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November 20, 2015

Earl Liverman, On-Scene Coordinator
United States Environmental Protection Agency, Region 10
1910 Northwest Boulevard, Suite 208
Coeur d'Alene, Idaho 83814

Re: Removal Action Report for the Bonanza Mine 2014 Removal Action, Sutherlin, Oregon
Contract Number EP-S7-13-07, TDD Number 14-06-0006

Dear Mr. Liverman:

Enclosed please find the Removal Action Report for the Bonanza Mine 2014 Removal Action. If you have any questions regarding this submittal, please call Jake Moersen at (206) 624-9537 or me at (206) 920-1739.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

Steven G. Hall
START-IV Removal Team Leader

cc: Jake Moersen, E & E, START-IV Project Manager

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REMOVAL ACTION REPORT

Bonanza Mine Site
Nonpareil, Oregon
TDD: 14-06-0006

Prepared for:

U.S. Environmental Protection Agency, Region 10
1910 Northwest Boulevard, Suite 208
Coeur d'Alene, Idaho 83814

Prepared by:

Ecology and Environment, Inc.
720 Third Avenue, Suite 1700
Seattle, Washington 98104

November 2015

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Table of Contents

Table of Contents (cont.)

Section **Page**

Table of Contents (cont.)

Section **Page**

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List of Tables

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List of Figures

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List of Abbreviations and Acronyms

Abbreviation	Definition
°	degrees
%	percent
%R	percent recovery
AAR	Applied Archaeological Research, Inc.
ACM	asbestos-containing material
AHERA	Asbestos Hazard Emergency Response Act
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BMPs	best management practices
BS	blank spike
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRS	Cultural Resources Survey
DataRam	DataRam portable particulate monitor
DHS	Oregon Department of Human Services
DQOs	data quality objectives
E & E	Ecology and Environment, Inc.
EHAP	Oregon Environmental Health Assessment Program
EPA	United States Environmental Protection Agency
EQM	Environmental Quality Management, Inc.
ERRS	Emergency and Rapid Response Services
ERM	exposure reduction measure
ft^2	square feet
HASP	health and safety plan
HC	Hart Crowser, Inc.
LLDPE	linear low-density polyethylene
Lone Rock	Lone Rock Timber Management Company
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MM&R	Maintenance, Monitoring and Repair
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
MVA	mercury vapor analyzer
NIOSH	National Institute for Occupational Safety and Health
ng/m^3	nanograms per cubic meter
ODEQ	Oregon Department of Environmental Quality
OHA	Oregon Health Authority
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PLM	polarized light microscopy

List of Abbreviations and Acronyms (cont.)

PPE	personal protective equipment
PolRep	Pollution Report
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
REL	recommended exposure limit
RPD	relative percent difference
SARA	Superfund Amendments and Reauthorization Act
SI	site inspection
Site	Bonanza Mine Site
SHPO	Oregon State Historic Preservation Office
SPAF	Sampling Plan Alteration Form
SPLP	Synthetic Precipitation Leaching Procedure
SOP	standard operating procedure
SSSP	Site-Specific Sampling Plan
START	Superfund Technical Assessment and Response Team
TCLP	Toxicity Characteristic Leaching Procedure
TDD	Technical Direction Document
TWA	time-weighted average
USFWS	United States Fish and Wildlife Service
$\mu g/m^3$	micrograms per cubic meter
XRF	X-ray fluorescence
yd^3	cubic yards

Executive Summary

In 2014 the United States Environmental Protection Agency (EPA) performed a time-critical removal action at the Bonanza Mine Site (Site). The Site consisted of a former mercury mine and mill that operated from the mid-1860s to the 1960s and produced more than 3,000,000 pounds of mercury. The removal action was intended to mitigate the potential human health and ecological threats posed by exposure to mercury and arsenic, including direct contact, ingestion, and inhalation pathways.

The Bonanza Mine was discovered between 1865 and 1870. In May 1939, the main ore body was discovered and by the end of 1944, the mine had become Oregon's largest all-time producer of quicksilver. Other than some short closures from 1949 to 1951 and in 1954, the mine operated continuously until October 1960 when minable reserves were exhausted and the mine closed.

Records of the property are incomplete from 1960 until 2000, at which time EPA performed a site investigation at the property. For the next 15 years, EPA and the Oregon Department of Environmental Quality (ODEQ) performed a variety of field events and surveys at the property. In February 2014, ODEQ initiated a time-critical removal action to achieve prompt human health risk reduction by removing and capping soil in certain inhabited areas of the Site that were impacted by elevated concentrations of mercury and arsenic. Large swaths of contamination were left in place because of the complexity of Site conditions and limited availability of funds and other resources.

In April 2014, EPA performed a pre-removal survey/sampling event at the Site along with ODEQ, a Superfund Technical Assessment and Response Team (START) engineer, and an Emergency and Rapid Response Services (ERRS) response manager. EPA mobilized to the Site in August 2014 to perform a time-critical removal action at the Site, including the former mill site and associated areas downgradient of the mine waste and calcine piles. Two additional locations associated with recently inhabited manufactured homes were also identified for removal activities.

In total, EPA removed 38,500 cubic yards (yd^3) of mine-waste contaminated material during the removal action. The excavated material was placed with approximately 130,000 yd^3 of preexisting calcine and waste rock in a repository constructed on Site. The total face of the repository was 196,000 square feet (ft^2), or nearly five acres in size. The excavated areas were backfilled and graded with 44,500 yd^3 of clean backfill obtained from off-Site quarries and on-Site source locations. Pre-existing grades were restored and disturbed areas were stabilized by placing erosion control slash material and seeding. The drainage systems were rebuilt to accommodate increased volumes of surface water runoff from the repository face.

During the removal action two manufactured homes and associated household items were discovered to contain elevated concentrations of mercury and other contaminants. It was not feasible to decontaminate the homes or personal effects, and they were transported off Site for disposal. The utilities were completely restored including a new leach field, septic tanks, water lines, power connections and communication lines. Two replacement manufactured homes were

procured along with basic furniture items to replace contaminated material that was discarded during the removal action. The homes were transported to the Site and connected to the utilities.

Construction and green removals best management practices (BMPs) were employed, and daily monitoring confirmed the effectiveness of the BMPs for control of short-term construction impacts. A long-term maintenance, monitoring, and repair plan was prepared for the property owner with assistance and oversight provided by ODEQ to ensure the continuing effectiveness of the removal action and to monitor Site conditions.

1 Introduction

The United States Environmental Protection Agency (EPA) performed a removal action at the Bonanza Mine Site (Site) in 2014 under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

The removal action was performed by Environmental Quality Management, Inc. (EQM) under an Emergency and Rapid Response Services (ERRS) contract with EPA. EPA tasked Ecology and Environment, Inc. (E & E), under Superfund Technical Assessment and Response Team (START)-IV contract number EP-S7-13-07, Technical Direction Document (TDD) number 14-06-0006, to provide engineering, sampling, and documentation support for the removal action.

This report documents the 2014 Site removal action and is organized into the following twelve sections:

- Introduction (Section 1);
- Site Description and Background (Section 2);
- Project Approach and Organization (Section 3);
- Removal Activities (Section 4);
- Field Monitoring and Sampling (Section 5);
- Maintenance, Monitoring and Repair (Section 6);
- Community Relations (Section 7);
- Quality Assurance / Quality Control (QA/QC) (Section 8);
- Health and Safety (Section 9);
- Difficulties Encountered / Recommendations (Section 10);
- Summary and Conclusions (Section 11); and
- References (Section 12).

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2 Site Description and Background

2.1 Site Location and Layout

Site Name	Bonanza Mine Site
Owners / Responsible Party	Don Smith
SSID #	10NE
CERCLIS #	ORN001001174
Location	Nonpareil, Douglas County, Oregon
Latitude	43.3899870
Longitude	-123.1845630

The Bonanza Mine Site is an abandoned historical mercury mine and mill located near the small community of Nonpareil, and 6 miles east of Sutherlin, Douglas County, Oregon (Figures 2-1 and 2-2). The Site is located within the southwest quarter of Section 16, Township 25 South, Range 4 West, Willamette Meridian (E & E 1999).

Except for one former building used as a residence, other mine and mill buildings were no longer present at the beginning of the 2014 removal action, leaving only the mill concrete foundations, waste rock pile, and calcine (retorted ore and associated tailings) pile. The mine had 12 adits and more than three miles of subterranean tunnels and shafts (USGS 1951). The Site is located on steep forested terrain. Prior to the EPA removal action, ruderal habitat on the Site included actively logged hillsides, waste rock piles, calcine piles, logging roads and valley floor, and rural residential land uses (Figure 2-3).

Five inhabited homes are located close to the mine, and in November 2013 a total of eight children were observed to living at the Site (EPA 2014d). Two manufactured homes are found within 200 feet of the former mill at locations identified as Residence 1 and Residence 2. The remaining homes include a travel trailer at Residence 3, the former mine superintendent's home at Residence 4, and a manufactured home at Residence 5. The Residence 6 location was previously used as a home site, but at the beginning of the removal action it was used to stage travel trailers and other items belonging to the nearby residents (Figure 2-4). Besides roads and driveways leading to the residences, the land is undeveloped. The nearest off-Site residences are located approximately one half mile to the northeast.

Although not part of the 2014 removal action, the nearby Red Rock Road is germane to the history of the Bonanza Mine. Red Rock Road is a former railroad grade. It is approximately 17 miles long and generally follows the Calapooya Creek east of Sutherlin (Figure 2-2). The western 10 miles of the railroad were constructed in the early 1900s by the Roach Timber Company. The Weyerhaeuser Company extended the railroad seven miles eastward in the 1940s (E & E 1999). During both periods of construction waste rock and calcine from the Bonanza Mine was used. The amount of material taken from the Bonanza Mine for the Red Rock Road is estimated at 316,000 yd^3. In addition, anecdotal information suggests that the same materials

were widely used in construction projects in the Sutherlin area (E & E 2008). Testing of the material used to construct the grade has shown it to have elevated concentrations of arsenic and mercury (E & E 2008).

2.2 Physical Setting

The surrounding land use includes land for livestock pasture, residences, and undeveloped property consisting of meadows and forests (E & E 2000). Much of the property adjacent to the Site is owned by Lone Rock Timber Management Company (Lone Rock).

2.2.1 Topography

The Bonanza Mine is located on the southeast side of a hill that rises from the adjacent valley floor at about 800 feet above mean sea level (msl) to about 1,400 feet msl. The initial mining activities (the "Glory Hole") occurred at an elevation of 1,200 feet (Figure 2-5). The former mill is located at about 880 feet in elevation (HC 2000).

In 2000, an overland surface water route draining south from the tailing pile was observed during a field sampling event; however, the water penetrated the ground surface approximately 50 feet from the pile (E & E 2000). During periods of heavy precipitation, contamination from the Site may migrate into Foster Creek via overland surface water flow in an intermittent stream channel located downgradient of the former mill site (Figure 2-3).

2.2.2 Geology

The regional geology in the vicinity of the Site consists of up to a few feet of clayey soil mantling the Umpqua Formation, which is typically comprised of rhythmically bedded sandstone, siltstone, and shale. At the Bonanza Mine, the sandstone beds strike to the northeast and dip from 35 degrees (°) to 55° southeast. The mercury-bearing ore occurred in altered tuffaceous sandstone overlain by shale. Along this contact is a zone of shearing caused by a reverse fault (average dip of 45° SE), which governed the deposition of mercury-bearing ore (USGS 1951).

The main mercury-containing mineral is cinnabar, although metacinnabar and native mercury were also reported in workings at the higher elevations. The main ore body, encountered at an elevation of about 950 feet, was about 600 feet long, with a maximum thickness of 60 feet. The ore body tapered both laterally and downward, pinching to a length of 150 feet and a width of 4 feet at an elevation of about 730 feet (Figure 2-6; USGS 1951).

2.2.3 Hydrogeology

Shallow groundwater was not encountered during EPA's 2014 field activities. One water well is located on the Site (Figure 2-3). A search of water well records from the Oregon Water Resources Department identified a well installed in 1980 and drilled to a depth of 185 feet. Groundwater was first encountered at a depth of 45 feet. After well installation, the static water level was 36 feet below ground surface (bgs; HC 2000).

2.3 Ownership and Site History

The Bonanza Mine has an operational history extending from the mid-1860s through 1960. The following is a summary of its history.

Early History (1860s - 1935)

The Bonanza Mine was discovered between 1865 and 1870. In 1870, a small Scott furnace was erected to process the ore. Additional development was done by the Bonanza Quicksilver Mining Co., which was organized in 1878. In 1887, 15 flasks of mercury (1 flask is equivalent to 76 pounds) were produced; this is the first and only record of production before 1937 (USGS 1951).

In 1916, the Sutherlin Quicksilver Mining, Refining, and Development Company was organized to operate the mine. At that time, they installed a small mill and retort, and had proposed concentrating ore before retorting. By 1934, the mine had been expanded to five adits, all less than 250 feet long (USGS 1951).

Main Production (1935 - 1960)

In 1935, the mine was acquired by H.C. Wilmot, who organized Bonanza Mines, Inc. (renamed Bonanza Oil & Mines Corp. in 1951). Assay results of ore ran from 3 to 9.3 pounds mercury per ton. A reduction mill was erected, and operations started in October 1937 (HC 2000).

Ore was trammed to an ore bin, with oversize material (>1 inch) going through a roll jaw crusher. Ore was then top-fed into a 50-ton Herreshoff furnace, a vertically-oriented cylindrical furnace with five hearths (Figure 2-7). Ore was heated by two oil-burners to vaporize mercury from the ore. The calcined ore exited the furnace bottom into a hopper, then into cars which dumped the calcine on the hillside below the mill (Figure 2-8). Production in 1937 ranged from 36 to 40 tons per day. The mercury vapor was condensed in a series of inclined pipes and U-bends constructed of sheet-iron and tile. The bottom of the condenser system sat in a water-filled concrete trough. Enamel pans were submerged in the trough under each pipe to collect the mercury. When the pans were removed, the water was decanted, and the mercury was warmed to drive off residual water (EPA 2014d).

In May 1939, the main (north) ore body was discovered. Two 100-ton Gould rotary furnaces were installed, one of which was removed in 1942. These furnaces used a similar system of vaporizing mercury from the ore and condensing it. By the end of 1944, the mine had become Oregon's largest all-time producer of quicksilver. In 1940, the mill produced 5,733 flasks of mercury, the second largest production in the United States. Other than some short closures from 1949 to 1951 and in 1954, the mine operated continuously until October 1960 when minable reserves were exhausted and the mine closed. In the end, the mine had 12 adits with 17,500 feet of shafts on 12 levels. Total recorded production was 39,540 flasks of mercury (or 3,005,040 pounds; EPA 2014d).

