	0.0899	mg/L	0.00138	0.0899	mg/L	0.00138	1.53%
Cd 226.502†	3243.3	0.0176	mg/L	0.00034	0.0176	mg/L	0.00034	1.92%

Cr 267.716†	89024.2	0.6846 mg/L	0.01912	0.6846 mg/L	0.01912	2.79%
Pb 220.353†	17986.7	1.410 mg/L	0.0235	1.410 mg/L	0.0235	1.67%
Se 196.026†	7.0	0.0028 mg/L	0.00089	0.0028 mg/L	0.00089	31.77%
[illegible] 328.068†	4892.6	0.0191 mg/L	0.00076	0.0191 mg/L	0.00076	3.97%
[illegible] 327.393†	2139889.7	12.84 mg/L	0.385	12.84 mg/L	0.385	3.00%
[illegible] 231.604†	3017.6	0.0511 mg/L	0.00079	0.0511 mg/L	0.00079	1.54%
Zn 206.200†	75876.0	1.789 mg/L	0.0497	1.789 mg/L	0.0497	2.78%
Be 313.107†	2423.3	0.0003 mg/L	0.00003	0.0003 mg/L	0.00003	9.55%
Sb 206.836†	4879.6	1.128 mg/L	0.0215	1.128 mg/L	0.0215	1.90%
Tl 190.801†	47.7	0.0178 mg/L	0.00101	0.0178 mg/L	0.00101	5.70%

Sequence No.: 20 **Autosampler Location: 24**
Sample ID: 116198-4 **Date Collected: 9/18/03 1:33:57 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:18 PM,**

Mean Data: 116198-4

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	787425.6	105.4	%	0.52				0.49%
Sc 361.383	1703390.6	113.1	%	1.45				1.28%
As 188.979†	59261.6	29.67	mg/L	0.791	29.67	mg/L	0.791	2.67%
Ba 233.527†	5458.5	0.0568	mg/L	0.00082	0.0568	mg/L	0.00082	1.44%
Cd 226.502†	11804.4	0.0642	mg/L	0.00191	0.0642	mg/L	0.00191	2.98%
Cr 267.716†	83544.6	0.6425	mg/L	0.01772	0.6425	mg/L	0.01772	2.76%
Pb 220.353†	22006.0	1.726	mg/L	0.0459	1.726	mg/L	0.0459	2.66%
Se 196.026†	7.4	0.0030	mg/L	0.00175	0.0030	mg/L	0.00175	59.33%
Ag 328.068†	13476.2	0.0527	mg/L	0.00147	0.0527	mg/L	0.00147	2.79%
Cu 327.393†	1937118.5	11.62	mg/L	0.332	11.62	mg/L	0.332	2.85%
Ni 231.604†	3273.6	0.0554	mg/L	0.00088	0.0554	mg/L	0.00088	1.59%
Zn 206.200†	78174.3	1.843	mg/L	0.0481	1.843	mg/L	0.0481	2.61%
Be 313.107†	768.1	0.0001	mg/L	0.00001	0.0001	mg/L	0.00001	16.83%
[illegible] 206.836†	4395.9	1.016	mg/L	0.0182	1.016	mg/L	0.0182	1.79%
[illegible] 190.801†	40.7	0.0152	mg/L	0.00114	0.0152	mg/L	0.00114	7.51%

Sequence No.: 21 **Autosampler Location: 25**
Sample ID: 116198-5 **Date Collected: 9/18/03 1:37:11 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:20 PM,**

Mean Data: 116198-5

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	769674.8	103.0	%	2.05				1.99%
Sc 361.383	1598413.7	106.1	%	1.01				0.95%
As 188.979†	231.1	0.1157	mg/L	0.00345	0.1157	mg/L	0.00345	2.98%
Ba 233.527†	16157.3	0.1682	mg/L	0.00095	0.1682	mg/L	0.00095	0.56%
Cd 226.502†	396.0	0.0022	mg/L	0.00007	0.0022	mg/L	0.00007	3.29%
Cr 267.716†	16694.4	0.1284	mg/L	0.00226	0.1284	mg/L	0.00226	1.76%
Pb 220.353†	831.6	0.0652	mg/L	0.00122	0.0652	mg/L	0.00122	1.86%
Se 196.026†	-12.7	-0.0051	mg/L	0.00108	-0.0051	mg/L	0.00108	21.43%
Ag 328.068†	-253.0	-0.0010	mg/L	0.00017	-0.0010	mg/L	0.00017	16.88%
Cu 327.393†	111791.0	0.6707	mg/L	0.00451	0.6707	mg/L	0.00451	0.67%
Ni 231.604†	7561.5	0.1280	mg/L	0.00070	0.1280	mg/L	0.00070	0.55%
Zn 206.200†	16779.5	0.3957	mg/L	0.00248	0.3957	mg/L	0.00248	0.63%
Be 313.107†	2267.3	0.0003	mg/L	0.00001	0.0003	mg/L	0.00001	3.51%
Sb 206.836†	34.5	0.0080	mg/L	0.00040	0.0080	mg/L	0.00040	4.97%
Tl 190.801†	23.3	0.0087	mg/L	0.00117	0.0087	mg/L	0.00117	13.44%

[illegible]equence No.: 22 **Autosampler Location: 26**
[illegible]ample ID: 116198-6 **Date Collected: 9/18/03 1:40:21 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:21 PM,**

Mean Data: 116198-6

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	779464.4	104.3	%	0.36				0.35%
Sc 361.383	1593218.6	105.8	%	1.19				1.13%
As 188.979†	100641.0	50.38	mg/L	0.877	50.38	mg/L	0.877	1.74%
Ba 233.527†	33660.3	0.3504	mg/L	0.00593	0.3504	mg/L	0.00593	1.69%
Cd 226.502†	55971.0	0.3043	mg/L	0.00536	0.3043	mg/L	0.00536	1.76%
Cr 267.716†	98587.9	0.7582	mg/L	0.01459	0.7582	mg/L	0.01459	1.92%
Pb 220.353†	322472.3	25.29	mg/L	0.451	25.29	mg/L	0.451	1.78%
Se 196.026†	129.5	0.0516	mg/L	0.00135	0.0516	mg/L	0.00135	2.62%
Ag 328.068†	26061.2	0.1019	mg/L	0.00233	0.1019	mg/L	0.00233	2.28%
Cu 327.393†	14259853.3	85.56	mg/L	1.397	85.56	mg/L	1.397	1.63%
Ni 231.604†	4682.6	0.0793	mg/L	0.00083	0.0793	mg/L	0.00083	1.05%
Zn 206.200†	318797.2	7.517	mg/L	0.1429	7.517	mg/L	0.1429	1.90%
Be 313.107†	4199.1	0.0005	mg/L	0.00002	0.0005	mg/L	0.00002	3.65%
Sb 206.836†	2994.4	0.6920	mg/L	0.01054	0.6920	mg/L	0.01054	1.52%
Tl 190.801†	101.7	0.0380	mg/L	0.00264	0.0380	mg/L	0.00264	6.96%

Sequence No.: 23
Sample ID: mb sp036
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 27
Date Collected: 9/18/03 1:43:42 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:23 PM,