2000

Records of the property are incomplete from 1960 until 2000, at which time EPA performed a site inspection at the property (Section 2.4.2). During the site inspection in May 2000, a total of five occupied residences were identified on the mine property, two of which were located within 200 feet of the former mill. Near the former mill were a calcine pile and waste rock pile, both situated below and outward from the mine. A depiction of the former mill, reproduced from a 1942 diagram of the property, is presented in Figure 2-9. The mill structure, including the associated equipment, was no longer present because the majority of it had reportedly been

scrapped for wood and metal. However, there were several cement structures and foundations still present on the property, as well as some wood debris (E & E 2000).

2.4 Previous Site Investigations and Cleanup Actions

There is substantial information indicating that human health and environmental impacts were present at the Site at the time of the removal action. A summary of previous Site investigations and cleanup activities is provided below.

2.4.1 1999 – EPA Preliminary Assessment

Under a START contract, E & E completed a preliminary assessment of Red Rock Road for EPA in May 1999. The preliminary assessment evaluated the potential for exposure to public health and the environment from potential metals contamination associated with the Red Rock Road, which is the former railroad grade approximately 17 miles long that was constructed of calcine from the Bonanza Mine. The amount of material used in construction of Red Rock Road was estimated at 316,000 yd^3. As a result of the preliminary assessment, further investigation was recommended (E & E 1999).

2.4.2 2000 – EPA Site Inspection

E & E completed a site inspection of the nearby Red Rock Road and surrounding watersheds for EPA in May 2000. As part of this inspection, nine surface soil samples were collected from potential source areas at the Bonanza Mine Site, including the former mill, calcine, waste rock, and an abandoned adit. Mercury concentrations in these areas ranged from 74 to 12,000 milligrams per kilogram (mg/kg), arsenic from 71 to 246 mg/kg, and lead from 7 to 1,240 mg/kg. The total on-Site volume of calcine and waste rock was estimated at 2,080 yd^3 and 400 yd^3, respectively (E & E 2000).

2.4.3 2000 – ODEQ Removal Site Evaluation

In September 2000, Hart Crowser, Inc. (HC) performed a removal assessment at the former mill site for ODEQ to gather additional data to delineate the extent of metals contamination at the Site and to identify which areas posed the greatest threat to human health and the environment. Thirty-one surface and near-surface soil samples were collected from the former mill site and surrounding hillside. Mercury concentrations ranged from 68 to 12,000 mg/kg, arsenic concentrations ranged from 20 to 314 mg/kg, and lead concentrations were generally below 70 mg/kg. Calcine, waste rock, and roadway soils also had elevated mercury and arsenic concentrations ranging up to 179 mg/kg and 246 mg/kg, respectively. Eight soil samples were collected for toxicity characteristic leaching procedure (TCLP) metals analysis. The TCLP sample collected near the 50-ton Herreshoff furnace had 113 milligrams per liter (mg/L) mercury which exceeded the regulatory level of 0.2 mg/L mercury (HC 2000).

One sample each of the former mill soil and calcine were analyzed for mercury speciation. Methyl mercury was detected at 0.03765 mg/kg in soil and 0.00246 mg/kg in calcine. Sequential extraction on soil and calcine indicated that most of the mercury was sulfide-bound, primarily in the form of cinnabar or metacinnabar. Volatile mercury was detected at 2,100 and 2,360 micrograms per cubic meter ($\mu g/m^3$; HC 2000).

Water samples were collected from the on-Site well and water storage tank. Arsenic was detected at 0.0536 mg/L in a sample collected from the on-Site well, which exceeded the federal Maximum Contaminant Level of 0.005 mg/L arsenic in drinking water. Reportedly, well water was used only for agricultural purposes (HC 2000).

2.4.4 2000 – ODEQ Removal Action

Based on the findings of the removal assessment in 1999, ODEQ directed HC to perform a targeted removal action at the former mill site. The objective of the removal action was to provide prompt risk reduction by excavating mercury contaminated soil at concentrations greater than 230 mg/kg from the former mill site. The cleanup goal was established by ODEQ and based on ten times the EPA Region 9 preliminary remediation goal for mercury (HC 2000). In September 2000, approximately 240 yd^3 of mine-waste contaminated soil was excavated and transported to a lined and temporary storage cell constructed near the toe of the waste rock pile. The excavation extended to depths up to 6 feet bgs, and 8 yd^3 of contaminated soil were excavated from the location of the Herreshoff furnace and placed in 1 yd^3 containers. Based on TCLP results from the 2000 RSE, this soil was designated as hazardous waste by ODEQ and transported to a temporary storage cell pending proper off-Site disposal. The excavated areas were backfilled with clean top soil and sand imported from an off-Site source. Control measures were added to the drainage from the tailings pile prior to conclusion of the removal action (HC 2000). In 2004, the mercury-contaminated soil designated as hazardous waste was transported to Chemical Waste Management's landfill in Arlington, Oregon, for disposal (HC 2005).

2.4.5 2003 – ODEQ Site Visit

HC returned to the Site on behalf of ODEQ in 2003 to assess whether ecological receptors and/or exposure pathways were present or potentially present at or in the Bonanza Mine Site and along Foster Creek. Impacts to the Site and surrounding properties attributable to contaminated environmental media were not observed during the Site visit. Physical impacts from historical mining operations included the waste rock pile, mine access roads, and mine excavation. Based on the results of the Oregon Natural Heritage Information Center data query and information from the Oregon Department of Fish and Wildlife, HC concluded that rare, threatened, and endangered species may be present at or near the Site (HC 2003).

2.4.6 2003 – Oregon Health Authority Exposure Investigation

In 2003, staff from the Environmental Health Assessment Program (EHAP) of the Oregon Health Authority (OHA) conducted an exposure investigation to determine the levels of arsenic and mercury in the urine of Bonanza Mine residents. The primary objectives were to determine the levels of arsenic and mercury in the urine of residents, to collect behavioral and demographic information, to provide health educational materials about heavy metals and exposure reduction measures (ERMs), and to fill existing data gaps in the evaluation of exposure pathways for residents at Bonanza Mine. A total of five urine samples were collected from residents at the Site. The investigation found detectable concentrations of mercury in two of five samples and arsenic in all five samples. All samples had urine levels below the reference ranges for mercury and arsenic. Based on these findings, EHAP determined that Bonanza Mine residents who were tested were not being exposed to significant levels of arsenic and mercury at the time of the testing (OHA 2004).

2.4.7 2005 – ODEQ Post-Removal Assessment Report

HC compiled and assessed available information for the Bonanza Mine in 2005 to assist in preparation of a remedial investigation Work Plan. The report also developed a preliminary conceptual site model for both human and ecological receptors at the Site and identified tasks to be performed during the remedial investigation to address data gaps. Volatile mercury was measured in soil from the former mill and calcine. No other environmental media samples were collected as part of this activity (HC 2005).

2.4.8 2012 – EHAP Public Health Consultation

EHAP performed a public health consultation at the Bonanza Mine to evaluate the potential health risks to adults living in sections of the Site denoted as "clean." EHAP did not evaluate child health risks because ODEQ did not expect children to live on the Site. The health consultation also assumed that areas outside the clean parcel would not be used for residential purposes. EHAP concluded that swallowing, touching or breathing in soil and dust was not expected to harm the health of on-Site adult residents living on the clean parcel of land for a year or longer. The report provided the following recommendations: children less than 6 years of age should not live at the Site; residents at the Site should avoid living or recreating in areas outside of the clean parcels; and arsenic-contaminated water from the on-Site well should not be used for drinking or cooking. The report encouraged use of ERMs such as minimizing tracking of dust into homes and using indoor cleaning methods to reduce the re-introduction of dust into air (OHA 2012).

2.4.9 2013 – Oregon DHS and EHAP Site Visit

In November 2013, Oregon Department of Human Services (DHS) contacted EHAP regarding the wellbeing of two of the eight children at the Site. DHS and ODEQ performed a voluntary relocation of five of the eight children and two adults in November 2013 (EPA 2014d). The children were taken to a medical provider, who collected blood samples for mercury and arsenic analysis. Results indicated elevated concentrations mercury above reference values for two of the children. In addition, physiologic reactions in two children were suspected of being related to mercury exposure at the Site (EPA 2014d). This incident confirmed the human health threat posed by exposure to mercury through direct contact, ingestion, and/or inhalation pathways.

2.4.10 2013 – ODEQ Soil Assessment

In December 2013, ODEQ performed an assessment at the Site to characterize the extent of mine-waste contamination in surface and near-surface soils. The primary objective was to identify potentially clean areas for Site residents where soil concentrations were below the Site cleanup screening values of 17 mg/kg for arsenic (Site-specific background established for the Sutherlin Valley region) and 23 mg/kg for mercury (residential risk-based concentrations; ODEQ 2012). During the assessment, ODEQ screened 118 soil samples using a field portable X-ray fluorescence (XRF) instrument and submitted nine discrete soil samples to an off-Site laboratory for analysis. The XRF data indicated concentrations of arsenic ranging from non-detect to 471 mg/kg, and mercury concentrations from non-detect to 1,200 mg/kg (ODEQ 2014b). The Site was conceptually divided into six separate areas for planning and sampling purposes (Figure 2-4). The results indicated that the extent of arsenic and mercury contamination was more widespread than previously anticipated, including near Residence 4 and Residence 5 (ODEQ 2014a). The greatest extent of contamination encompassed approximately 16 acres and was

found primarily in Areas 1, 2, and 4. Additional contamination was also detected in the southern section of the Site near Areas 3, 5, and 6 (ODEQ 2014a).

2.4.11 2014 – ODEQ Removal Action

In February 2014, ODEQ initiated a time-critical removal action to achieve prompt human health risk reduction by removing and capping soil in certain inhabited areas of the Site that were impacted by elevated concentrations of mercury and arsenic. Approximately 60 yd^3 of contaminated soil and firebrick were excavated from targeted sections identified as Areas 3, 5, and 6 (Figure 2-4). The excavated material was placed in a temporary cell near the base of the waste rock pile. Disturbed areas were backfilled with clean soil and restored to the original Site conditions. Excavation of contaminated material in Areas 1, 2, and 4 was not performed during the ODEQ removal action due to the size and complexity of these areas in addition to limited availability of funds and other resources. Prior to demobilizing from the Site, temporary fencing and gates were installed to restrict access to Areas 1 and 2, and extensive blackberry brambles were left in place to discourage access to Area 4 (APEX 2014).

2.5 Pre-Removal Activities

2.5.1 Site Visit

In April 2014, EPA performed a Site visit with ODEQ, a START engineer, and an ERRS response manager. The property owner and some of the affected residents had an informal meeting with the visitors. The objective of the Site visit was to perform a Site reconnaissance related to a potential time-critical removal action involving the manufactured homes at Residences 1 and 2, the former mill site, calcine pile, and waste piles. START used the Lumex mercury vapor analyzer (MVA) to screen for mercury vapors at the residences and former mill site (E & E 2014d).

2.5.2 Cultural Resources Survey

Prior to performing the removal action, EPA consulted with the Oregon State Historic Preservation Office (SHPO). Because of the age of the Bonanza Mine and its historical significance, SHPO recommended that a Cultural Resources Survey (CRS) was needed for compliance with Section 106 of the National Historical Preservation Act of 1966. The CRS was performed by Applied Archaeological Research, Inc. (AAR) of Portland, Oregon, as a subcontractor to E & E. The CRS included background research on the historical mine, documentation of the mine as a historic cultural resource, and a pedestrian survey of the area of potential effects to identify mining and non-mining related archaeological resources (AAR 2014).

The historical or potentially historical materials observed during the survey and described in the CRS report were recorded as elements of the historical Bonanza Mine. The Site consisted of sparse deposits of architectural and industrial debris and consumer-related objects, mining-landscape features, and the remains of the furnace building marked by a concrete slab and a set of concrete structures. Although diverse types of cultural materials were observed, in general, surprisingly little remained at the Site considering the scope of the mining enterprise and its length of operation. The Bonanza Mine extends beyond the current projected area of potential effects to the north ore body on an adjacent property, with its associated adits and other ore

extraction features, waste rock piles, and access roads. That part of the Bonanza Mine was not surveyed and is only known through historical documents (AAR 2014).

Based on the CRS, and following consultation with the Oregon State Archaeologist, EPA determined that the removal action had no potential to have an adverse effect on historic properties because no such properties remained at the Site (EPA 2014b). Copies of the CRS report were forwarded to the Douglas County Historical Society, the Oregon State Archaeologist, and the Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians (EPA 2014b).

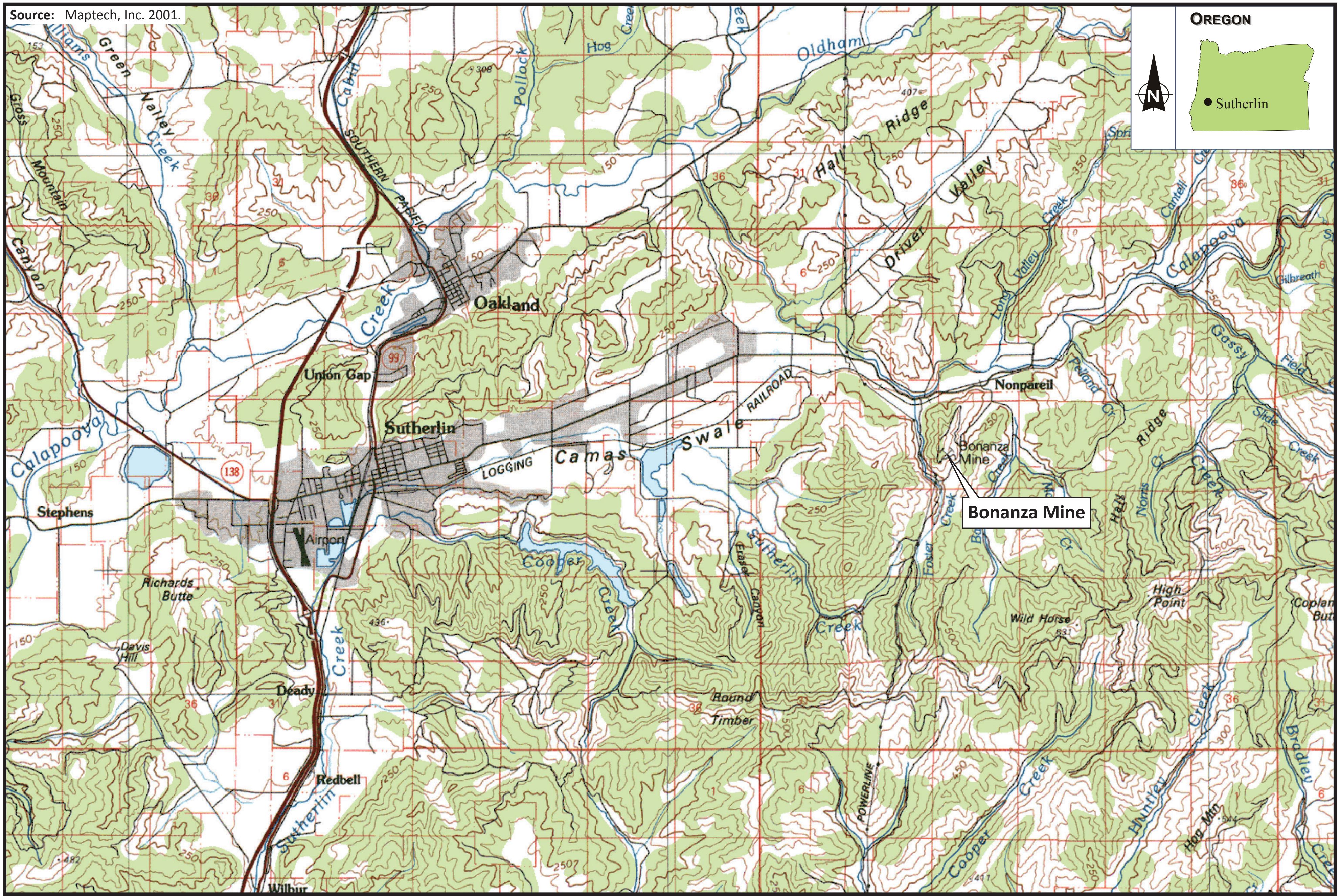
2.5.3 Sampling Event and Topographical Survey

In June 2014, START performed a pre-removal survey/sampling event at the Site to prepare for the impending time-critical removal action. Sampling tasks included collecting soil samples for analysis of total metals and synthetic precipitation leaching procedure (SPLP) metals by an off-Site analytical laboratory (Table 2-1). The SPLP mercury and arsenic results were compared to state and federal regulatory/screening levels for human health and ecological receptors in both groundwater and surface water to help evaluate the potential for the Site mine waste materials to leach and to determine the requirements for the repository cap (E & E 2014c; Section 5.2). START also coordinated with the subcontracted surveyors from Centerline Concepts Land Surveying, Inc. based on Oregon City, Oregon. The surveyor prepared a pre-removal existing conditions map of the calcine pile, waste rock pile, planned Repository, and associated Site features (Figure 2-10). Additional survey-related information can be found in Section 4.2.7.

2.5.4 Endangered Species Act Survey

To assist EPA in planning for the removal action, ODEQ initially contacted the Oregon Department of Fish and Wildlife to ask about threatened and endangered species and critical habitat that may occur at the project Site. ODEQ then contacted the United States Fish and Wildlife Service (USFWS) and was informed that one threatened or endangered plant species, the Kincaid's lupine (*Lupinus oreganus*), had the potential to occur at the Site (USFWS 2006). To determine whether this plant species was present at the Site, EPA directed START to conduct a plant survey.

During the sampling event described Section 2.5.3, a START biologist performed a pedestrian survey for the Kincaid's lupine and its critical habitat within the project area. The Kincaid's lupine is a perennial species known to occur about 13 miles from the project area. It is listed as threatened by both the federal government under the Endangered Species Act and the State of Oregon. Neither Kincaid's lupine nor its critical habitat was observed in the project area during the pedestrian survey.



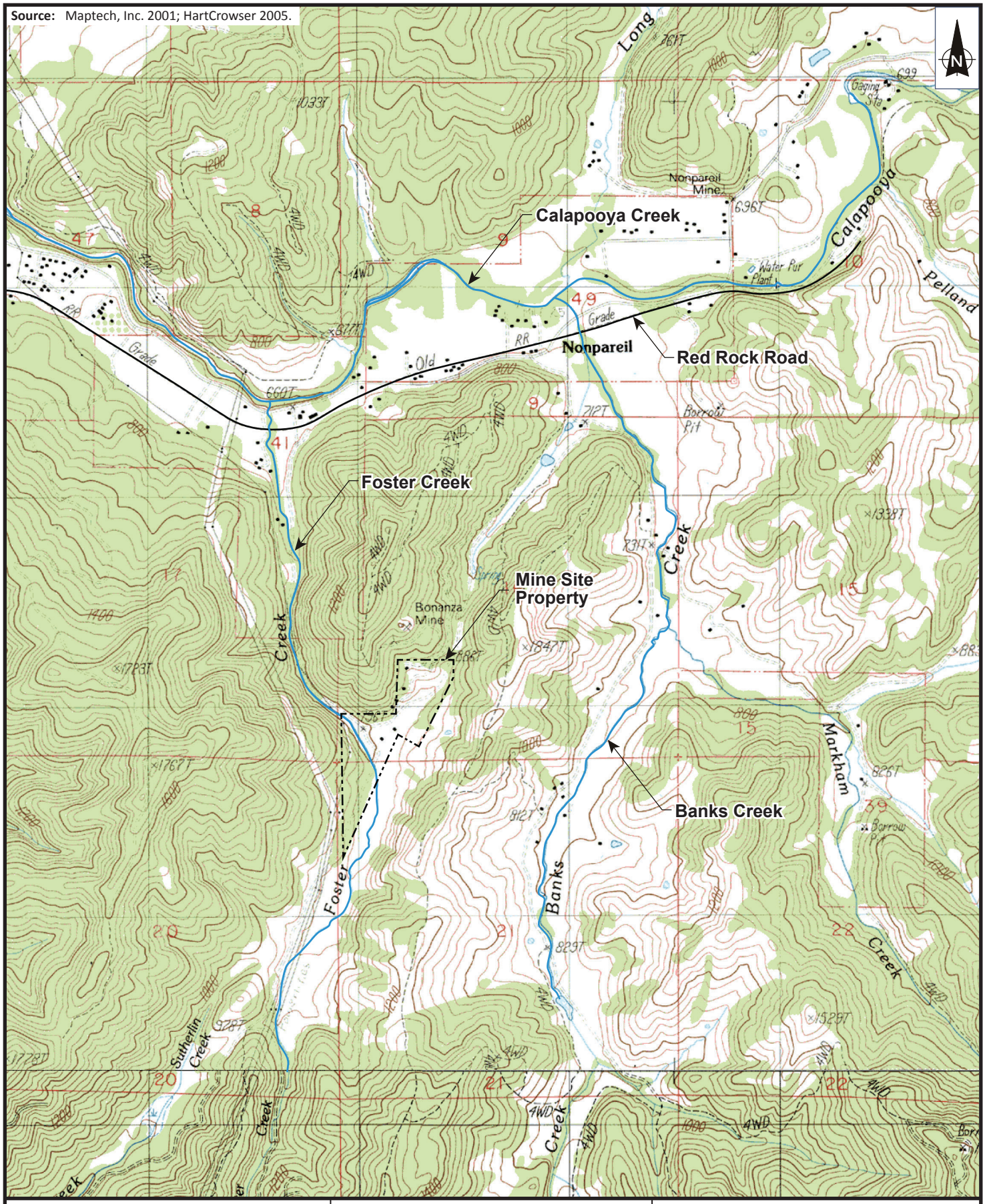
ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

Figure 2-1
SITE LOCATION MAP

0 .75 1.5
Approximate Scale in Miles

Date:	Drawn by:	
7/7/15	AES	10:START-IV\14030011\fig 2-1



ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

Figure 2-2
SITE VICINITY MAP

0 1000 2000
Approximate Scale in Feet

Date:	Drawn by:	
7/7/15	AES	10:START-IV\14030011\fig 2-2

Source: © 2014 Microsoft Corporation (Bing); HartCrowser 2005; Apex Companies LLC 2014.

N

Residence 1

Former Mill Site

Waste Rock

Calcine

Residence 2

Former Temporary Storage Cell Location

Bonanza Mine Road

Shallow Pond

Gate

Intermittent Tributary (approx. location)

Residence 3

Residence 4

Pump House

Water Well

Residence 5

Property Boundary

Foster Creek

Bonanza Mine Road

Key:
- Creek
- Intermittent Tributary
- Property Boundary
- Water Well
- Pre-Removal Home Location

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Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

Figure 2-3
SITE LAYOUT MAP

Not to Scale

Date:	Drawn by:	
7/7/15	AES	10:START-IV\14030011\fig 2-3

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Source: © 2014 Microsoft Corporation (Bing); HartCrowser 2005; Apex Companies LLC 2014.

N

RESIDENCE 1

UPPER ROAD

REPOSITORY

MILL SITE

RESIDENCE 2

RESIDENCE 6

Bonanza Mine Road

Shallow Pond

AREA 1

AREA 4

AREA 2

Residence 3

AREA 3

Residence 4

PUMP HOUSE

AREA 5

Residence 5

AREA 6

Property Boundary

EPA COMMAND POST

Foster Creek

Bonanza Mine Road

Key:

- Creek
- EPA Removal Action Areas
- Previous Removal Action
- Current Home Location
- Property Boundary

Note: Contamination may be present in all other areas not included in the removal action.

ecology and environment, inc. Global Environmental Specialists Seattle, Washington	BONANZA MINE SITE Sutherlin, Oregon	Figure 2-4 SITE AREA MAP		
	Not to Scale	Date: 7/1/15	Drawn by: AES	10:START-IV\14030011\fig 2-4

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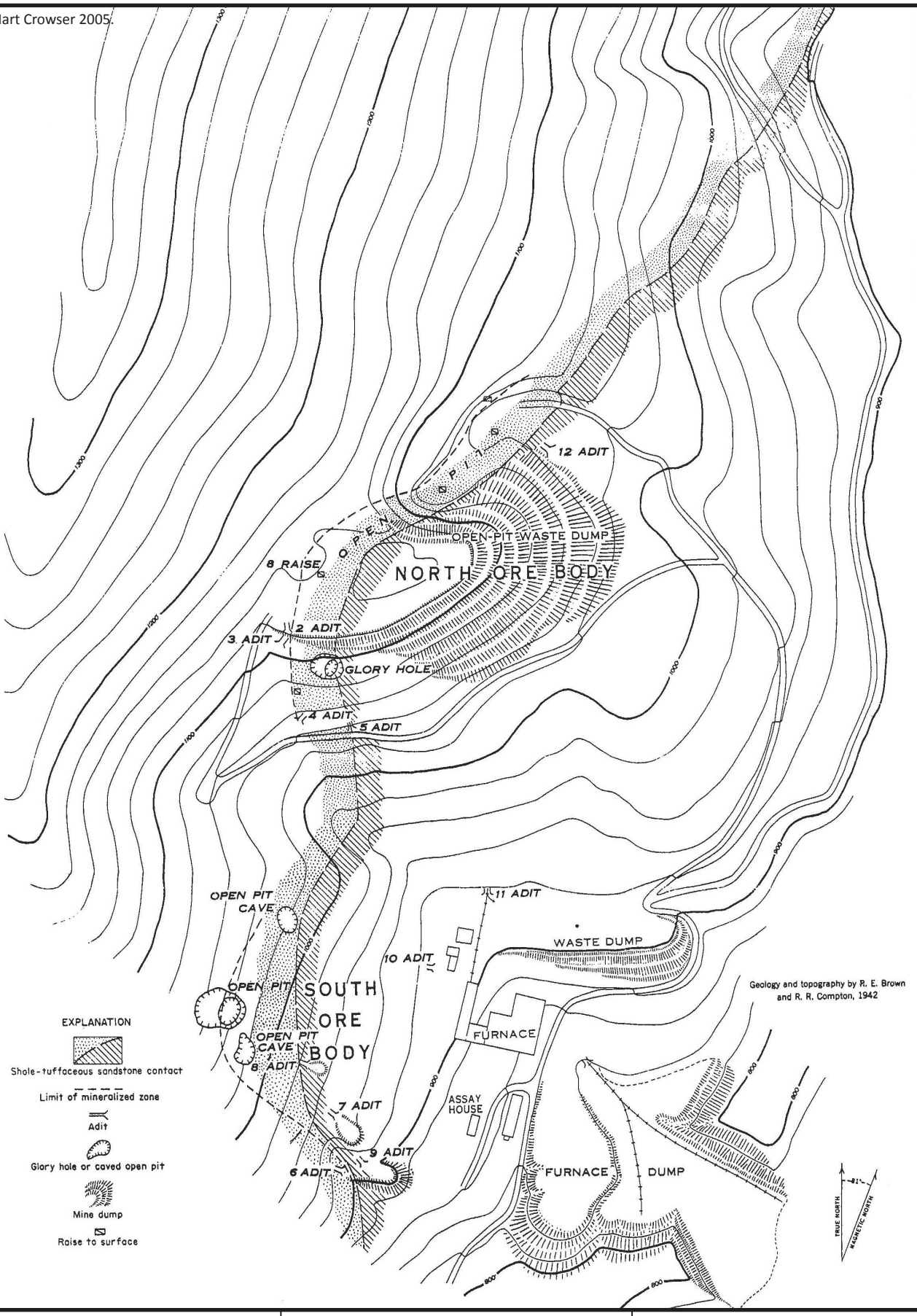
Source: Hart Crowser 2005.



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BONANZA MINE SITE
Sutherlin, Oregon

Figure 2-5
TOPOGRAPHIC MAP OF BONANZA MINE

Date:	Drawn by:	
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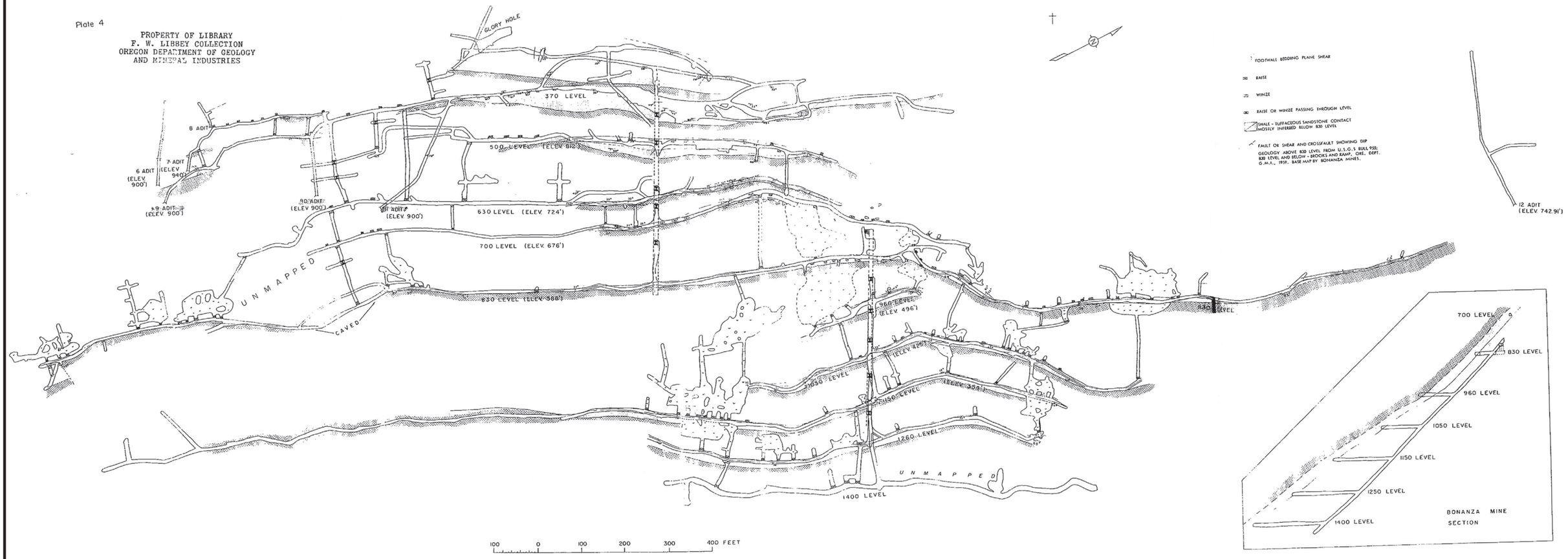
Source: Hart Crowser 2005.