Mean Data: mb sp036

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	756363.7	101.3	%	0.38				0.37%
Sc 361.383	1514079.9	100.5	%	0.49				0.49%
As 188.979†	55.6	0.0278	mg/L	0.00558	0.0278	mg/L	0.00558	20.06%
Ba 233.527†	15.3	0.0002	mg/L	0.00005	0.0002	mg/L	0.00005	28.31%
Cd 226.502†	-32.4	-0.0002	mg/L	0.00005	-0.0002	mg/L	0.00005	26.38%
Cr 267.716†	47.9	0.0004	mg/L	0.00027	0.0004	mg/L	0.00027	74.46%
Pb 220.353†	36.0	0.0028	mg/L	0.00119	0.0028	mg/L	0.00119	42.08%
Se 196.026†	1.5	0.0006	mg/L	0.00211	0.0006	mg/L	0.00211	346.05%
Ag 328.068†	-121.6	-0.0005	mg/L	0.00040	-0.0005	mg/L	0.00040	84.50%
Cu 327.393†	8477.6	0.0509	mg/L	0.00469	0.0509	mg/L	0.00469	9.22%
Ni 231.604†	-46.6	-0.0008	mg/L	0.00001	-0.0008	mg/L	0.00001	1.07%
Zn 206.200†	732.5	0.0173	mg/L	0.00032	0.0173	mg/L	0.00032	1.84%
Be 313.107†	-195.6	0.0000	mg/L	0.00000	0.0000	mg/L	0.00000	4.20%
Sb 206.836†	-10.2	-0.0024	mg/L	0.00078	-0.0024	mg/L	0.00078	33.03%
Tl 190.801†	-3.6	-0.0013	mg/L	0.00137	-0.0013	mg/L	0.00137	102.37%

Sequence No.: 24
Sample ID: CCV
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 5
Date Collected: 9/18/03 1:46:01 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:24 PM,

Mean Data: CCV

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	768324.6	102.9	%	3.63				3.53%
Sc 361.383	1594508.5	105.9	%	3.84				3.62%
As 188.979†	9461.5	4.737	mg/L	0.2324	4.737	mg/L	0.2324	4.91%
QC value within limits for As 188.979 Recovery = 94.73%								
Ba 233.527†	45763.5	0.4764	mg/L	0.02353	0.4764	mg/L	0.02353	4.94%
QC value within limits for Ba 233.527 Recovery = 95.28%								
Cd 226.502†	88087.1	0.4789	mg/L	0.02245	0.4789	mg/L	0.02245	4.69%
QC value within limits for Cd 226.502 Recovery = 95.78%								
Cr 267.716†	62427.9	0.4801	mg/L	0.02320	0.4801	mg/L	0.02320	4.83%
QC value within limits for Cr 267.716 Recovery = 96.02%								
Pb 220.353†	61154.4	4.795	mg/L	0.2349	4.795	mg/L	0.2349	4.90%
QC value within limits for Pb 220.353 Recovery = 95.91%								

Se 196.026†	12027.5	4.792 mg/L	0.2282	4.792 mg/L	0.2282	4.76%
QC value within limits for Se 196.026 Recovery = 95.83%						
Ag 328.068†	122974.8	0.4810 mg/L	0.02152	0.4810 mg/L	0.02152	4.47%
QC value within limits for Ag 328.068 Recovery = 96.21%						
327.393†	85588.2	0.5135 mg/L	0.02141	0.5135 mg/L	0.02141	4.17%
QC value within limits for Cu 327.393 Recovery = 102.70%						
Ni 231.604†	28507.4	0.4825 mg/L	0.02391	0.4825 mg/L	0.02391	4.96%
QC value within limits for Ni 231.604 Recovery = 96.51%						
Zn 206.200†	20131.6	0.4747 mg/L	0.02316	0.4747 mg/L	0.02316	4.88%
QC value within limits for Zn 206.200 Recovery = 94.94%						
Be 313.107†	4200099.4	0.4774 mg/L	0.02132	0.4774 mg/L	0.02132	4.47%
QC value within limits for Be 313.107 Recovery = 95.48%						
Sb 206.836†	19984.9	4.619 mg/L	0.2440	4.619 mg/L	0.2440	5.28%
QC value within limits for Sb 206.836 Recovery = 92.37%						
Tl 190.801†	13011.0	4.863 mg/L	0.2528	4.863 mg/L	0.2528	5.20%
QC value within limits for Tl 190.801 Recovery = 97.26%						

All analytes passed QC.

Sequence No.: 25 **Autosampler Location: 6**
Sample ID: CCB **Date Collected: 9/18/03 1:48:21 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:26 PM,**

Mean Data: CCB

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	798518.7	106.9	%	4.64				4.34%
Sc 361.383	1599226.6	106.2	%	4.60				4.33%
As 188.979†	13.3	0.0066	mg/L	0.00093	0.0066	mg/L	0.00093	13.93%
QC value within limits for As 188.979 Recovery = Not calculated								
Ba 233.527†	59.1	0.0006	mg/L	0.00038	0.0006	mg/L	0.00038	61.20%
QC value within limits for Ba 233.527 Recovery = Not calculated								
d 226.502†	-47.3	-0.0003	mg/L	0.00005	-0.0003	mg/L	0.00005	17.70%
QC value within limits for Cd 226.502 Recovery = Not calculated								
Cr 267.716†	-19.2	-0.0001	mg/L	0.00029	-0.0001	mg/L	0.00029	194.06%
QC value within limits for Cr 267.716 Recovery = Not calculated								
Pb 220.353†	-14.1	-0.0011	mg/L	0.00112	-0.0011	mg/L	0.00112	101.18%
QC value within limits for Pb 220.353 Recovery = Not calculated								
Se 196.026†	2.0	0.0008	mg/L	0.00124	0.0008	mg/L	0.00124	152.07%
QC value within limits for Se 196.026 Recovery = Not calculated								
Ag 328.068†	-273.7	-0.0011	mg/L	0.00053	-0.0011	mg/L	0.00053	49.34%
QC value within limits for Ag 328.068 Recovery = Not calculated								
Cu 327.393†	4134.8	0.0248	mg/L	0.00048	0.0248	mg/L	0.00048	1.93%
QC value within limits for Cu 327.393 Recovery = Not calculated								
Ni 231.604†	-44.0	-0.0007	mg/L	0.00014	-0.0007	mg/L	0.00014	18.56%
QC value within limits for Ni 231.604 Recovery = Not calculated								
Zn 206.200†	-43.9	-0.0010	mg/L	0.00041	-0.0010	mg/L	0.00041	39.29%
QC value within limits for Zn 206.200 Recovery = Not calculated								
Be 313.107†	-590.1	-0.0001	mg/L	0.00004	-0.0001	mg/L	0.00004	52.51%
QC value within limits for Be 313.107 Recovery = Not calculated								
Sb 206.836†	16.0	0.0037	mg/L	0.00044	0.0037	mg/L	0.00044	11.97%
QC value within limits for Sb 206.836 Recovery = Not calculated								
Tl 190.801†	-7.6	-0.0029	mg/L	0.00076	-0.0029	mg/L	0.00076	26.74%
QC value within limits for Tl 190.801 Recovery = Not calculated								

All analytes passed QC.

Sequence No.: 26 **Autosampler Location: 28**
Sample ID: mb sp036 **Date Collected: 9/18/03 1:50:49 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:27 PM,**

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ean Data: mb sp036

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	774136.9	103.6	%	2.32				2.24%

Sc 361.383	1563968.2	103.8	%	2.27			2.18%
As 188.979†	12.8	0.0064	mg/L	0.00120	0.0064 mg/L	0.00120	18.79%
Ba 233.527†	46.7	0.0005	mg/L	0.00018	0.0005 mg/L	0.00018	36.92%
[redacted] 226.502†	-47.3	-0.0003	mg/L	0.00004	-0.0003 mg/L	0.00004	16.54%
[redacted] 267.716†	0.9	0.0000	mg/L	0.00056	0.0000 mg/L	0.00056	>999.9%
Pb 220.353†	-17.3	-0.0014	mg/L	0.00038	-0.0014 mg/L	0.00038	28.20%
Se 196.026†	-0.2	-0.0001	mg/L	0.00074	-0.0001 mg/L	0.00074	932.23%
Ag 328.068†	-216.1	-0.0008	mg/L	0.00023	-0.0008 mg/L	0.00023	26.68%
Cu 327.393†	3411.0	0.0205	mg/L	0.00063	0.0205 mg/L	0.00063	3.06%
Ni 231.604†	-48.0	-0.0008	mg/L	0.00017	-0.0008 mg/L	0.00017	20.78%
Zn 206.200†	-42.5	-0.0010	mg/L	0.00013	-0.0010 mg/L	0.00013	12.82%
Be 313.107†	-608.0	-0.0001	mg/L	0.00001	-0.0001 mg/L	0.00001	20.22%
Sb 206.836†	-7.5	-0.0017	mg/L	0.00052	-0.0017 mg/L	0.00052	30.01%
Tl 190.801†	-2.6	-0.0010	mg/L	0.00029	-0.0010 mg/L	0.00029	30.46%