Plate 4



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BONANZA MINE SITE
Sutherlin, Oregon

Figure 2-6
GEOLOGIC MAP OF BONANZA MINE

Date:	Drawn by:	
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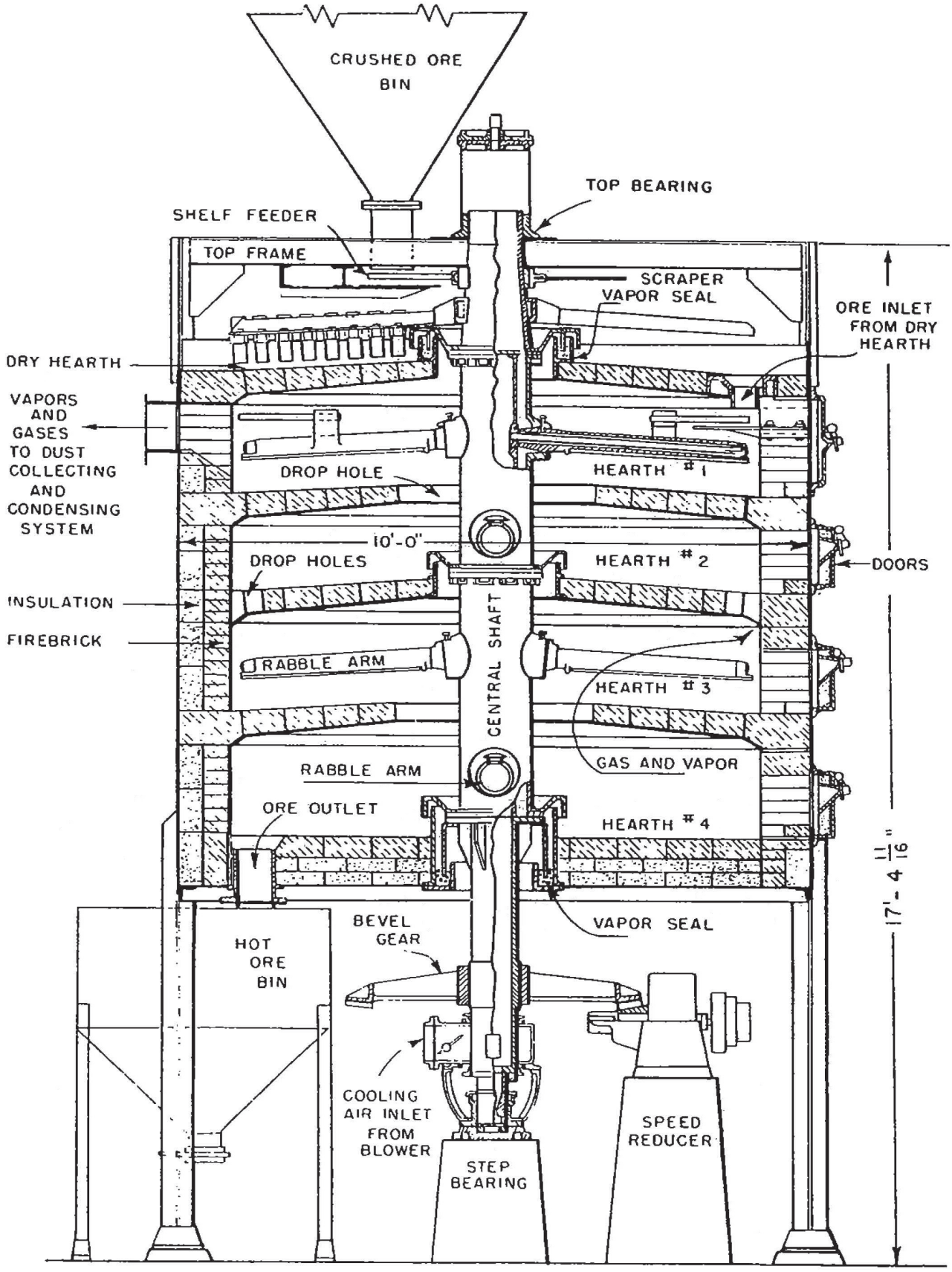
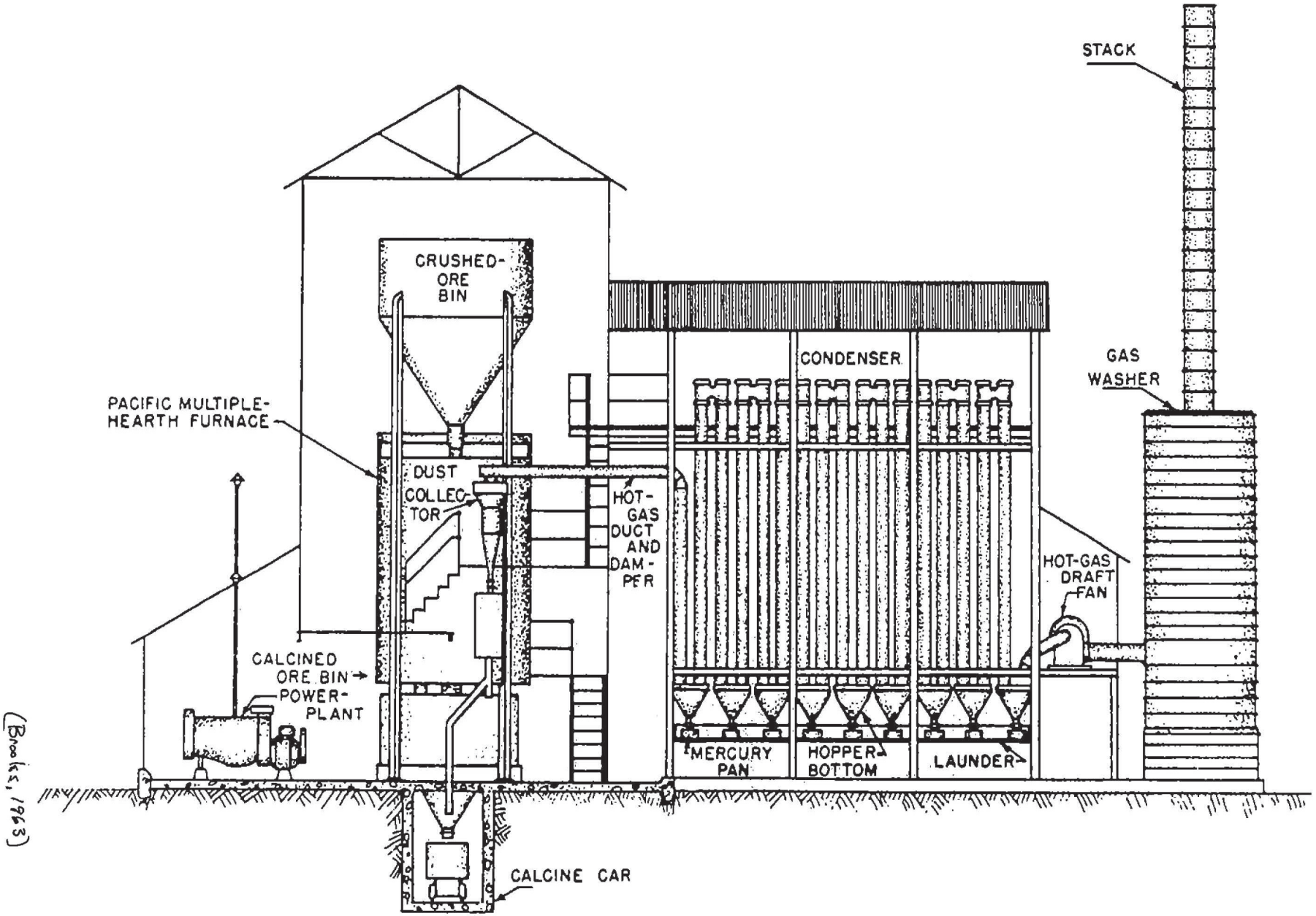
Source: Hart Crowser 2005.



ecology and environment, inc. Global Environmental Specialists Seattle, Washington	BONANZA MINE SITE Sutherlin, Oregon	Figure 2-7 SECTION THROUGH A MULTIPLE-HEARTH FURNACE Date: 7/1/15 | Drawn by: AES | 10:START-IV\14030011\fig 2-7

Source: Hart Crowser 2005.



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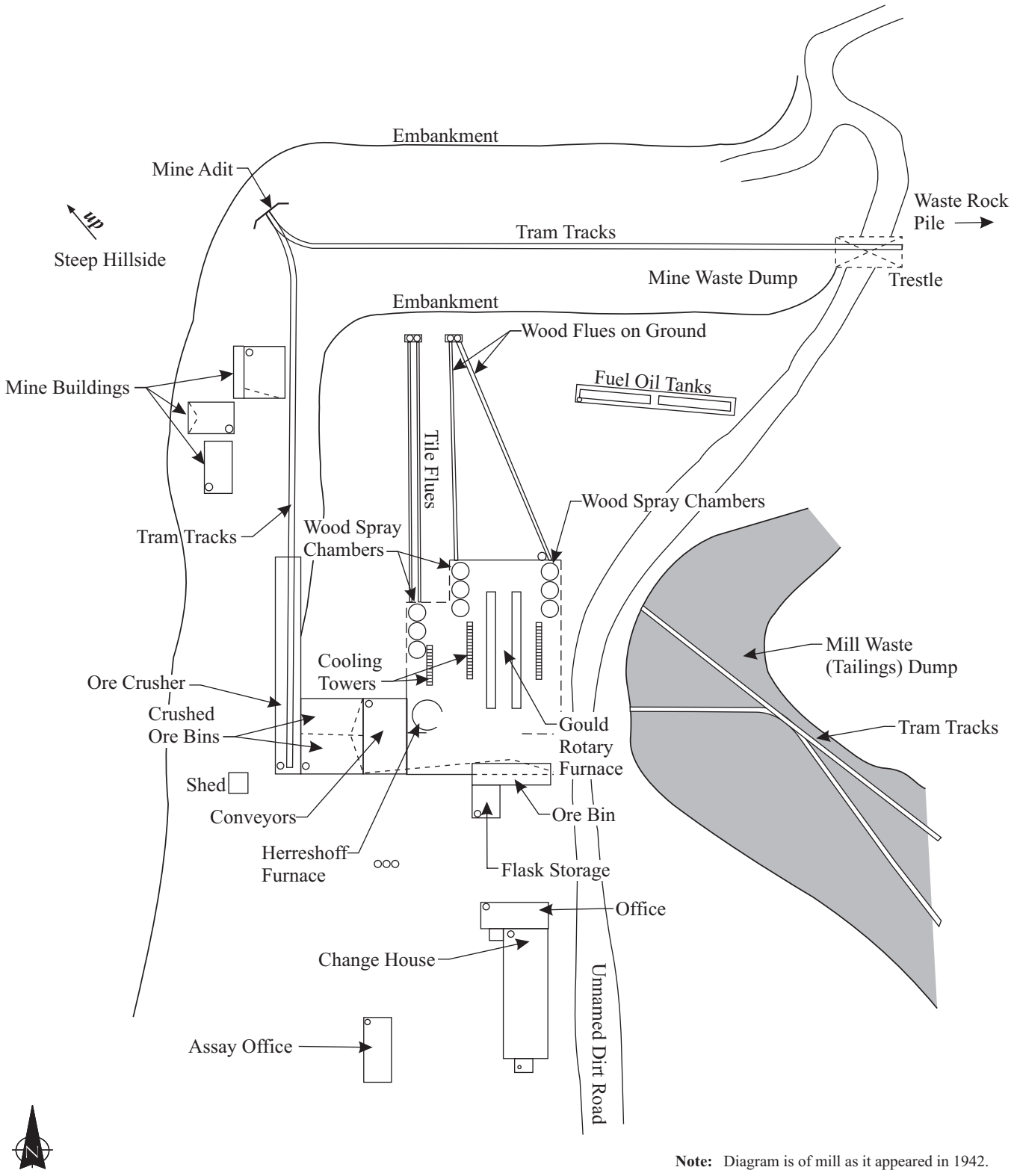
BONANZA MINE SITE
Sutherlin, Oregon