Sequence No.: 27 **Autosampler Location: 29**
Sample ID: 116198-7 **Date Collected: 9/18/03 1:53:10 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:29 PM,**

Mean Data: 116198-7

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	792463.6	106.1	%	0.91				0.86%
Sc 361.383	1707275.2	113.4	%	2.03				1.79%
As 188.979†	91327.2	45.72	mg/L	0.901	45.72	mg/L	0.901	1.97%
Ba 233.527†	14116.6	0.1469	mg/L	0.00295	0.1469	mg/L	0.00295	2.01%
Cd 226.502†	22302.9	0.1213	mg/L	0.00254	0.1213	mg/L	0.00254	2.09%
Cr 267.716†	56412.6	0.4338	mg/L	0.01085	0.4338	mg/L	0.01085	2.50%
Pb 220.353†	47442.1	3.720	mg/L	0.0814	3.720	mg/L	0.0814	2.19%
Se 196.026†	6.3	0.0025	mg/L	0.00059	0.0025	mg/L	0.00059	23.22%
Ag 328.068†	6091.4	0.0238	mg/L	0.00068	0.0238	mg/L	0.00068	2.87%
[redacted] 327.393†	214510.1	1.287	mg/L	0.0177	1.287	mg/L	0.0177	1.38%
[redacted] 231.604†	1116.0	0.0189	mg/L	0.00039	0.0189	mg/L	0.00039	2.07%
Zn 206.200†	37143.1	0.8758	mg/L	0.02076	0.8758	mg/L	0.02076	2.37%
Be 313.107†	732.1	0.0001	mg/L	0.00003	0.0001	mg/L	0.00003	34.10%
Sb 206.836†	5115.0	1.182	mg/L	0.0234	1.182	mg/L	0.0234	1.98%
Tl 190.801†	44.7	0.0167	mg/L	0.00133	0.0167	mg/L	0.00133	7.95%

Sequence No.: 28 **Autosampler Location: 30**
Sample ID: 116198-8 **Date Collected: 9/18/03 1:56:25 PM**
Analyst:
Sample Wt: **Sample Prep Volume:**
Dilution: **Data Type: Reprocessed on 9/18/03 3:58:30 PM,**

Mean Data: 116198-8

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	785912.3	105.2	%	0.82				0.78%
Sc 361.383	1628588.1	108.1	%	1.13				1.05%
As 188.979†	1680.4	0.8413	mg/L	0.00553	0.8413	mg/L	0.00553	0.66%
Ba 233.527†	17193.3	0.1790	mg/L	0.00222	0.1790	mg/L	0.00222	1.24%
Cd 226.502†	4456.5	0.0242	mg/L	0.00033	0.0242	mg/L	0.00033	1.35%
Cr 267.716†	11771.4	0.0905	mg/L	0.00229	0.0905	mg/L	0.00229	2.53%
Pb 220.353†	2567.5	0.2013	mg/L	0.00178	0.2013	mg/L	0.00178	0.88%
Se 196.026†	-6.9	-0.0028	mg/L	0.00086	-0.0028	mg/L	0.00086	31.38%
Ag 328.068†	19.6	0.0001	mg/L	0.00018	0.0001	mg/L	0.00018	240.05%
Cu 327.393†	237648.7	1.426	mg/L	0.0334	1.426	mg/L	0.0334	2.34%
Ni 231.604†	6524.9	0.1104	mg/L	0.00115	0.1104	mg/L	0.00115	1.04%
Zn 206.200†	54958.2	1.296	mg/L	0.0282	1.296	mg/L	0.0282	2.18%
Be 313.107†	2223.1	0.0003	mg/L	0.00002	0.0003	mg/L	0.00002	7.63%
[redacted] 206.836†	200.4	0.0463	mg/L	0.00021	0.0463	mg/L	0.00021	0.44%
[redacted] 190.801†	20.9	0.0078	mg/L	0.00145	0.0078	mg/L	0.00145	18.55%

Sequence No.: 29 **Autosampler Location: 31**

Sample ID: bs sp036
Analyst:
Sample Wt:
Dilution:

Date Collected: 9/18/03 1:59:39 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:32 PM,

Mean Data: bs sp036

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	794855.1	106.4	%	1.27				1.19%
Sc 361.383	1625301.5	107.9	%	0.99				0.91%
As 188.979†	7252.6	3.631	mg/L	0.0353	3.631	mg/L	0.0353	0.97%
Ba 233.527†	356374.2	3.710	mg/L	0.0505	3.710	mg/L	0.0505	1.36%
Cd 226.502†	17301.6	0.0941	mg/L	0.00090	0.0941	mg/L	0.00090	0.96%
Cr 267.716†	48537.4	0.3733	mg/L	0.00440	0.3733	mg/L	0.00440	1.18%
Pb 220.353†	11662.5	0.9145	mg/L	0.01057	0.9145	mg/L	0.01057	1.16%
Se 196.026†	8848.9	3.525	mg/L	0.0493	3.525	mg/L	0.0493	1.40%
Ag 328.068†	139425.4	0.5454	mg/L	0.00652	0.5454	mg/L	0.00652	1.20%
Cu 327.393†	103333.5	0.6200	mg/L	0.00558	0.6200	mg/L	0.00558	0.90%
Ni 231.604†	53491.0	0.9054	mg/L	0.01170	0.9054	mg/L	0.01170	1.29%
Zn 206.200†	37600.6	0.8866	mg/L	0.01113	0.8866	mg/L	0.01113	1.26%
Be 313.107†	796500.1	0.0905	mg/L	0.00124	0.0905	mg/L	0.00124	1.37%
Sb 206.836†	11343.9	2.622	mg/L	0.0309	2.622	mg/L	0.0309	1.18%
Tl 190.801†	9459.0	3.535	mg/L	0.0300	3.535	mg/L	0.0300	0.85%

Sequence No.: 30
Sample ID: bsd sp036
Analyst:
Sample Wt:
Dilution:

Autosampler Location: 32
Date Collected: 9/18/03 2:01:55 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:33 PM,

Mean Data: bsd sp036

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
[illegible] 261.542	783551.4	104.9	%	0.30				0.28%
Sc 361.383	1617433.0	107.4	%	0.72				0.67%
As 188.979†	7435.2	3.722	mg/L	0.0203	3.722	mg/L	0.0203	0.54%
Ba 233.527†	364495.4	3.794	mg/L	0.0525	3.794	mg/L	0.0525	1.38%
Cd 226.502†	17188.6	0.0935	mg/L	0.00044	0.0935	mg/L	0.00044	0.48%
Cr 267.716†	50197.3	0.3860	mg/L	0.00262	0.3860	mg/L	0.00262	0.68%
Pb 220.353†	11993.4	0.9405	mg/L	0.00608	0.9405	mg/L	0.00608	0.65%
Se 196.026†	9113.6	3.631	mg/L	0.0249	3.631	mg/L	0.0249	0.69%
Ag 328.068†	143474.5	0.5612	mg/L	0.00734	0.5612	mg/L	0.00734	1.31%
Cu 327.393†	97695.1	0.5862	mg/L	0.00659	0.5862	mg/L	0.00659	1.12%
Ni 231.604†	55316.5	0.9363	mg/L	0.00876	0.9363	mg/L	0.00876	0.94%
Zn 206.200†	38223.8	0.9013	mg/L	0.00852	0.9013	mg/L	0.00852	0.94%
Be 313.107†	816975.2	0.0929	mg/L	0.00135	0.0929	mg/L	0.00135	1.46%
Sb 206.836†	11723.9	2.710	mg/L	0.0088	2.710	mg/L	0.0088	0.33%
Tl 190.801†	9771.6	3.652	mg/L	0.0209	3.652	mg/L	0.0209	0.57%