Figure 2-8
LAYOUT OF A MULTIPLE-HEARTH FURNACE PLANT

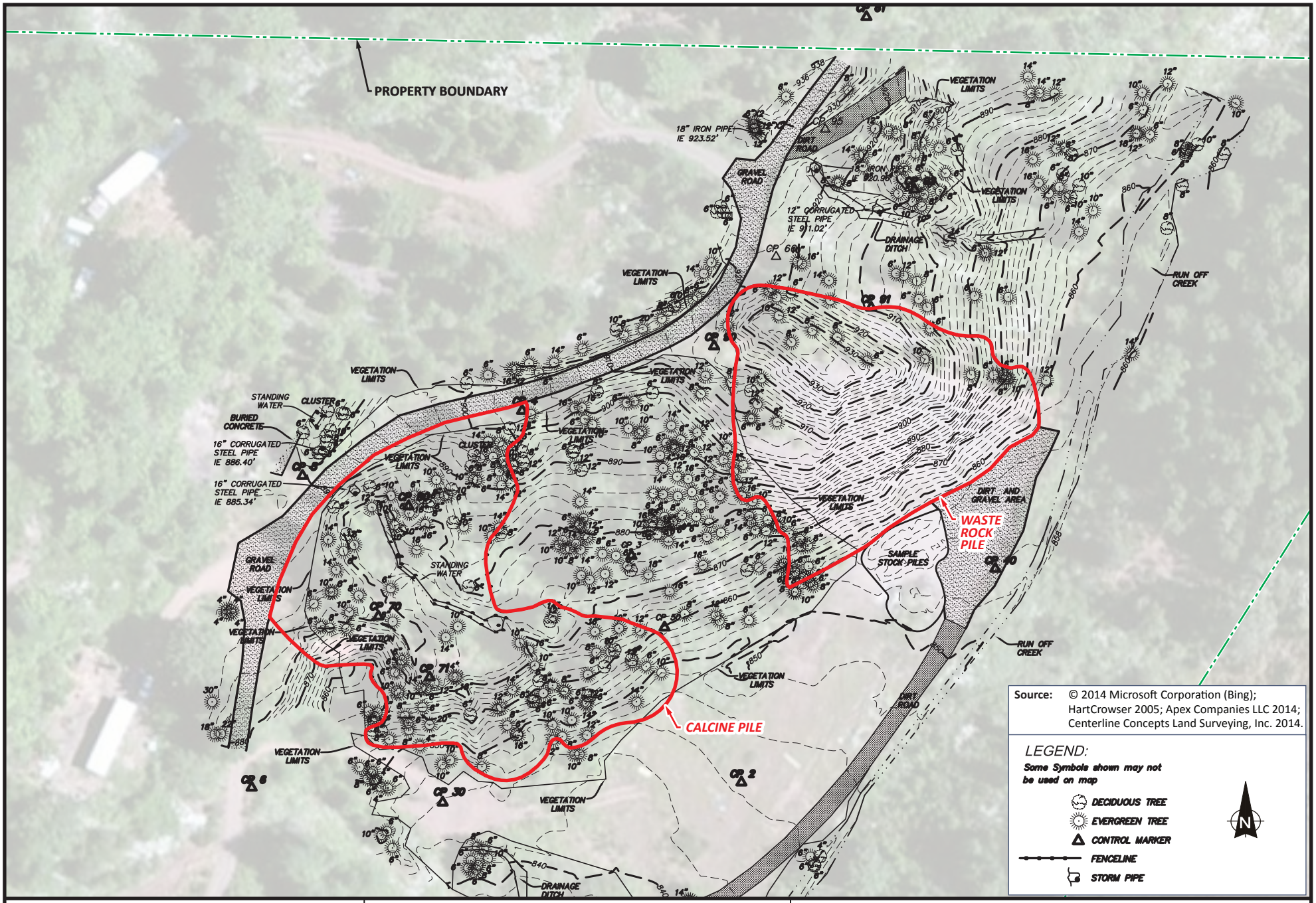
Date:	Drawn by:	
7/8/15	AES	10:START-IV\14030011\fig 2-8

Source: Cosgrove and Company, Inc., 1942.



Note: Diagram is of mill as it appeared in 1942.

ecology and environment, inc. Global Environmental Specialists Seattle, Washington	BONANZA MINE SITE Sutherlin, Oregon	Figure 2-9 1942 MILL DIAGRAM		
	0 25 50 Approximate Scale in Feet	Date: 6-30-15	Drawn by: AES	10:START-IV\14030011\fig 2-9



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BONANZA MINE SITE
Sutherlin, Oregon

0 50 100
Approximate Scale in Feet

Figure 2-10
PRE-REMOVAL SURVEY MAP

Date:	Drawn by:	
7/7/15	AES	10:START-IV\14030011\fig 2-10

Table 2-1

Pre-Removal Total and SPLP Metals Results
Bonanza Mine Site
Sutherlin, Oregon

Sample Number	Location ID	Location Description	Total Metals (mg/kg)		SPLP Metals (µg/L)	
			Arsenic	Mercury	Arsenic	Mercury
Soil		Site-Specific Cleanup Level	17	23	n/a	n/a
Drinking Water		EPA MCL	n/a	n/a	10	2
		EPA RSL Tapwater	n/a	n/a	0.052	0.063
		Oregon RBC Residential	n/a	n/a	0.38	11
Surface Water		Oregon Acute Aquatic Life	n/a	n/a	340	1.4
		Oregon Chronic Aquatic Life	n/a	n/a	150	0.77
		Oregon HH WQC (Water and Organism)	n/a	n/a	0.018	n/a
		Oregon HH WQC (Organism)	n/a	n/a	0.14	n/a
10ZZ-0001	WR01WR 0.5-1.0	Waste Rock Pile	185	691 JK	< 7.2	< 0.06
10ZZ-0002	MA01SS 0-0.5	Mill Area	130	96.5 JK	32.5 JQ	< 41.3
10ZZ-0003	HS01SS 0-0.5	Home Site	30.9	64.6 JK	< 10.8	9.3
10ZZ-0004	CA01CA 0.5-1.0	Calcine Pile	202	54 JK	26.6 JQ	9.6
10ZZ-0005	CA01QC	Calcine Pile	257	51.5 JK	< 7.2	0.79 J
10ZZ-0006	WR02WR 0-0.5	Waste Rock Pile	74.6	122 JK	< 7.2	< 0.06
10ZZ-0007	A101SS 0-0.5	Area 1	414	572 JK	61.4	52.4
10ZZ-0008	CA02CA 0-0.5	Calcine Pile	155	124 JK	27 JQ	35.7
10ZZ-0009	RD01SS 0-0.5	Road/Driveway	178	84.1 JK	< 8.8	2.1
10ZZ-0010	RD02SS 0-0.5	Road/Driveway	196	87.4 JK	< 7.2	2.2

Key:

µg/L	= micrograms per liter
EPA	= Environmental Protection Agency
HH	= human health
ID	= identification
J	= estimated value
JK	= estimated value with unknown bias
JQ	= estimated value with unknown bias (between the method detection limit and method reporting limit)
MCL	= Maximum Contaminant Level
mg/kg	= milligrams per kilogram
n/a	= not applicable
RBC	= risk-based concentration
RSL	= Regional Screening Level
SPLP	= Synthetic Precipitation Leaching Procedure
WQC	= water quality criteria
	= total arsenic or mercury values exceed the site-specific cleanup level
	= SPLP arsenic or mercury values exceed the EPA MCL

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3 Project Approach and Organization

EPA performed a removal action from August 4 to December 6, 2014, at the Bonanza Mine Site. The removal action was intended to mitigate the potential human health and ecological threats posed by exposure to mercury and arsenic, including direct contact, ingestion, and inhalation pathways (EPA 2014d).

3.1 Removal Action Design Approach

EPA performed the 2014 removal action in accordance with the Final Draft Work Plan and Conceptual Design (Work Plan) to provide a preliminary approach and conceptual design for guidance during implementation of the removal action (E & E 2014a). START engineers provided EPA with design drawings and specifications for an on-Site repository of mine-related contaminated soils. EPA prepared an action memorandum to document approval of the time-critical removal action and outline proposed actions at the Site (EPA 2014d).

3.1.1 Removal Action Tasks

The following tasks were identified during the RA:

- Excavation of mine-waste materials including calcine, waste rock, and mill foundations that exceed cleanup levels for mercury (23 mg/kg) and arsenic (17 mg/kg) to a depth of 24 inches bgs or as directed by the EPA On-Scene Coordinator (OSC);
- Consolidation of excavated materials into the on-Site repository;
- Construction of a soil and membrane cover for the repository;
- Proper off-Site disposal of material unsuited for placement in the repository, such as household hazardous waste, asbestos waste, and elemental mercury;
- Reconstruction of the intermittent stream and other drainage features running through the waste areas;
- Reconstruction of roads and driveways;
- Demolition of two existing single-wide manufactured homes and removal of contaminated personal items;
- Replacement of two single-wide manufactured homes in accordance with the EPA Guidance for Compensation for Property Loss in Removal Actions (EPA 1995);
- Closure of any adits or mine workings encountered in the work zones; and
- At the conclusion of the removal action, final grading and seeding of disturbed areas.

The action memorandum and Work Plan also described construction best management practices (BMPs), greener cleanup BMPs, and post-removal site control activities including long-term monitoring, maintenance, and repair (MM&R) requirements for the Site.

The Work Plan and Site-specific sampling plan (SSSP; E & E 2014a) and sampling plan alteration form (SPAF: E & E 2015) described screening and sampling of environmental media, including the following tasks:

- Field screening of soil with the XRF instrument;
- Field screening of air with the Lumex MVA;
- Dust monitoring with DataRam portable particulate monitors (DataRams);
- Air sampling for mercury and arsenic;

- Soil sampling for mercury and arsenic; and
- Bulk material sampling for asbestos.

3.1.2 On-Site Repository Design

E & E engineers initially designed the on-Site repository to hold over 10,000 yd^3 of mine-waste material anticipated to be excavated from the Site (E & E 2014a). This volume did not include the underlying waste rock in the repository footprint that required grading to meet the 3:1 (run:rise) repository slope. Specific areas identified for excavation included the former mill site, Residences 1 and 2, and Areas 1, 2, and 4. The repository design was intended to allow for field changes, if necessary.

The on-Site repository was designed to hold excavated mine-waste materials along with ancillary debris such as concrete foundations from the former mill site. The repository location was in Area 1, against the calcine and waste rock piles and hillside in the north end of valley floor. The calcine and waste rock piles were consolidated to achieve a smaller footprint. The repository was designed to have a protective barrier cover consisting of an impermeable geomembrane liner and minimum of 24 inches of clean rock and/or soil covering the contaminated material (E & E 2014a).

3.2 Field Changes to Work Plan and On-Site Repository Design

During the course of the removal action, an increased volume of excavated soil and concomitant soil and geomembrane cover necessitated adjustments to the design and slope calculations of the on-Site repository. Specific factors included the increased depth of excavation at the former mill site due to presence of highly-contaminated soil and free mercury, and the increased depth of excavation at nearly all areas based on field screening values (EPA 2014a). Additional information regarding the repository can be found in Section 4.2.4.

The Work Plan was intended to be flexible and allow EPA to adapt to changing field conditions. These revisions included the following:

- The extent of contamination was greater than originally anticipated, and it was not practical to removal all contaminated materials above the cleanup levels. Accordingly, some contamination remains at the Site outside of the repository. To the extent possible, EPA covered contaminated material with clean fill, or if it existed on steep slopes, EPA left existing vegetation in place to encourage permanent stabilization and reduce erosion and sedimentation.
- The Residence 2 replacement home was relocated to Residence 6 (Section 4.2.5).
- An on-Site clean backfill borrow source was developed behind the EPA command post.
- The drain pipe in the toe drain was reduced from a diameter of 8 inches to 6 inches.

3.3 Project Organization and Management

The removal action was performed by EPA and its contractors:

On-Scene Coordinator: The removal action was performed under the supervision of EPA OSCs Earl Liverman, Richard Franklin, and Dan Heister.

Emergency and Rapid Response Services: Removal action cleanup work was performed by EQM under the EPA Region 10 ERRS contract.

Superfund Technical Assistance and Response Team: E & E, under the EPA Region 10 START contract, provided on-Site technical assistance, collected environmental samples, and documented Site activities.

3.4 Project Funding, Accounting and Costs

The project ceiling cost estimate for the Site was $3,215,000 which includes contractor costs and EPA extramural cost contingency is provided in Table 3-1.

Table 3-1 Project Ceiling Cost Estimate

Cost Allocation	Amount
ERRS	$2,450,000
START	$375,000
EPA Contingency	$390,000
Total 2014 Project Ceiling	**$3,215,000**

3.5 Project Schedule

EPA performed the removal action from August 4 to December 6, 2014. A summary of the removal timeline is provided in Table 3-2.

Table 3-2 2014 Removal Action Timeline

Activity	Date
EPA, ERRS, and START, mobilized to the Site.	August 4, 2014
Established Site infrastructure, installed BMPs, set up command post.	August 4 – 7, 2014
Began air sampling and screening for particulates and mercury vapors.	August 6, 2014
Performed asbestos survey at Residences 1 and 2.	August 9, 2014
Began clearing and shaping the repository footprint.	August 11, 2014
Began excavation of former mill site.	August 12, 2014
Observed free mercury at the former mill site excavation.	August 13, 2014
Began excavation at Areas 1, 2, and 4.	August 16, 2014
Began excavation at Residences 1, 2 and 6.	September 4, 2014
Began construction drainage features including the armored channel in Areas 1, 2, and 4.	September 4, 2014
Completed excavation of mine-waste material from all Areas.	September 27, 2014
Began to backfill excavated Areas with rock and top soil.	September 27, 2014
Downgraded to Level D personal protective equipment (PPE) throughout the Site.	October 9, 2014
Repository liner installed and covered with soil.	November 5, 2014

Table 3-2 2014 Removal Action Timeline

Activity	Date
Performed Site restoration activities (regraded borrow area, regraded property, seeded property).	November 12, 2014
START demobilized from the Site.	November 21, 2014
ERRS demobilized from the Site.	December 6, 2014

4 Removal Activities

This section describes the removal action activities that took place between August 4 and December 6, 2014. Mine-waste materials including calcine, waste rock, and mill foundations that exceeded cleanup levels for mercury (23 mg/kg) and arsenic (17 mg/kg) were excavated to a depth of 24 inches bgs or as directed by the EPA OSC. It was not practical to removal all contaminated materials above the cleanup levels, and some contamination remains at the Site outside of the repository. To the extent possible, EPA covered contaminated material with clean fill, or if it existed on steep slopes, EPA left existing vegetation in place to encourage permanent stabilization and reduce erosion and sedimentation. Photographs taken throughout the removal action are presented in Appendix A.

4.1 Preparation and Mobilization

The following subsections describe the Site improvements to establish the Site infrastructure in anticipation of the removal action.

4.1.1 Utility Locate and Services

Prior to initiating work at the Site, ERRS coordinated with local utility companies to obtain service for the temporary on-Site facilities that were utilized during implementation of the removal action (i.e., temporary construction trailers, etc.). In addition, utility locating agencies were contacted in order to identify aboveground and/or subgrade utilities that existed at the Site that may interfere with the removal activities. For privately located utilities (such as septic systems) the homeowners were consulted for information on their location.

4.1.2 Clearing and Grubbing

Throughout the removal action, activities were restricted in an effort to preserve existing vegetation. This was especially true along the slopes that exist across the Site. A limited amount of clearing and grubbing was performed to clear trees and vegetation only in areas that were required for the removal activities.

Clearing consisted of the felling, trimming, and cutting of trees and vegetation in the designated removal areas into sections. These trees and other vegetation, including downed timber, snags, and brush, were later reused as cover material within the support areas, excavation areas, and the repository. Cleared trees and brush were used as erosion control material to the extent practicable.

Grubbing consisted of the removal of stumps, roots larger than 3 inches in diameter, and matted roots from the same areas that required clearing and reuse as erosion-control slash material. Small plants, brush and vines were cut off flush with or below the original ground surface. The canes of blackberry plants were removed above the crown, which was then grubbed from the soil

4.1.3 Construction Site Layout

The temporary facilities were established in locations that would limit interference with construction operations or traffic flow by Site residents or adjacent property owners. The

locations were leveled using heavy equipment after they were cleared and grubbed. The project command post, including EPA office trailers and equipment storage areas, was set up in the south section of the property based on equipment limitations and access requirements.