Sequence No.: 31
Sample ID: lcs-soil
Analyst:
Sample Wt:
Dilution:

Autosampler Location: 33
Date Collected: 9/18/03 2:04:12 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:35 PM,

Mean Data: lcs-soil

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	788682.0	105.6	%	0.91				0.86%
Sc 361.383	1642995.5	109.1	%	2.50				2.29%
As 188.979†	1100.6	0.5510	mg/L	0.01267	0.5510	mg/L	0.01267	2.30%
Ba 233.527†	157763.0	1.642	mg/L	0.0499	1.642	mg/L	0.0499	3.04%
[illegible] 226.502†	85871.7	0.4669	mg/L	0.01531	0.4669	mg/L	0.01531	3.28%
[illegible] 267.716†	107284.8	0.8250	mg/L	0.02572	0.8250	mg/L	0.02572	3.12%
Pb 220.353†	6479.6	0.5081	mg/L	0.01332	0.5081	mg/L	0.01332	2.62%
Se 196.026†	2076.4	0.8272	mg/L	0.02262	0.8272	mg/L	0.02262	2.73%

Ag 328.068†	14007.8	0.0548 mg/L	0.00980	0.0548 mg/L	0.00980	17.88%
Cu 327.393†	93231.9	0.5594 mg/L	0.01672	0.5594 mg/L	0.01672	2.99%
Ni 231.604†	36995.6	0.6262 mg/L	0.01935	0.6262 mg/L	0.01935	3.09%
[illegible] 206.200†	36788.2	0.8675 mg/L	0.02967	0.8675 mg/L	0.02967	3.42%
[illegible] 313.107†	5641582.3	0.6412 mg/L	0.02414	0.6412 mg/L	0.02414	3.77%
Sb 206.836†	3417.1	0.7897 mg/L	0.01968	0.7897 mg/L	0.01968	2.49%
Tl 190.801†	2088.7	0.7807 mg/L	0.01845	0.7807 mg/L	0.01845	2.36%

Sequence No.: 32
Sample ID: mb sp036
Analyst:
Sample Wt:
Dilution:

Autosampler Location: 34
Date Collected: 9/18/03 2:07:33 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:36 PM,

Mean Data: mb sp036

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	763343.7	102.2	%	1.40				1.37%
Sc 361.383	1524802.1	101.2	%	1.30				1.28%
As 188.979†	4.0	0.0020	mg/L	0.00082	0.0020	mg/L	0.00082	40.92%
Ba 233.527†	36.5	0.0004	mg/L	0.00016	0.0004	mg/L	0.00016	42.20%
Cd 226.502†	-4.0	0.0000	mg/L	0.00005	0.0000	mg/L	0.00005	235.08%
Cr 267.716†	20.4	0.0002	mg/L	0.00024	0.0002	mg/L	0.00024	152.46%
Pb 220.353†	-16.4	-0.0013	mg/L	0.00022	-0.0013	mg/L	0.00022	16.94%
Se 196.026†	-0.4	-0.0002	mg/L	0.00020	-0.0002	mg/L	0.00020	125.69%
Ag 328.068†	-68.6	-0.0003	mg/L	0.00050	-0.0003	mg/L	0.00050	186.65%
Cu 327.393†	1192.0	0.0072	mg/L	0.00081	0.0072	mg/L	0.00081	11.35%
Ni 231.604†	-37.2	-0.0006	mg/L	0.00005	-0.0006	mg/L	0.00005	7.73%
Zn 206.200†	-47.6	-0.0011	mg/L	0.00011	-0.0011	mg/L	0.00011	10.12%
Be 313.107†	520.9	0.0001	mg/L	0.00003	0.0001	mg/L	0.00003	49.77%
Sb 206.836†	-2.2	-0.0005	mg/L	0.00110	-0.0005	mg/L	0.00110	221.50%
Tl 190.801†	5.3	0.0020	mg/L	0.00049	0.0020	mg/L	0.00049	24.95%

[illegible]equence No.: 33
Sample ID: CCV
Analyst:
Sample Wt:
Dilution:

Autosampler Location: 5
Date Collected: 9/18/03 2:10:03 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:38 PM,

Mean Data: CCV

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
Lu 261.542	767073.9	102.7	%	3.05				2.97%
Sc 361.383	1609929.6	106.9	%	3.42				3.20%
As 188.979†	9402.5	4.707	mg/L	0.1572	4.707	mg/L	0.1572	3.34%
QC value within limits for As 188.979 Recovery = 94.14%								
Ba 233.527†	45718.2	0.4759	mg/L	0.01565	0.4759	mg/L	0.01565	3.29%
QC value within limits for Ba 233.527 Recovery = 95.18%								
Cd 226.502†	87652.8	0.4766	mg/L	0.01573	0.4766	mg/L	0.01573	3.30%
QC value within limits for Cd 226.502 Recovery = 95.31%								
Cr 267.716†	62192.6	0.4783	mg/L	0.01561	0.4783	mg/L	0.01561	3.26%
QC value within limits for Cr 267.716 Recovery = 95.66%								
Pb 220.353†	60977.6	4.782	mg/L	0.1634	4.782	mg/L	0.1634	3.42%
QC value within limits for Pb 220.353 Recovery = 95.63%								
Se 196.026†	11973.5	4.770	mg/L	0.1638	4.770	mg/L	0.1638	3.43%
QC value within limits for Se 196.026 Recovery = 95.40%								
Ag 328.068†	123636.3	0.4836	mg/L	0.02162	0.4836	mg/L	0.02162	4.47%
QC value within limits for Ag 328.068 Recovery = 96.72%								
Cu 327.393†	81577.6	0.4895	mg/L	0.02148	0.4895	mg/L	0.02148	4.39%
QC value within limits for Cu 327.393 Recovery = 97.89%								
Ni 231.604†	28395.4	0.4807	mg/L	0.01709	0.4807	mg/L	0.01709	3.56%
QC value within limits for Ni 231.604 Recovery = 96.13%								
[illegible]n 206.200†	20010.9	0.4719	mg/L	0.01554	0.4719	mg/L	0.01554	3.29%
QC value within limits for Zn 206.200 Recovery = 94.37%								
[illegible]e 313.107†	4222533.3	0.4799	mg/L	0.02066	0.4799	mg/L	0.02066	4.30%
QC value within limits for Be 313.107 Recovery = 95.99%								
Sb 206.836†	19989.3	4.620	mg/L	0.1670	4.620	mg/L	0.1670	3.61%

00060

QC value within limits for Sb 206.836 Recovery = 92.39%
Tl 190.801† 12863.3 4.808 mg/L 0.1652 4.808 mg/L 0.1652 3.44%
QC value within limits for Tl 190.801 Recovery = 96.15%
All analytes passed QC.