4.1.4 Site Control and Access

Temporary Site controls were utilized in order to provide means of added protection for public health, safety, welfare, and the environment, and to maintain the effectiveness and integrity of the removal action. In general, these Site controls consisted of signage that was posted around the perimeter of the Site to prohibit unauthorized entry of persons to the work areas. Activities associated with the excavation and repository construction were restricted to the designated working zones.

Site access was achieved by utilizing Bonanza Mine Road and temporary Site access roads. Access roads and staging pads were installed by performing limited grading (as necessary), then placing geotextile (as necessary) and gravel on the graded surface. Access roads within and outside the working limits at the Site were maintained to allow for uninterrupted equipment/personnel access. To provide equipment access to the excavation areas from the storage/staging and laydown zones, additional temporary access roads and gravel equipment pads were constructed for the staging of clean equipment and/or materials.

4.1.5 Traffic Control

Signage was deployed near the turnoff from Nonpareil Road onto Bonanza Mine Road to warn of construction-related truck traffic, and information placards were installed near the Site entrance to direct visitors and subcontractors to report to the EPA office trailers. Publicly owned and operated vehicles (i.e., those not related to Site activities) were not allowed on Site with the exception of residents and visitors to the three on-Site residences that were inhabited during the removal action. Whenever possible, traffic detours and disruption were coordinated with the homeowners in advance. The movement of equipment and personnel during on-Site operations (e.g., construction equipment staging, waste and fill hauling, and Site personnel access) was limited to daylight hours.

4.1.6 Site Security

A security company was subcontracted to provide security during periods when work was suspended such as overnight and Sunday. Security personnel were provided with a satellite phone in case of emergency. They were based at the EPA office trailers and directed to conduct random periodic patrols of the Site.

4.1.7 Communications

Satellite dishes were installed for the duration of the project to provide internet access to the two office trailers. During daily operations, workers used hand-held radios for on-Site communications. Cellular service was unreliable at the Site.

4.1.8 Temporary Storage of Personal Belongings

The two manufactured homes at Residences 1 and 2 had fallen in disrepair since the two families were temporarily relocated by ODEQ in November 2013 (Section 2.4.9). The Work Plan called for the excavation of contaminated soil from both residences but because of the structural

condition of the homes they could not be moved and saved without incurring further damage. Although larger items such as couches and mattresses could not be decontaminated in an efficient and cost-effective manner, the residents were encouraged to keep smaller items and personal belongings. EPA coordinated with the affected homeowners to provide secure on-Site storage of their personal belongings in Conex containers, and the contents of the storage container were returned to the residents upon completion of the removal action (Section 4.2.5.6).

4.2 Site-Wide Removal Activities

Daily Site activity included a morning health and safety meeting at 0700 hours attended by EPA, ERRS, and START, followed immediately by an operations meeting to discuss daily tasks and assignments. Excavation in the predefined work zones assumed level C PPE, including respirators with mercury vapor cartridges, unless the results of air monitoring indicated that PPE could be downgraded. Upon conclusion of the meeting, ERRS personnel checked erosion and sediment control BMPs and made improvements, if necessary. START prepared the necessary field instrumentation such as DataRam portable particulate monitors, XRF soil screening instrument, and/or Lumex MVA. On a typical day, ERRS refueled the heavy equipment and began the daily tasks while START deployed the DataRams. ERRS took a short break for lunch at noon and typically ended the day between 1700 and 1800 hours. START collected the field instrumentation at the end of each day, and ERRS typically departed the Site around 1730 hours.

The following sections describe activities performed during the 2014 RA.

4.2.1 Removal of Existing Manufactured Homes

START collected two samples of building materials from the manufactured homes at Residences 1 and 2 for off-Site laboratory analysis of TCLP arsenic, lead, and mercury. The results were less than Resource Conservation and Recovery Act (RCRA) limits for disposal, and the manufactured homes were eligible for disposal at a municipal landfill (Section 4.2.6).

START also performed an asbestos survey of the manufactured homes and collected approximately 20 bulk samples from each home for asbestos analysis by polarized light microscopy (PLM) at an off-Site laboratory (Section 5.2.1). Approximately 25 percent (%) of the samples were identified as asbestos-containing material (ACM) which is defined as the presence of greater than 1% asbestos. Prior to demolition, ERRS subcontracted First Response Environmental to perform an asbestos abatement of the manufactured homes. The ACM was removed from the homes, double-bagged in asbestos disposal bags, and transported for disposal at the Klamath County Landfill, which is licensed for asbestos waste.

Upon completion of the asbestos abatement the homes were demolished using an excavator. The debris was placed into roll off containers and transported to the Douglas County landfill for disposal as non-hazardous construction and demolition debris.

4.2.2 Excavation of Mine-Waste Contamination

Mine-waste materials including calcine and waste rock that exceeded cleanup levels for mercury (23 mg/kg) and arsenic (17 mg/kg) were excavated to a depth of 24 inches bgs or as directed by the EPA OSC. Additionally, the mill foundations were also removed from their location. The

amount of mine-waste contaminated material requiring excavation and consolidation at the on-Site repository was originally estimated at 10,350 yd^3 (EPA 2014d).

The limits of excavation were determined in the field using field screening instruments such as the XRF spectrometer and Lumex MVA, and by visual observations of the presence of visible mercury or the presence of red color indicating calcine. A limited selection of samples were collected and submitted to off-Site commercial laboratories for confirmation analysis. Mercury and arsenic concentrations were found to exceed their respective cleanup levels by many factors or orders of magnitude and at depths frequently greater than 24 inches bgs (EPA 2014a).

Excavation of mine-waste contaminated material began on August 11 and continued until September 27. The excavated material was placed in an on-Site repository located over the pre-existing mine tailings and calcine piles. The repository was shaped and graded in a 3:1 (run:rise) slope; additional information regarding the repository is found in Section 4.2.4. By the end of the removal action, the total volume of excavated soil was nearly 38,500 yd^3.

EPA coordinated with START and ERRS to revise the depth of excavation in the predefined work zones (Figure 2-4). In each work zone, the maximum depth of excavation was determined based on the presence or absence of free mercury, the concentration of mercury- and/or arsenic-contaminated waste, the concentration of mercury vapors in air, the historical use of the work zone, and the planned future use of the work zone. At some locations, notably the former mill site and Residence 1, the concentration of the contamination initially seemed to increase with depth, as determined by field screening. The deepest excavation was approximately 14 feet at the former mill site.

In general, the mine-waste contamination was excavated in approximate 12-inch lifts to allow for field observation and field screening in order to minimize the unnecessary excavation of clean material. As the excavation progressed north from Area 2 to Area 1 including the repository toe, shallow groundwater in the form of springs was encountered. The presence of the springs was incorporated into the location of the storm water channels.

EPA utilized the presence of on-Site borrow sources for backfill to achieve significant cost savings, which ERRS estimated at approximately $500,000. On-Site borrow sources also increased the pace of backfilling excavated areas and reduced vehicle emissions.

4.2.2.1 Former Mill Site Excavation

The former mill site was the first targeted area for excavation due to the elevated concentrations of mercury and arsenic identified during previous investigations and removals. Approximately 3,500 yd^3 of mine-waste material and 100 yd^3 of concrete remnants were removed from the former mill site and placed in the repository by mid-August.

Elemental mercury, also known as free mercury, was encountered in comingled soil and woody debris near the foundation of the former mill site. The regular excavation procedures were temporarily suspended to allow the crew to identify, remove, and recover the free mercury using a mercury vacuum and hand tools for disposal at an off-Site facility. Due to the location of the mercury in combination with the method of recovery, the mercury could not be separated from

the surrounding media in all instances during cleanup and was occasionally removed as a comingled waste along with soil and other debris such as wood and roots. Two 55-gallon drums of comingled waste were recovered from the former mill area and transported off Site for retirement.

Periodic screening for mercury vapors was performed on Site to continually assess and evaluate the appropriate selection of PPE. On September 5, START performed a routine screening in the former mill site which had been excavated into a bowl-shaped feature restricted on all sides by a steep hillside, a raised access road, and Residence 2. The Lumex MVA identified mercury vapors ranging from 3,000 to 25,000 nanograms per cubic meter (ng/m^3); for reference, the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) time-weighted average (TWA) for mercury vapor is 50,000 ng/m^3. The potential sources of mercury vapors included a yet-unidentified location within the former mill site, the nearby repository, additional locations such as Residence 1, or a combination thereof. Elevated afternoon air temperatures and swirling winds promoted the rapid volatilization and transport of mercury vapors which presented difficulty in identifying and mitigating these source(s). In response, the field crew continued to wear Level C PPE, including mercury vapor cartridges, until screening results allowed a downgrade to Level D.

START performed a detailed survey of the former mill site and identified four locations with consistently elevated mercury vapors. These locations were targeted for an additional round of excavation, and approximately 1,300 yd^3 of soil was removed on September 10. On the following day, START identified small beads of free mercury comingled with dark grey soil and decomposed wooden beams at two recently exposed locations. The free mercury and comingled debris was recovered before ERRS performed a final targeted excavation of 400 yd^3 of contaminated soil. A concrete pad and narrow gauge rail line was observed at the bottom of the excavation; the rail line appeared to run directly underneath Residence 1 although there was no open mine feature. Four confirmation soil samples were collected from the excavation floor and sidewalls for ex-situ XRF analysis. The concentration of mercury ranged from non-detect to 14 mg/kg, and arsenic ranged from 16 to 30 mg/kg, and the OSC directed ERRS to discontinue excavation at the former mill site.

The final depth of excavation in the former mill site extended to a depth of 6 to 14 feet bgs during three separate targeted excavations resulting in a total of 5,312 yd^3 of mine-waste contaminated material and 96 yd^3 of concrete debris. The area was backfilled with 4,600 yd^3 of soil from on-Site borrow sources and 700 yd^3 of imported unscreened rock. It was then covered with a thin layer of top soil and seeded.

4.2.2.2 Area 1

The depth of calcine in Area 1 ranged from 12 inches in the south to nearly 60 inches near the toe of the repository in the north. The volume of mine-waste material in Area 1 was greater than originally anticipated, resulting in approximately 12,400 yd^3 of excavated material. For reference, the original estimate of excavated mine-waste material for the entire 2014 removal action was less than 11,000 yd^3.

The XRF was used extensively to guide the removal in Area 1 and reduce the unnecessary excavation of relatively clean soil. The average in-situ concentration of mercury was 171 mg/kg, and the maximum concentration of 6,507 mg/kg was two orders of magnitude greater than the cleanup level of 23 mg/kg. The average in-situ arsenic concentration of 25 mg/kg was near the targeted cleanup level of 17 mg/kg with a maximum concentration of 435 mg/kg.

A former surface water pathway was identified by visual identification and confirmed with the XRF (i.e., because of the presence of mercury-contaminated sediments that had apparently been carried downstream by runoff) at a depth of approximately 48 inches bgs. The discoloration appeared to be a result of historical ore processing at the upgradient former mill site. The surface water pathway continued in a southerly direction and was intermittently encountered in both Area 2 and Area 4.

After the mine-waste material was excavated, an extensive network of storm channels was installed to accommodate surface water drainage from the repository face and nearby hillsides. The armored drainage features were constructed using 100 yd^3 of 4- to 8-inch rock and 700 yd^3 of smaller diameter rock. Area 1 was backfilled with 310 yd^3 from an on-Site borrow source to assist with final grading, and portions of the area were covered with seed and straw.

4.2.2.3 Area 2

The depth of mine-waste contaminated material in Area 2 ranged from 24 to 36 inches resulting in a total of nearly 9,800 yd^3 of excavated mine-waste material which was nearly four times the initial estimate of 2,400 yd^3. The excavation in Area 2 was performed in 12-inch lifts followed by in-situ XRF screening to guide additional excavation. At the initial target depth of excavation of 24 inches the maximum concentration for mercury and arsenic was 5,626 mg/kg and 579 mg/kg, respectively. Portions of the former surface water pathway were identified using the XRF. The depth of excavation was extended to 36 inches bgs in locations containing elevated concentrations of mercury and arsenic.

On August 20, an adit (or similar mine feature) filled with a gelatinous grey material was discovered at a depth of 36 inches in the south section of Area 2. The XRF was used to screen the gelatinous grey material which contained elevated concentrations of mercury (2,675 mg/kg) and arsenic (980 mg/kg). The Lumex MVA was deployed to screen the headspace of the mine feature (50,000 ng/m^3) which was equal to the NIOSH TWA for mercury vapors. A sample of the gelatinous grey material was collected in a plastic bag. Later that day the headspace was screened with the Lumex MVA; the 1-second reading was 90,000 ng/m^3 which was the highest reading recorded during the 2014 removal action. The mine feature was excavated to a depth of 8 feet bgs, lined with bentonite, and backfilled with 4- to 8-inch rock and soil.

A road was located on the northern and western perimeter of Area 2 which provided access to an inhabited travel trailer to the east of Area 1. The road was excavated to a depth of 18 to 36 inches bgs and reconstructed using approximately 18 inches of rock base. Three culverts were installed in the road ranging from 15 to 24 inches in diameter to connect with storm water channels from Area 1. Nearly 500 yd^3 of 4- to 8-inch rock was used to construct armored drainage channels. Upon completion of the excavation, Area 2 was covered with unscreened top soil, seed, and straw.

4.2.2.4 Area 4

The depth of excavation in Area 4 ranged from 18 to 36 inches bgs resulting in nearly 4,500 yd^3 of mine-waste material. The eastern section was excavated to 18 inches bgs and screened at 30 locations with the XRF. The majority (18 of 30) locations were non-detect for mercury. Two of the remaining locations had elevated concentrations of mercury (189 and 545 mg/kg) and were targeted for additional removal.

The north and west sections were excavated to 18 inches bgs and screened with the XRF. The discolored former surface water pathway was clearly visible in the west section of Area 4 including fine-grained material containing grey, yellow, and purple discoloration. The XRF was used to screen the pathway and surrounding soil. Multiple locations were identified with mercury concentrations greater than 1,000 mg/kg with a maximum of 7,059 mg/kg. The XRF identified targeted locations for additional excavation ranging from 24 to 36 inches bgs.

An access road along the western perimeter of Area 4 was excavated and rebuilt with approximately 24 inches of rock base to accommodate haul trucks and other vehicle traffic. A preexisting culvert connecting Areas 2 and 4 was replaced with a 24-inch culvert in early September. An armored channel was constructed through Area 4 using 215 yd^3 of 4- to 8-inch rock to accommodate surface water flow, and a 24-inch culvert was installed at the south end across Bonanza Mine Road. Upon completion of the excavation, Area 4 was covered with unscreened top soil, seed and straw.

4.2.2.5 Residence 1

The manufactured home located at Residence 1 was removed on September 4 (Section 4.2.1). The following section includes details regarding the removal of mine-waste contaminated material in the work zone known as Residence 1.