Sequence No.: 34
Sample ID: CCB
Analyst:
Sample Wt:
Dilution:

Autosampler Location: 6
Date Collected: 9/18/03 2:12:22 PM

Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:58:39 PM,

Mean Data: CCB

Analyte	Mean Corrected Intensity	Calib Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
Lu 261.542	778029.1	104.2	%	0.42				0.40%
Sc 361.383	1559509.1	103.5	%	0.32				0.31%
As 188.979†	2.3	0.0012	mg/L	0.00049	0.0012	mg/L	0.00049	42.27%
QC value within limits for As 188.979 Recovery = Not calculated								
Ba 233.527†	41.3	0.0004	mg/L	0.00004	0.0004	mg/L	0.00004	10.02%
QC value within limits for Ba 233.527 Recovery = Not calculated								
Cd 226.502†	-34.1	-0.0002	mg/L	0.00001	-0.0002	mg/L	0.00001	7.04%
QC value within limits for Cd 226.502 Recovery = Not calculated								
Cr 267.716†	-40.1	-0.0003	mg/L	0.00006	-0.0003	mg/L	0.00006	20.02%
QC value within limits for Cr 267.716 Recovery = Not calculated								
Pb 220.353†	-19.0	-0.0015	mg/L	0.00062	-0.0015	mg/L	0.00062	41.34%
QC value within limits for Pb 220.353 Recovery = Not calculated								
Se 196.026†	0.9	0.0004	mg/L	0.00138	0.0004	mg/L	0.00138	394.04%
QC value within limits for Se 196.026 Recovery = Not calculated								
Ag 328.068†	-179.8	-0.0007	mg/L	0.00038	-0.0007	mg/L	0.00038	53.45%
QC value within limits for Ag 328.068 Recovery = Not calculated								
Cu 327.393†	653.5	0.0039	mg/L	0.00061	0.0039	mg/L	0.00061	15.47%
QC value within limits for Cu 327.393 Recovery = Not calculated								
Ni 231.604†	-39.4	-0.0007	mg/L	0.00014	-0.0007	mg/L	0.00014	20.42%
QC value within limits for Ni 231.604 Recovery = Not calculated								
Zn 206.200†	-67.9	-0.0016	mg/L	0.00006	-0.0016	mg/L	0.00006	3.51%
QC value within limits for Zn 206.200 Recovery = Not calculated								
Be 313.107†	-310.8	0.0000	mg/L	0.00002	0.0000	mg/L	0.00002	53.31%
QC value within limits for Be 313.107 Recovery = Not calculated								
Sb 206.836†	15.9	0.0037	mg/L	0.00237	0.0037	mg/L	0.00237	64.37%
QC value within limits for Sb 206.836 Recovery = Not calculated								
Tl 190.801†	2.9	0.0011	mg/L	0.00187	0.0011	mg/L	0.00187	171.34%
QC value within limits for Tl 190.801 Recovery = Not calculated								

All analytes passed QC.

Sequence No.: 1
Sample ID: ICSA
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 7
Date Collected: 9/18/03 2:14:50 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:59:33 PM,

Mean Data: ICSA

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Calib Std.Dev.	Sample Conc.	Sample Units	Sample Std.Dev.	RSD
Lu 261.542	675311.5	90.41	%	3.761				4.16%
Sc 361.383	1392121.2	92.43	%	3.961				4.28%
As 188.979†	28.9	0.0145	mg/L	0.01048	0.0145	mg/L	0.01048	72.54%
QC value within limits for As 188.979 Recovery = Not calculated								
Ba 233.527†	-3091.0	-0.0322	mg/L	0.00181	-0.0322	mg/L	0.00181	5.62%
QC value within limits for Ba 233.527 Recovery = Not calculated								
Cd 226.502†	-3419.7	-0.0186	mg/L	0.00040	-0.0186	mg/L	0.00040	2.14%
QC value within limits for Cd 226.502 Recovery = Not calculated								
Cr 267.716†	-227.3	-0.0017	mg/L	0.00012	-0.0017	mg/L	0.00012	6.62%
QC value within limits for Cr 267.716 Recovery = Not calculated								
Pb 220.353†	81.8	0.0064	mg/L	0.00132	0.0064	mg/L	0.00132	20.66%
QC value within limits for Pb 220.353 Recovery = Not calculated								
Se 196.026†	-18.6	-0.0074	mg/L	0.01416	-0.0074	mg/L	0.01416	190.98%
QC value within limits for Se 196.026 Recovery = Not calculated								
Ag 328.068†	-93.0	-0.0004	mg/L	0.00023	-0.0004	mg/L	0.00023	63.38%
QC value within limits for Ag 328.068 Recovery = Not calculated								
Cu 327.393†	-2974.7	-0.0178	mg/L	0.00087	-0.0178	mg/L	0.00087	4.87%
QC value within limits for Cu 327.393 Recovery = Not calculated								
Ni 231.604†	-115.9	-0.0020	mg/L	0.00127	-0.0020	mg/L	0.00127	64.63%
QC value within limits for Ni 231.604 Recovery = Not calculated								
Zn 206.200†	-330.2	-0.0078	mg/L	0.00095	-0.0078	mg/L	0.00095	12.19%
QC value within limits for Zn 206.200 Recovery = Not calculated								
Be 313.107†	1528.7	0.0002	mg/L	0.00005	0.0002	mg/L	0.00005	26.11%
QC value within limits for Be 313.107 Recovery = Not calculated								
Sb 206.836†	56.0	0.0129	mg/L	0.00554	0.0129	mg/L	0.00554	42.83%
QC value within limits for Sb 206.836 Recovery = Not calculated								
Tl 190.801†	157.1	0.0587	mg/L	0.01088	0.0587	mg/L	0.01088	18.53%
QC value within limits for Tl 190.801 Recovery = Not calculated								

All analytes passed QC.

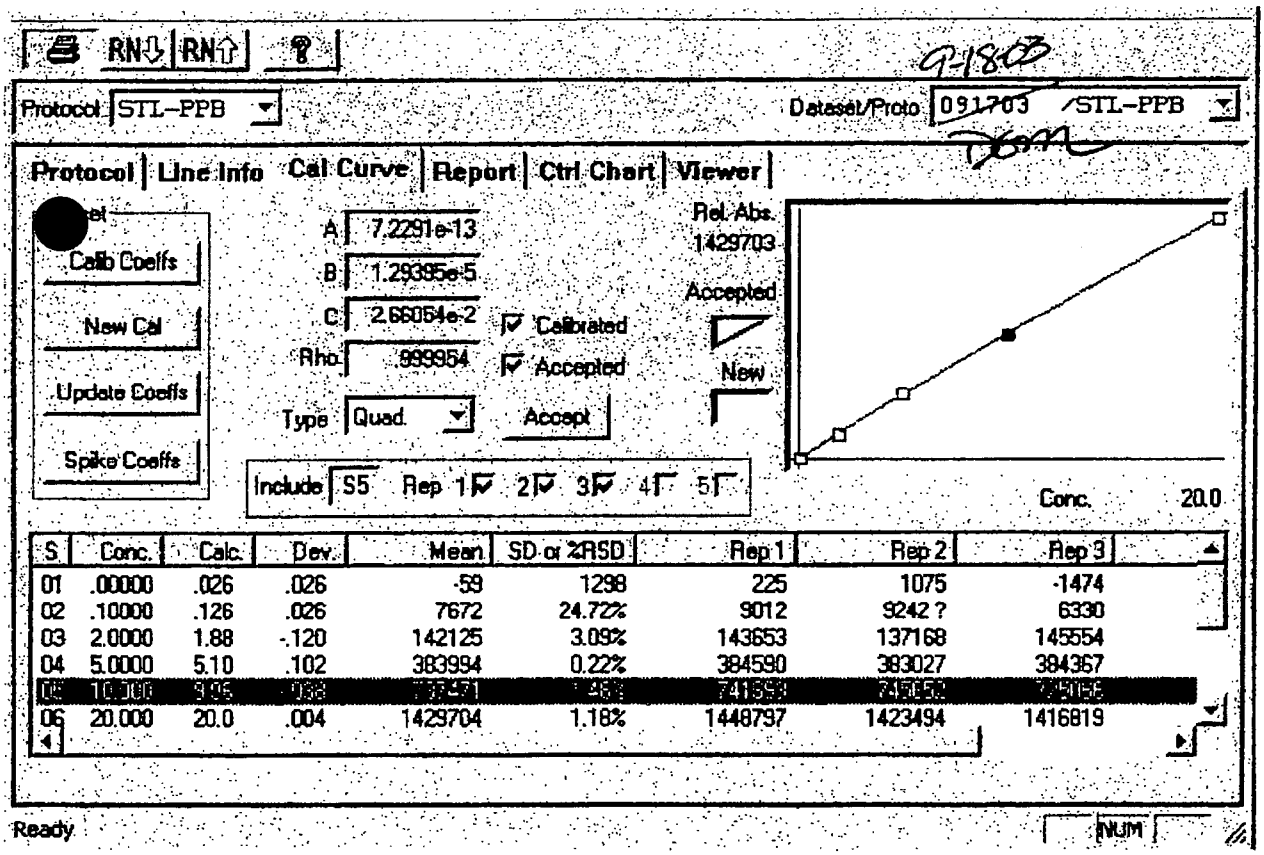
Sequence No.: 2
Sample ID: ICSAB
Analyst:
Sample Wt:
Dilution:
Autosampler Location: 8
Date Collected: 9/18/03 2:16:25 PM
Sample Prep Volume:
Data Type: Reprocessed on 9/18/03 3:59:34 PM,