Residence 1 was conceptually subdivided into three sections (i.e., north, middle, and south) for planning purposes, and each section ranged in size between 6,000 and 8,000 ft^2. The excavation in Residence 1 began with an initial lift of approximately 12 inches bgs followed by in-situ XRF screening. The average mercury concentration was 215 mg/kg with a maximum reading of 2,197 mg/kg, and the average arsenic value was 139 mg/kg with a maximum of 505 mg/kg. The middle section was excavated to a total depth of 24 inches bgs and the south section to a depth of 24 to 36 inches bgs. START collected composite samples from the floor of each section for ex-situ XRF screening, and persistent contamination of both mercury (162 mg/kg) and arsenic (144 mg/kg) was identified in the middle and south sections at depth. Because contamination exceeded the planned excavation limit of 24 inches, the remaining material was left in place. Clean backfill from the Site, including clay from Area 1 and shale rock from Residence 2, was used to level the three sections. An additional layer of imported rock was placed throughout Residence 1. Top soil was placed around trees and other select locations. Imported rock (2.5-inch minus) from the nearby Umpqua Quarry was then placed throughout Residence 1.

Two septic concrete tanks were identified at Residence 1 during the excavation. An older, empty tank was encountered in the middle section and a full, newer tank recently connected to the manufactured home was located in the south section. A septic subcontractor arrived to pump

approximately 1,000 gallons from the south tank. Both tanks were then crushed and hauled to the repository and the excavated areas were backfilled with clean rock.

Two vertical boreholes likely associated with historical mine operations were identified during the excavation of Residence 1. An intact 4-inch borehole was found in the middle section and a partially collapsed borehole was located in the south section. The concentration of mercury vapor at the borehole entrance was 2,000 ng/m^3 and 5,500 ng/m^3, respectively. The boreholes were plugged with bentonite to disable the pathway for mercury vapors. Confirmation screening for mercury vapors with the Lumex MVA showed decreased values less than 1,000 ng/m^3 from both boreholes.

A footpath along a steep slope connected Residence 1 to Residence 2. The footpath was screened with the XRF at six locations, and elevated concentrations of mercury up to 1,230 mg/kg were identified. An excavator rendered the footpath inaccessible to discourage future use of the footpath. Concrete debris and other excavated material from the footpath was used to fill a suspected mine shaft (or stope) located between the former mill site and Residence 1. A combination of slash, straw, and seed were distributed in the area to encourage revegetation and mitigate erosion.

Information regarding utilities and the replacement manufactured home placed at Residence 1 can be found in Section 4.2.5.4.

4.2.2.6 Residence 2

The manufactured home located at Residence 2 was demolished on September 4 (Section 4.2.1). The following section includes details regarding the removal of mine-waste contaminated material in the work zone known as Residence 2.

For planning purposes, Residence 2 was subdivided into two operational areas: the level home site was approximately 6,000 ft^2, and the sloping hillside and access road was an additional 10,000 ft^2. In early September, the home site was excavated to approximately 18 inches bgs and the sloping hillside was excavated to 36 inches bgs. On September 9, the floor of the excavation was screened with the XRF at 30 locations. The average mercury concentration was 51 mg/kg, and the average arsenic was 51 mg/kg. The total volume of excavated soil from Residence 2 was 2,300 yd^3.

Notable features of Residence 2 included burn pits, fire brick, and garbage pits in the south section of the home site. These features were excavated and placed in the repository. An intact concrete septic tank at Residence 2 was identified during the excavation. A septic subcontractor pumped out the tank, approximately 1,000 gallons, before the tank was crushed and transported to the repository.

The replacement manufactured home originally planned for Residence 2 was relocated to Residence 6 (Section 4.2.5.2). The remaining soil and underlying shale rock at Residence 2 was identified as an acceptable source of clean backfill on Site (Section 4.2.3). Upon completion of excavation in Residence 2, the area was covered with top soil, seed, and straw.

4.2.2.7 Residence 6

The Residence 6 location is located immediately downgradient of Residence 2 along the access road (Figure 2-4). Residence 6 was used as a home site for a trailer home in the past, but at the start of the removal action it was used to stage campers and other items belonging to the nearby residents. During the first month of the removal it was initially used as a staging area for Conex containers to store personal effects of the temporarily displaced families. By mid-September, the Conex containers were relocated to Residence 1 to allow for excavation at Residence 6.

Approximately 800 yd^3 of soil, fire bricks, and red cobbles were excavated from Residence 6 at a depth of 12 to 24 inches bgs. In-situ XRF screening at 25 locations identified relatively low concentrations of mercury in soil (less than 80 mg/kg) with the exception of an oval-shaped section containing red cobbles the size of softballs with small patches of red sand and gravel containing mercury up to 277 mg/kg. The Lumex MVA detected mercury vapors up to 18,000 ng/m^3 in the void space between cobbles; for reference, the NIOSH REL is 50,000 ng/m^3.

Nearly 200 yd^3 of cobbles were excavated to a depth of 8 feet bgs. Additional screening with the Lumex MVA detected mercury vapors at 10,000 ng/m^3. The void space between the red cobbles appeared to be a pathway for mercury vapors and the depth of the red cobbles was unknown. To close the pathway and reduce the mercury vapors, the void spaces were plugged with 3,500 pounds of bentonite and the excavated area was backfilled with nearly 300 yd^3 of clay from an on-Site source. Confirmation screening identified mercury vapors concentrations above the backfilled area at less than 100 ng/m^3.

Residence 6 was leveled with approximately 6 inches of rock in preparation for utility installation and the installation of a replacement manufactured home; additional details can be found in Section 4.2.5.

4.2.2.8 Roads

Two sections of roadway were excavated and rebuilt during the 2014 removal action. Details regarding excavation of the lower access road can be found in Sections 4.2.2.1 through 4.2.2.3.

The upper road stretched from Area 2 to Residence 1 (Figure 2-4) and was excavated in three sections. The section between the former mill site and Residence 1 was excavated to a depth of 12 to 24 inches bgs resulting in 1,100 yd^3 of mine-waste material transported to the repository. Fifteen locations were screened with the XRF with an average concentration of mercury (60 mg/kg) and arsenic (51 mg/kg). The middle section of road between Residence 6 and the former mill site was excavated to 18 inches bgs, exposing visible calcine. Nine locations were screened with the XRF, and elevated concentrations of mercury (173 mg/kg) and arsenic (173 mg/kg) were detected. The contaminated areas were covered with 400 linear feet of geotextile fabric and covered with a clean backfill to provide a physical barrier over the contaminated material. The third section of road between Area 2 and Residence 6 was excavated to 12 inches bgs. The average concentration of mercury and arsenic at 22 locations was 40 mg/kg and 73 mg/kg, respectively.

Six inches of rock was placed on the excavated road to suppress dust and prepare for rainfall in October and November. Up to 12 inches of additional rock was used to reinforce the roads and accommodate haul trucks carrying borrow source material to the top of the repository.

4.2.2.9 Adits and Other Mine Features

Four adits or similar mine features were identified on the Site during the 2014 removal action. A previously unidentified adit (or stope) in the south section of Area 2 was excavated to 8 feet bgs and backfilled; a previously unidentified mine feature with a narrow gauge rail line in the former mill site was exposed during deeper excavation and covered with backfill; a suspected shaft (or stope) located between the former mill site and Residence 1 near the footpath was filled with concrete debris and covered with soil; and an open hardrock exploratory adit south of Residence 2 approximately 100 meters in length was flagged with blue tape by the survey crew, but no other measures were taken.

4.2.3 Backfill

Over 950 loads of rock and top soil totaling nearly 18,000 yd^3 were imported from Umpqua Quarry and Nonpareil Quarry for use as backfill, road base, and revegetation.

The area behind the EPA work trailers was identified as a potential source for on-Site borrow material. With approval of the Site property owner, EPA removed nearly 20,000 yd^3 of native soil to use as soil cover for the repository. An additional 4,600 yd^3 of clean soil and rock was excavated from Residence 2 for use as backfill in the former mill site. Smaller volumes of clay, rock, and soil were also used to level and backfill Residences 1 and 6. In total, nearly 26,500 yd^3 of material was sourced from on-Site resulting in an estimated cost savings of over $500,000.

4.2.4 Repository Construction

The amount of calcine and waste rock already present in the footprint of the repository was originally estimated at 46,500 yd^3 (Figure 2-10). The volume of mine-waste contaminated material requiring excavation and consolidation at the on-Site repository was initially estimated at 10,350 yd^3 with a repository face (or front) of 85,000 ft^2 (EPA 2014d). During the removal action, the volume of calcine and waste rock in the repository footprint was revised to approximately 130,000 yd^3. Additional mine-waste contaminated material was observed by field personnel and confirmed by field screening instruments. Based on these determinations, the total volume of excavated mine-waste contaminated material was 38,500 yd^3. Thus, the total material volume in the repository was nearly 170,000 yd^3 which required a larger face (196,000 ft^2) and a concomitant increase in repository cover materials including clean backfill and geomembrane liner material (EPA 2014a). The increased Site costs associated with the expanded repository were mitigated in part by the cost savings of the on-Site borrow sources (Section 4.2.3).

Specific hydraulic and hydrologic design methodology for the repository is detailed in the Work Plan. In summary, the repository was designed with several cover layers to reduce meteoric infiltration into the contaminated waste rock stored within. The mine-waste contaminated material was compacted before placement of a lower liner made of 40-mil linear low-density polyethylene (LLDPE) to act as a physical barrier to the contaminated material. A second 200-mil Geonet liner composed of mesh LLDPE liner attached to a geotextile fabric was placed between the lower LLDPE liner and an overlying 24-inch soil cap of clean material to facilitate

the downgradient flow of infiltrated precipitation to the repository toe drain. The liners were secured in anchor trenches along the north, west and south perimeter of the repository constructed to a minimum of 3 feet deep and 6 feet wide. A combination anchor trench and drainage ditch was installed along the eastern toe of the repository because the opposing hillside was too close to the repository to accommodate both features independent of one another. A 6-inch diameter repository toe drain pipe was installed along the perimeter toe of the tailings pile along with drainage channels along the sides and top of the repository.

The calcine and waste rock piles located downgradient of the former mill site formed the base of the repository (Figure 2-10). The piles were shaped and graded during the initial phase of the removal with bulldozers in early August. Excavated material from the former mill site and other sections of the Site were transported in 20-, 30-, and 40-ton haul trucks to the repository where it was shaped and graded in a 3:1 (run:rise) slope.

By early September, the repository had expanded toward the south to overlay pre-existing calcine piles and to accommodate the aforementioned increase in volume of mine-waste contaminated materials. A survey of the repository on September 3 provided an updated area of 106,000 ft^2 with a 3:1 slope. A START engineer was on Site during the week of September 15 – 19. During this time, the engineer verified design and adequacy of erosion control measures and verified design and expansion of the repository to accommodate placement of considerably larger amounts of mine-waste contaminated material. The repository continued to expand to the south, and an updated survey of the repository on September 23 provided a revised area of 176,000 ft^2. On September 29, all excavated mine-waste contaminated material was placed in the repository and compacted with heavy equipment.

During construction of the repository, direct sunlight on the southern face increased the volatilization of mercury vapors from the mine-waste contaminated material. This phenomenon was especially evident during hot dry days in August and September. Routine screening for mercury vapors during repository construction identified concentrations between 5,000 and 25,000 ng/m^3 (Section 5.1.2). The elevated concentrations required the use of Level C PPE with mercury vapor cartridges until the repository was covered with top soil and the field crew was allowed to downgrade to Level D PPE (Section 9).

In early October, a 6-inch layer of clean unscreened top soil was placed on top of the compacted mine-waste material. On October 10, ERRS removed windrows, sharp sticks and rocks from the compacted top soil and smoothed the edges of the repository using the mini-excavator. The repository was covered with the LLDPE and Geonet liners between the dates of October 16 and October 19. The LLDPE sections were joined by the liner subcontractor with assistance from the ERRS field crew using a hot air seam sealing machine, and the Geonet sections were connected using zip ties (for the plastic mesh) and butane torch (for the filter fabric).

Beginning October 19, a 24-inch soil cap was placed on top of the Geonet liner. The soil was transported to the repository using two haul trucks and pushed over the geomembrane/geonet liner system with a low-ground-pressure dozer in an approximately 30- to 36-inch lift to avoid damage to the liner system. The cover soil was sourced from an on-Site location identified west of the EPA command post. The haul trucks placed the cover soil on the liner system starting

from the bottom of the repository slope in approximately 50-foot wide section, and then progressively upward over the liner until covering to the top of the slope. As each section was completed, the fill operation was shifted to the adjacent sections to the northwest, again placing cover soil starting from the bottom of the slope and working upward. The sections of cover soil were compacted using a smooth-drum roller compactor, in a single, full-thickness lift.

During this period, a START engineer was on Site to observe and document the installation of a French drain along a select section of the southern toe. The engineer also met with the EPA OSC and ERRS response manager to discuss and optimize drainage features on the north side of the repository including the upper repository run-on control ditch and the repository side perimeter ditches.

By November 5, the 24-inch soil cap was completed which included several days of postponed work due to rainy weather and unfavorable soil conditions. Due to project time and budget constraints, and limited availability of suitable import top soil, the planned 6-inch top soil cover was replaced by additional on-Site borrow soil material to serve as the final surface cover. The repository was surveyed upon completion of the soil cover and prior to application of the seed or slash (Figure 4-1).

On November 10, 2014, the repository was track-walked and back-bladed with a low ground pressure bulldozer to remove surficial erosion rills and texture the surface. A 16:16:1 fertilizer pellet blend was applied to the soil surface, and a turf grass seed mix was broadcast over the repository. The slash that was preserved and stockpiled from the initial repository area preparation was distributed over the repository surface using the mini-excavator. The excavator placed logs perpendicular to the slope and dispersed stumps, light slash, and brushweed in between the logs.

4.2.5 Manufactured Homes

4.2.5.1 Replacement

The single-wide manufactured homes located at Residences 1 and 2 were replaced in accordance with the *EPA Guidance on Compensation for Property Loss in Removal Actions* (EPA 1995). The homes were originally located on pads constructed of calcine, and it was determined that they could not be moved and saved without incurring further damage (the homes had fallen in disrepair since the families were relocated in late 2013). Additionally, contaminated items made of soft, permeable materials such as carpeting, mattresses, and sofas could not be decontaminated in an efficient and cost effective manner (EPA 2014d). Thus, these items were targeted for disposal and replaced with property of similar value (Section 4.2.5.6).