Mean Data: ICSAB

Analyte	Mean Corrected Intensity	Calib Conc.	Calib Units	Calib Std.Dev.	Sample Conc.	Sample Units	Sample Std.Dev.	RSD
Lu 261.542	736159.1	98.55	%	2.725				2.76%
Sc 361.383	1483346.9	98.49	%	2.268				2.30%
As 188.979†	18835.3	9.429	mg/L	0.2776	9.429	mg/L	0.2776	2.94%
QC value within limits for As 188.979 Recovery = 94.29%								
Ba 233.527†	253652.9	2.640	mg/L	0.0858	2.640	mg/L	0.0858	3.25%
QC value within limits for Ba 233.527 Recovery = 88.01%								
Cd 226.502†	462934.6	2.517	mg/L	0.0779	2.517	mg/L	0.0779	3.10%
QC value within limits for Cd 226.502 Recovery = 83.90%								
Cr 267.716†	354460.5	2.726	mg/L	0.0852	2.726	mg/L	0.0852	3.13%
QC value within limits for Cr 267.716 Recovery = 90.86%								
Pb 220.353†	109784.4	8.609	mg/L	0.2716	8.609	mg/L	0.2716	3.15%
QC value within limits for Pb 220.353 Recovery = 86.09%								
Se 196.026†	11816.7	4.708	mg/L	0.1424	4.708	mg/L	0.1424	3.03%
QC value within limits for Se 196.026 Recovery = 94.15%								
Ag 328.068†	764906.0	2.992	mg/L	0.0927	2.992	mg/L	0.0927	3.10%
QC value within limits for Ag 328.068 Recovery = 99.73%								
Cu 327.393†	433690.9	2.602	mg/L	0.0865	2.602	mg/L	0.0865	3.32%
QC value within limits for Cu 327.393 Recovery = 86.74%								

Ni 231.604†	147808.4	2.502 mg/L	0.0779	2.502 mg/L	0.0779	3.11%
QC value within limits for Ni 231.604 Recovery = 83.40%						
Zn 206.200†	104261.4	2.458 mg/L	0.0718	2.458 mg/L	0.0718	2.92%
QC value within limits for Zn 206.200 Recovery = 81.95%						
313.107†	8143531.8	0.9256 mg/L	0.02797	0.9256 mg/L	0.02797	3.02%
QC value within limits for Be 313.107 Recovery = 92.56%						
Sb 206.836†	39639.7	9.161 mg/L	0.3792	9.161 mg/L	0.3792	4.14%
QC value within limits for Sb 206.836 Recovery = 91.61%						
Tl 190.801†	23282.2	8.702 mg/L	0.2675	8.702 mg/L	0.2675	3.07%
QC value within limits for Tl 190.801 Recovery = 87.02%						

All analytes passed QC.


RN↓ RN↑
9-1803
Protocol STL-PPB
Dataset/Proto 091703 /STL-PPB
Protocol Line Info Cal Curve Report Ctrl Chart Viewer
Calib Coeffs
New Cal
Update Coeffs
Spike Coeffs
A 7.2291e-13
B 1.29385e-5
C 2.66054e-2
Rho .999954
Type Quad.
Calibrated
Accepted
Accept
Rel. Abs. 1429703
Accepted
New
Include S5 Rep 1 2 3 4 5
Conc. 20.0
S Conc. Calc. Dev. Mean SD or %RSD Rep 1 Rep 2 Rep 3
01 .00000 .026 .026 -59 1298 225 1075 -1474
02 .10000 .126 .026 7672 24.72% 9012 9242 ? 6330
03 2.0000 1.88 -.120 142125 3.09% 143653 137168 145554
04 5.0000 5.10 .102 383994 0.22% 384590 383027 384367
06 20.000 20.0 .004 1429704 1.18% 1448797 1423494 1416819
Ready
NUM

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Standard: 1 Rep: 1				Seq: 1		15:06:50 18 Sep 03			HG
Hg	.000	ppb	225						=
*** Standard: 1 Rep: 2				Seq: 2		15:09:03 18 Sep 03			HG
Hg	.000	ppb	1075						=
*** Standard: 1 Rep: 3				Seq: 3		15:11:16 18 Sep 03			HG
Hg	.000	ppb	-1474						=
*** Standard: 2 Rep: 1				Seq: 4		15:13:26 18 Sep 03			HG
Hg	.100	ppb	9012						=
*** Standard: 2 Rep: 2				Seq: 5		15:16:05 18 Sep 03			HG
Hg	.100	ppb	9242						=
*** Standard: 2 Rep: 3				Seq: 6		15:18:34 18 Sep 03			HG
Hg	.100	ppb	6330						=
*** Standard: 3 Rep: 1				Seq: 7		15:20:43 18 Sep 03			HG
Hg	2.00	ppb	143653						=
*** Standard: 3 Rep: 2				Seq: 8		15:22:54 18 Sep 03			HG
Hg	2.00	ppb	137168						=
*** Standard: 3 Rep: 3				Seq: 9		15:25:07 18 Sep 03			HG
Hg	2.00	ppb	145554						=
*** Standard: 4 Rep: 1				Seq: 10		15:27:36 18 Sep 03			HG
Hg	5.00	ppb	384589						=
*** Standard: 4 Rep: 2				Seq: 11		15:30:10 18 Sep 03			HG
Hg	5.00	ppb	383027						=
*** Standard: 4 Rep: 3				Seq: 12		15:33:03 18 Sep 03			HG
Hg	5.00	ppb	384367						=
*** Standard: 5 Rep: 1				Seq: 13		15:35:33 18 Sep 03			HG
Hg	10.0	ppb	741692						=
*** Standard: 5 Rep: 2				Seq: 14		15:38:07 18 Sep 03			HG
Hg	10.0	ppb	745652						=
*** Standard: 5 Rep: 3				Seq: 15		15:40:20 18 Sep 03			HG
Hg	10.0	ppb	725066						=
*** Standard: 6 Rep: 1				Seq: 16		15:43:10 18 Sep 03			HG
Hg	20.0	ppb	1448796						

Line	Conc.	Units	SD/RSD	1	2	3	4	5	
*** Standard: 6 Rep: 2				Seq: 17		15:45:21 18 Sep 03			HG
Hg	20.0	ppb	1423494						=
*** Standard: 6 Rep: 3				Seq: 18		15:47:32 18 Sep 03			HG
Hg	20.0	ppb	1416819						=
*** Check Standard: 1 Ck1 BLANK				Seq: 19		16:22:08 18 Sep 03			HG
Line	Flag	Found	Range(+/-)	Units	SD/RSD				
Hg		.009	.200	ppb	.000				=
*** Check Standard: 2 Ck2 5 PPB				Seq: 20		16:24:18 18 Sep 03			HG
Line	Flag	%Rcv.	Found	True	Units	SD/RSD			
Hg		94.0	4.70	5.00	ppb	.000			=
*** Check Standard: 3 Ck3 2 PPB				Seq: 21		16:26:57 18 Sep 03			HG
Line	Flag	%Rcv.	Found	True	Units	SD/RSD			
Hg		94.6	1.89	2.00	ppb	.000			=
*** Check Standard: 4 Ck4 4 PPB				Seq: 22		16:29:07 18 Sep 03			HG
Line	Flag	%Rcv.	Found	True	Units	SD/RSD			
Hg		106.	4.23	4.00	ppb	.000			=
*** Check Standard: 2 Ck2 5 PPB				Seq: 29		18:33:49 18 Sep 03			HG
Line	Flag	%Rcv.	Found	True	Units	SD/RSD			
Hg		92.6	4.63	5.00	ppb	.000			=
*** Check Standard: 1 Ck1 BLANK				Seq: 30		18:35:58 18 Sep 03			HG
Line	Flag	Found	Range(+/-)	Units	SD/RSD				
Hg		-.066	.200	ppb	.000				=
*** Sample ID: mb-zs1424				Seq: 31		18:38:09 18 Sep 03			HG
Hg	.047	ppb	.000	.047					=
*** Sample ID: 116223-1				Seq: 32		18:40:28 18 Sep 03			HG
Hg	.367	ppb	.000	.367					=
*** Sample ID: 116223-1d				Seq: 33		18:42:56 18 Sep 03			HG
Hg	.294	ppb	.000	.294					=
*** Sample ID: 116223-1dd				Seq: 34		18:45:44 18 Sep 03			HG
Hg	.320	ppb	.000	.320					=
*** Sample ID: 116223-1s				Seq: 35		18:49:04 18 Sep 03			HG
Hg	2.00	ppb	.000	2.00					=
*** Sample ID: 116223-1sd				Seq: 36		18:51:12 18 Sep 03			HG
Hg	1.96	ppb	.000	1.96					=

Line	Conc.	Units	SD/RSD	1	2	3	4	5
*** Sample ID: era				Seq: 37		18:53:43 18 Sep 03		HG
			10x					
Hg	2.00	ppb	.000	2.00				=
*** Sample ID: bs				Seq: 38		18:56:05 18 Sep 03		HG
Hg	1.86	ppb	.000	1.86				=
*** Sample ID: bsd				Seq: 39		18:58:34 18 Sep 03		HG
Hg	1.90	ppb	.000	1.90				=
*** Sample ID: mb				Seq: 40		19:01:10 18 Sep 03		HG
Hg	.042	ppb	.000	.042				=

*** Check Standard: 2 Ck2 5 PPB				Seq: 41		19:03:23 18 Sep 03		HG
Line	Flag	%Rcv.	Found	True	Units	SD/RSD		
Hg		98.5	4.92	5.00	ppb	.000		=

*** Check Standard: 1 Ck1 BLANK				Seq: 42		19:06:04 18 Sep 03		HG
Line	Flag	Found	Range(+/-)	Units		SD/RSD		
Hg		.016	.200	ppb		.000		=
*** Sample ID: 116223-2				Seq: 43		19:08:23 18 Sep 03		HG
Hg	.135	ppb	.000	.135				=

*** Check Standard: 2 Ck2 5 PPB				Seq: 53		19:31:14 18 Sep 03		HG
Line	Flag	%Rcv.	Found	True	Units	SD/RSD		
Hg		102.	5.10	5.00	ppb	.000		=

*** Check Standard: 1 Ck1 BLANK				Seq: 54		19:33:32 18 Sep 03		HG
Line	Flag	Found	Range(+/-)	Units		SD/RSD		
Hg		-.009	.200	ppb		.000		=

[redacted]

metals Worksheet - total

RUSH

QC Level:Tier II / Matrix:solid	**Due: ASAP**	**Work Order - 116223**
Herrera Environmental Consultants	Proj. Manager:Katie Downie	TJ2

Special Instructions 24 HR Rush

Sample number:116223-[redacted]	%Solids	Client Sample ID	RP-1 Repository 1
Sample Weight/Volume	QA/QC Batch SP036	Date Received	9/17/03
		Date Sampled	**9/9/03 10:45:00 AM**

Analyte Name	ICP	ICPMS	Result	PQL	Units
Antimony					
Arsenic					
Beryllium					
Cadmium					
Chromium					
Copper					
Lead					
Nickel					
Selenium					
Silver					
Thallium					
[redacted]					

Sample number:116223-2 [redacted]	%Solids	Client Sample ID	RS-1 Rocksource 1
Sample Weight/Volume 1.00	QA/QC Batch	Date Received	9/17/03
		Date Sampled	**9/9/03 1:10:00 PM**

Analyte Name	ICP	ICPMS	Result	PQL	Units
Antimony					
Arsenic					
Beryllium					
Cadmium					
Chromium					
Copper					
Lead					
Nickel					
Selenium					
Silver					
Thallium					
Zinc					

Analyst [redacted] Date 9/18/03

Reviewed by [redacted] Date 9/18/03

Organics worksheet v4.0
If you have suggestions for changes please bring them to me - Dennis

00068

Mercury (CVAA) Worksheet - total

RUSH

QC Level:Tier IV	Due: ASAP	Work Order - 116223
Matrix:solid		
Herrera Environmental Consultants	Proj. Manager:Katie Downie	

Special Instructions 24 HR Rush

Sample number: 116223-1	%Solids	Client Sample ID	RP-1 Repository 1
Sample Weight/Volume	QA/QC Batch 251424	Date Received	9/17/03
		Date Sampled	**9/9/03 10:45:00 AM**

Analyte Name	ICP	ICPMS	Result	PQL	Units
Mercury (CVAA)					

Sample number: 116223-2	%Solids	Client Sample ID	RS-1 Rocksource 1
Sample Weight/Volume	QA/QC Batch	Date Received	9/17/03
		Date Sampled	**9/9/03 1:10:00 PM**

Analyte Name	ICP	ICPMS	Result	PQL	Units
Mercury (CVAA)					

Analyst _____ Date 9-19-03

Reviewed by _____ Date 9-23-03

Organics worksheet v4.0
If you have suggestions for changes please bring them to me - Dennis

STL Seattle

6a **Sample Information**

Client Name	Herrera Environmental Consultants
Work Order Number	116223
Sample Number	1
Data Filename	sp036
Client Sample ID	P-1 Repository 1
Date Received	09-17-03
Date Prepared	09-17-03
Date Analyzed	09-18-03
Sample matrix type	solid
QC sample type	sample

Related Blan sp036

Sample weight (g)	0.252	=	0.00025	/kg	Calc. Fact. 262.13859
Digest volume	50	=	50	ml	Dry Weight 0.1907388 g
Dilution Factor		=	1		Sample Units mg/kg
% Solids	75.69	=	0.7569		Spike Factor 5.24277179
		=	1		Rept. Dil. Fac 1
Report in PPM	1	=	0.001		
mg/kg Carbon		=	1		

x	Target Analytes	Quan Value	User Flag	Blank	Calculated Amount	Total Flags	PQL
x	Arsenic	0.028485			7.47		2.62
	Barium	2.083703			546		1.31
x	Beryllium	0.001988			0.521	J	0.524
x	Chromium	0.026886			7.05		2.62
x	Copper	0.085331			22.4		2.62
x	Lead	0.054094			14.2		2.62
x	Nickel	0.029636			7.77		2.62
x	Zinc	0.344845			90.4		2.62

STL Seattle

6a **Sample Information**

Client Name	**Herrera Environmental Consultants**
Work Order Number	**116223**
Sample Number	**2**
Data Filename	**sp036**
Client Sample ID	**S-1 Rocksource 1**
Date Received	**09-17-03**
Date Prepared	**09-17-03**
Date Analyzed	**09-18-03**
Sample matrix type	**solid**
QC sample type	**sample**

Related Blan sp036

Sample weight (g)	**0.2604**	=	0.00026	/kg	Calc. Fact. 250.081126
Digest volume	**50**	=	50	ml	Dry Weight 0.19993512 g
Dilution Factor		=	1		Sample Units mg/kg
% Solids	**76.78**	=	0.7678		Spike Factor 5.00162253
		=	1		Rept. Dil. Fac 1
Report in PPM	**1**	=	0.001		
mg/kg Carbon		=	1		

x	Target Analytes	Quan Value	User Flag	Blank	Calculated Amount	Total Flags	PQL
x	Arsenic	0.012955			3.24		2.5
	Barium	1.032462			258		1.25
x	Beryllium	0.001405			0.351	J	0.5
x	Chromium	0.011291			2.82		2.5
x	Copper	0.073071			18.3		2.5
x	Lead	0.049057			12.3		2.5
x	Nickel	0.012986			3.25		2.5
x	Zinc	0.10531			26.3		2.5

STL Seattle

6a **Sample Information**

Client Name						
Work Order Number					Related Blan	noblank
Sample Number						
Data Filename	sp036					
Client Sample ID						
Date Received						
Date Prepared	09-17-03					
Date Analyzed	09-18-03					
Sample matrix type	solid					
QC sample type	blank					
Sample weight (g)	0.25	=	0.00025	/kg	Calc. Fact.	200
Digest volume	50	=	50	ml	Dry Weight	0.25 g
Dilution Factor		=	1		Sample Units	mg/kg
% Solids		=	1		Spike Factor	4
		=	1		Rept. Dil. Fac	1
Report in PPM	1	=	0.001			
mg/kg Carbon		=	1			

x	Target Analytes	Quan Value	User Flag	Blank	Calculated Amount	Total Flags	PQL

STL Seattle

6a Sample Information

Client Name	Herrera Environmental Consultants
Work Order Number	116223
Sample Number	1
Data Filename	zs1424
Client Sample ID	P-1 Repository 1
Date Received	09-17-03
Date Prepared	09-18-03
Date Analyzed	09-18-03
Sample matrix type	solid
QC sample type	sample

Related Blan zs1424

Sample weight (g)	0.6971	=	0.0007 /kg	Calc. Fact.	94.7624796
Digest volume	50	=	50 ml	Dry Weight	.52763499 g
Dilution Factor		=	1	Sample Unit	mg/kg
% Solids	75.69	=	0.7569	Spike Factor	1.89524959
		=	1	Rept. Dil. Fa	1
Report in PPM	1	=	0.001		
mg/kg Carbon		=	1		

x	Target Analytes	Quan Value	User Flag	Blank	Calculated Amount	Total Flags	PQL
x	Mercury	0.000294			0.0279		0.019

$$\frac{0.000294 \text{ mg/kg} \times 0.05 \text{ L}}{0.0006971 \text{ kg} \times 0.7569} = 0.0279 \text{ mg/kg}$$

DPM

STL Seattle

6a **Sample Information**

Client Name	**Herrera Environmental Consultants**
Work Order Number	**116223**
Sample Number	**2**
Data Filename	**zs1424**
Client Sample ID	**S-1 Rocksource 1**
Date Received	**09-17-03**
Date Prepared	**09-18-03**
Date Analyzed	**09-18-03**
Sample matrix type	**solid**
QC sample type	**sample**

Related Blan zs1424

Sample weight (g)	**0.6274**	=	0.00063 /kg	Calc. Fact.	103.795227
Digest volume	**50**	=	50 ml	Dry Weight	.48171772 g
Dilution Factor		=	1	Sample Unit	mg/kg
% Solids	**76.78**	=	0.7678	Spike Factor	2.07590454
		=	1	Rept. Dil. Fa	1
Report in PPM	**1**	=	0.001		
mg/kg Carbon		=	1		

x	Target Analytes	Quan Value	User Flag	Blank	Calculated Amount	Total Flags	PQL
x	Mercury	0.000135			0.014	J	0.0208

STL Seattle

6a **Sample Information**

Client Name		
Work Order Number		Related Blan noblank
Sample Number		
Data Filename	zs1424	
Client Sample ID		
Date Received		
Date Prepared	09-18-03	
Date Analyzed	09-18-03	
Sample matrix type	solid	
QC sample type	blank	

Sample weight (g)	0.5	=	0.0005	/kg	Calc. Fact.	100
Digest volume	50	=	50	ml	Dry Weight	0.5 g
Dilution Factor		=	1		Sample Unit	mg/kg
% Solids		=	1		Spike Factor	2
		=	1		Rept. Dil. Fa	1
Report in PPM	1	=	0.001			
mg/kg Carbon		=	1			

x	Target Analytes	Quan Value	User Flag	Blank	Calculated Amount	Total Flags	PQL

APPENDIX G

Certified Weed-free Seed Mix Labels

Circle S Seeds of Montana Inc

(406)285-3269

14990 Madison Frontage Road
P.O. Box 130
Three Forks, MT 59752

lbs.	Variety		Lot #	Pure	Ger	Hard	Viable	TZ	Tested	Org	Mix
2.12	VNS	Redtop	008007	99.2	95	0	95		2/13/2003	ID	4.21
				0	0	0	0				0.00
17.45	Covar Sheep	Fescue	SC41C1	95.48	91	0	91	91	9/12/2002	WA	33.33
				0	0	0	0				0.00
11.79	Cert. Cortez Tall	Fescue	M20-2-DF18	99.5	95	0	95		4/17/2003	OR	23.47
				0	0	0	0				0.00
4.25	VNS Tufted	Hairgrass	99-43	94.4	96	0	96		3/27/2002	CD	8.02
				0	0	0	0				0.00
2.12	Climax	Timothy	0-0052	99.81	94	0	94		3/31/2003	CAN	4.24
				0	0	0	0				0.00
4.25	Reubens Canada	Bluegrass	66.5.99	92.55	0	0	94	94	9/24/2003	ID	7.86
				0	0	0	0				0.00
8.02	Paddock Meadow	Brome	89-8-000834	97.44	96	0	96		9/19/2003	CAN	15.63
				0		0	0				0.00

Other Crop	Weed	Prohibited	Restricted/#	Inert	Weight	Name:
0.03	0.06	0.00	0.00	3.17	50	4 Acres

Circle S Seeds of Montana Inc

(406)285-3269

14990 Madison Frontage Road
P.O. Box 130
Three Forks, MT 59752

lbs.	Variety		Lot #	Pure	Ger	Hard	Viable	TZ	Tested	Org	Mix
2.38	VNS	Redtop	008007	99.2	95	0	95		2/13/2003	ID	4.21
				0	0	0	0				0.00
19.55	Covar Sheep	Fescue	SC41C1	95.48	91	0	91	91	9/12/2002	WA	33.33
				0	0	0	0				0.00
13.21	Cert. Cortez Tall	Fescue	M20-2-DF18	99.5	95	0	95		4/17/2003	OR	23.47
				0	0	0	0				0.00
4.75	VNS Tufted	Hairgrass	99-43	94.4	96	0	96		3/27/2002	CD	8.02
				0	0	0	0				0.00
2.38	Climax	Timothy	0-0052	99.81	94	0	94		3/31/2003	CAN	4.24
				0	0	0	0				0.00
4.75	Reubens Canada	Bluegrass	66.5.99	92.55	0	0	94	94	9/24/2003	ID	7.86
				0	0	0	0				0.00
8.98	Paddock Meadow	Brome	89-8-000834	97.44	96	0	96		9/19/2003	CAN	15.63
				0		0	0				0.00

Other Crop	Weed	Prohibited	Restricted/#	Inert	Weight	Name:
0.03	0.06	0.00	0.00	3.17	56	4 Acres