4.2.5.2 Location

The location for the replacement homes was reassessed during the 2014 removal action based on an analysis of the following set of five criteria: proximity to the former mill site; amount of mine-waste contaminated material excavated from and replaced with clean backfill; ambient construction-related data from field instrumentation such as the Lumex MVA; cost comparison between previous locations and proposed locations; and, homeowner preference. In early October, EPA determined that Residences 1 and 6 were the optimal locations for the replacement

homes. This decision also allowed Residence 2 to be used as a borrow source for clean backfill (4.2.3).

4.2.5.3 Procurement, Inspection and Screening

Acquisition of replacement homes commenced the first week of the removal action and proved to be an unanticipated challenge (Section 10). Search criteria included an equivalent number of bedrooms and bathrooms and similar square footage from homes of approximately the same era. The dwellings were required to be decent, safe, and sanitary which included standards related to local housing and occupancy codes, structural integrity, and electrical wiring (EPA 2002).

Although many dealerships offered new manufactured homes, the turnover of dwellings in the resale market was often a fleeting and casual transaction. OSC Heister coordinated the internet search along with the ERRS response manager and other personnel. Typically, an OSC would schedule an in-person visit of homes that appeared to meet the replacement criteria. Pending the outcome of the results by a certified building inspector (and whether the home was still available), EPA negotiated the sale price and coordinated transportation of the home to the Site.

Both homes were screened with the Lumex MVA to check for the presence of pre-existing mercury contamination. Neither home had elevated readings above background concentrations. In addition, neither home contained mercury switches in the thermostats.

On October 25, EPA completed the purchase of a two-bedroom, one-bathroom manufactured home in Eugene, Oregon. Procurement of a three-bedroom single wide manufactured home proved challenging until November 12, when EPA closed on the purchase of a three-bedroom, two-bathroom home in Klamath Falls, Oregon.

4.2.5.4 Utility Installation and Connection

Site-wide utilities required replacement because they were installed in mine waste contaminated materials and could not be temporarily relocated without damage.

Temporary drinking water lines were connected during the excavation in Areas 2 and 4, and a permanent drinking water system was installed during Site restoration activities. The dilapidated pumphouse located south of Area 4 was replaced with a new weather-resistant pumphouse because it was in disrepair and infested with rodents. Drinking water lines leading to the property owner's residence (Residence 5) and the former superintendent's house (Residence 4) were also updated during the RA.

In addition to the aforementioned reasons, the subsurface septic systems associated with the two manufactured homes were replaced because they were not functioning properly. A representative from Douglas County Planning identified an ideal location for the leach field (undisturbed soil, level drain pathways, and slope less than 45 degrees) near Residence 5. Test pits were installed to confirm the location, and START used the XRF to confirm that the ground was not contaminated with mine-waste contaminated material. A septic system subcontractor was selected to install septic tanks at each residence in addition to the leach field and connecting effluent lines.

A trench for the communication line was installed from Residence 1 to the south end of Area 4. A conduit was placed in the trench before a representative from CenturyLink arrived on Site to place a communication cable in the conduit and make the appropriate connections with Residences 1 and 6. An additional line of communication cable was installed to Residences 4 and 5.

Electrical power connections from the utility poles to the home sites were upgraded in order to meet current electrical code requirements (EPA 2014a). In mid-October the local power company arrived on Site to assess the current electrical hardware. The utility poles were deemed to be sufficient and the transformers did not need to be moved or replaced. However, the power company requested the installation of service pole at Residence 6 in order to connect from the power pole to the dwelling. An electrical subcontractor installed the service pole and placed conduit from the service pole to the dwelling at Residence 6. The subcontractor also installed electrical meters at both residences. Upon siting and placement of both manufactured homes, electrical connections were finalized to the homes and approved by county inspectors. At Residence 1, the power company connected the transformer to the power pole.

4.2.5.5 Placement and Finishing

On October 31, the replacement manufactured home from Eugene was transported to the Site and placed at Residence 6. This home included two bedrooms, one bathroom, a living room, kitchen, and other amenities. A subcontractor installed the vapor barrier, support blocks, and hurricane straps while ERRS installed front and rear steps, roof gutters, downspouts, and skirting around the base off the home. ERRS also performed minor roof repairs. The property owner was accompanied by OSC Liverman, ERRS and START on a tour of the home. START conducted a mercury air monitoring survey in each room of the manufactured home using the Lumex MVA. No elevated mercury readings were observed.

On November 18, a four-person ERRS crew traveled to Klamath Falls to prepare the second manufactured home for transport to the Site. On November 21st the home arrived on Site and was placed at Residence 1.This home had three bedrooms, two bathrooms, a living room, kitchen, and other amenities.

4.2.5.6 Furnishings and Personal Belongings

New smoke detectors and carbon monoxide detectors were installed in each of the homes. Because many original household items were contaminated and/or could not be reclaimed, each home was furnished with basic furniture items such as a kitchen table and chairs, couch, and bed frames with mattresses that were purchased from a used furniture store in nearby Sutherlin. The personal belongings temporarily stored in the Conex containers were released to the displaced families so they could begin the process of moving into their homes.

4.2.6 Off-Site Disposal

Bulk samples were collected from the manufactured homes prior to disposal (Section 5.2), and a number of samples were identified as ACM. An asbestos abatement subcontractor mobilized to the Site to remove a total of approximately 7 yd^3 of ACM from manufactured homes before both residences were demolished and loaded into eight 30 yd^3roll-off containers for disposal at Roseburg Municipal landfill as non-hazardous waste. Additional debris generated during the

four-month removal including garbage, construction debris, and cuttings from the repository liner installation, which were also transported to the Roseburg Municipal landfill for disposal as non-hazardous waste (local company Sutherlin Sanitary dropped off and picked up the roll-offs).

Free mercury and visibly contaminated soil and debris from the former mill site were collected and placed in a 55-gallon drum for retirement via sulfide treatment in accordance with the Mercury Export Ban Act. Additional mercury-contaminated material from the former mill site was staged in two separate 55-gallon drums for macroencapsulation. See Table 4-1 for additional details regarding off-Site waste disposal.

4.2.7 Surveying

A licensed subcontractor performed six separate surveys to support the 2014 removal. The initial survey was performed in June 2014 to prepare an existing conditions map of the waste rock and calcine piles (Figure 2-10). This information was used to design the on-Site repository. During construction of the repository, three additional surveys were performed to periodically assess the size and scope. Specifically, the increased area of the repository required a concomitant increase in repository liners material. A boundary survey was prepared in mid-October during the search for potential on-Site borrow source material and to assess potential locations for the replacement manufactured homes; the corners of the property were staked and flags were placed at approximate 100 foot intervals along the northern and southern boundaries. During the boundary survey, an open hardrock exploratory adit south of Residence 2 approximately 100 meters in length was flagged with blue tape (Section 4.2.2.9). The boundary survey also identified a portion of the EPA command post that was inadvertently constructed on the adjacent property owned by Lone Rock. OSC Franklin contacted a representative from the company to discuss the situation (Section 4.3.2). Finally, an as-built survey was performed upon conclusion of the 2014 removal action to document current Site conditions, drainage features, and utilities (Figure 4-2). A figure depicting post-removal Site features including areas of revegetation, drainage channels, and the final location of the manufactured homes was also prepared (Figure 4-3).

4.2.8 Inclement Weather

The first few months of the removal action were relatively hot and dry. A *Wild Fire Prevention and Suppression Plan* was prepared during the first week of the removal action to establish procedures for fire prevention and suppression of fires set indirectly as a result of the response action activities performed at the Site (Section 9). An additional water truck was mobilized to the Site to provide increased response capability and suppress fugitive dust. No fires were reported or observed on Site during the removal action. The local fire chief and deputy fire chief visited the Site in early September along with the Roseburg City Manager.

By late September, rain showers and wet conditions contributed to intermittent delays in excavation and repository construction. Task scheduling was assessed daily based on current conditions and weather forecasts in consideration of Site safety, and to avoid damage to the repository and roads from working in unsuitable conditions. In advance of forecast rainstorms, ERRS deployed straw bales in drainage channels and placed plastic tarps over piles of clean fill (Section 4.2.9). On September 24, a record-setting rain event generated 1.37 inches of precipitation during a 24-hour period. The erosion control measures successfully withstood the downpour. Specifically, the prior construction of the drainage ditches and the compaction of the

repository facilitated the surface water runoff from the Site to Foster Creek. During the months of October and November, the rate and intensity of precipitation continued to increase.

4.2.9 Construction BMPs

Construction best management practices were utilized during Site planning and management, including erosion controls (to prevent or minimize wind or water erosion to limit water pollution and soil loss) and sediment controls (to keep eroded soil on the construction Site). The integrity of all BMPs were inspected daily with addition emphasis immediately prior to rain events and immediately thereafter. Examples of construction BMPs included the following:

- Construction sequencing to coordinate the timing of land-disturbing activities and installation of erosion and sediment control measures;
- Preserving natural vegetation by clearing and grubbing only areas identified for excavation or other removal-related activities;
- Placing of tarps over backfill stockpiles during rainstorms to prevent erosion;
- Managing runoff by stabilizing channels with 4- to 8-inch rock, reducing velocity with straw bales, and installing sediment traps in Areas 2 and 4;
- Installing check dams downstream of Area 4 using straw bales to slow the velocity of runoff and catch sediment;
- Placing seed and straw in restored areas to provide permanent stabilization and reduce erosion and sedimentation;
- Diverting runoff from the exposed repository slope during construction to reduce erosion;
- Deploying straw wattles on the finished repository to hold the material in place, increase revegetation, prevent erosion, and minimize rill and gully development;
- Using logs and slash on the finished repository slope to decrease water velocity and reduce erosion;
- Maintaining construction roads, parking areas, and the construction entrance;
- Performing dust suppression using water trucks to reduce soil loss, minimize nuisance dust and airborne contaminants, and decrease the likelihood of sedimentation and water pollution;
- Installing permanent slope diversions and adequate outfall protection for storm water runoff; and
- Reassigning daily tasks, and in some cases stopping work altogether, to limit the generation of mud in the work zones and reduce sedimentation in the drainage channels during heavy rain events.

4.2.10 Greener Removal BMPs

Greener cleanup BMPs implemented during the removal action included minimizing:

- Energy consumption (e.g., minimizing use of air conditioning, restricting idle time for heavy equipment, renting fuel efficient and low emission heavy equipment and generators);
- Fugitive dust suppression only when deemed necessary by visual observation or field instrumentation;
- Waste generation by segregating plastic bottles and metal cans for recycling;
- Unnecessary soil and habitat disturbance, which minimized the need for clearing and grubbing (disturbed areas were stabilized with certified weed-free seed and straw);

- Transportation by reuse of cleared trees and slash rather than transporting off Site;
- Methane production by spreading woody debris (this results in aerobic breakdown rather than chipping or leaving organic matter in large piles that have the potential to become anaerobic and significantly increase greenhouse gases);
- Noise and light disturbances (e.g., operation of heavy equipment was limited to 0700 hours to 1800 hours); and
- Identification of on-Site borrow sources to reduce fuel consumption and vehicle emissions generated during the transportation of backfill from off-Site quarries.

4.3 Demobilization

4.3.1 Heavy Equipment Decontamination and Demobilization

Contaminants of concern at the Bonanza Mine Site included mercury vapor, mercury in soil, and arsenic in soil. Elevated concentrations of Site contaminants were documented using field screening equipment and off-Site laboratory analysis. Specifically, the concentration of mercury vapor was known to exceed the NIOSH REL and/or Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) at some locations on the Site. In response, a *Draft Recommended Decontamination and Screening Protocol for Heavy Equipment* was prepared to ensure that bulldozers, haul trucks, excavators, and other heavy equipment used on Site were sufficiently decontaminated for general use in Level D PPE (Appendix B). The document prescribed nine detailed steps to achieve ambient mercury vapor concentrations below the action level of 1,000 ng/m^3 per indoor air guidance from the Agency for Toxic Substances and Disease Registry (ATSDR). The protocol was initiated on September 22, and the cope was expanded to include any wheeled or tracked vehicles potentially exposed to mine-waste contaminated material. By the end of the month, a total of three haul trucks, three water trucks, two bulldozers, an excavator, and a vibratory compactor were all successfully decontaminated and screened prior to demobilization from the Site. The protocol continued to be implemented as equipment was periodically demobilized from the Site.

4.3.2 Final Site Activities

By mid-November the last piece of heavy machinery, the 30-ton haul truck, had been demobilized from the Site along with the two work trailers and generator from the command post. All final grading, reclamation, and surface restoration was complete. Approximately seven warning signs were deployed at various locations throughout the Site to warn residents, visitors, and other personnel of remaining hazards on the property including the on-Site repository and outlying areas with unexcavated mine-waste contaminated material.

On November 12, OSC Franklin contacted the adjacent property owner, Lone Rock, to discuss possible restoration efforts on the parking area of the EPA command post which was inadvertently constructed on their property. Lone Rock agreed for the gravel pad to be left in place and that no additional restoration was necessary.

On November 20, OSC Liverman and OSC Heister met with Mr. Smith to review the transfer agreement for the manufactured homes. An ODEQ representative was present to discuss requirements of the MM&R plan; the plan was prepared by EPA to clearly identify the property owner's responsibility of maintaining, monitoring, and repairing Site features under ODEQ oversight (Section 6).

Final Site activities included installation of three check dams downstream of the pond near the pump house, deployment of straw wattles in Area 1, and placement of additional rock along the access road in Areas 1 and 2. By December 6, all EPA personnel, contractors and assets had demobilized from the Site.

Table 4-1

2014 Removal Action Off-Site Disposal
Bonanza Mine Site
Sutherlin, Oregon

Waste Stream	Medium	Quantity	Manifest Number	Treatment/Disposal Method	Disposal Facility
Asbestos-Containing Material	Sealant, tar paper, tape, window trim from Residences 1 and 2	7 yd^3	ASN4 No. 0559	Landfill as ACM	Klamath County Landfill, Klamath Falls, Oregon
Bulk Material	Demolition debris and 40 tires from Residences 1 and 2	240 yd^3	Not available	Landfill as non-hazardous waste	Roseburg Municipal Landfill, Roseburg, Oregon
Bulk Material	Construction debris, garbage and repository liner cuttings	150 yd^3	Not available	Landfill as non-hazardous waste	Roseburg Municipal Landfill, Roseburg, Oregon
Mercury, Soil Waste	Free mercury, soil and other debris from the former mill site	One 55-gallon drum: 40 pounds of free mercury plus 100 pounds of soil and debris	007851712 FLE	Retirement via sulfide treatment	Bethlehem Apparatus Compay, Hellentown, Pennsylvania
Mercury, Woody Debris	Mercury-contaminated soil, wood, and other debris from the former mill site	Two 55-gallon drums: 10 pounds of free mercury plus 1000 pounds of soil, wood and other debris	007851711 FLE	Macro-encapsulation	Clean Harbors Grassy Mountain, Grantsville, Utah

Key:

ACM = asbestos-containing material

yd^3 = cubic yards

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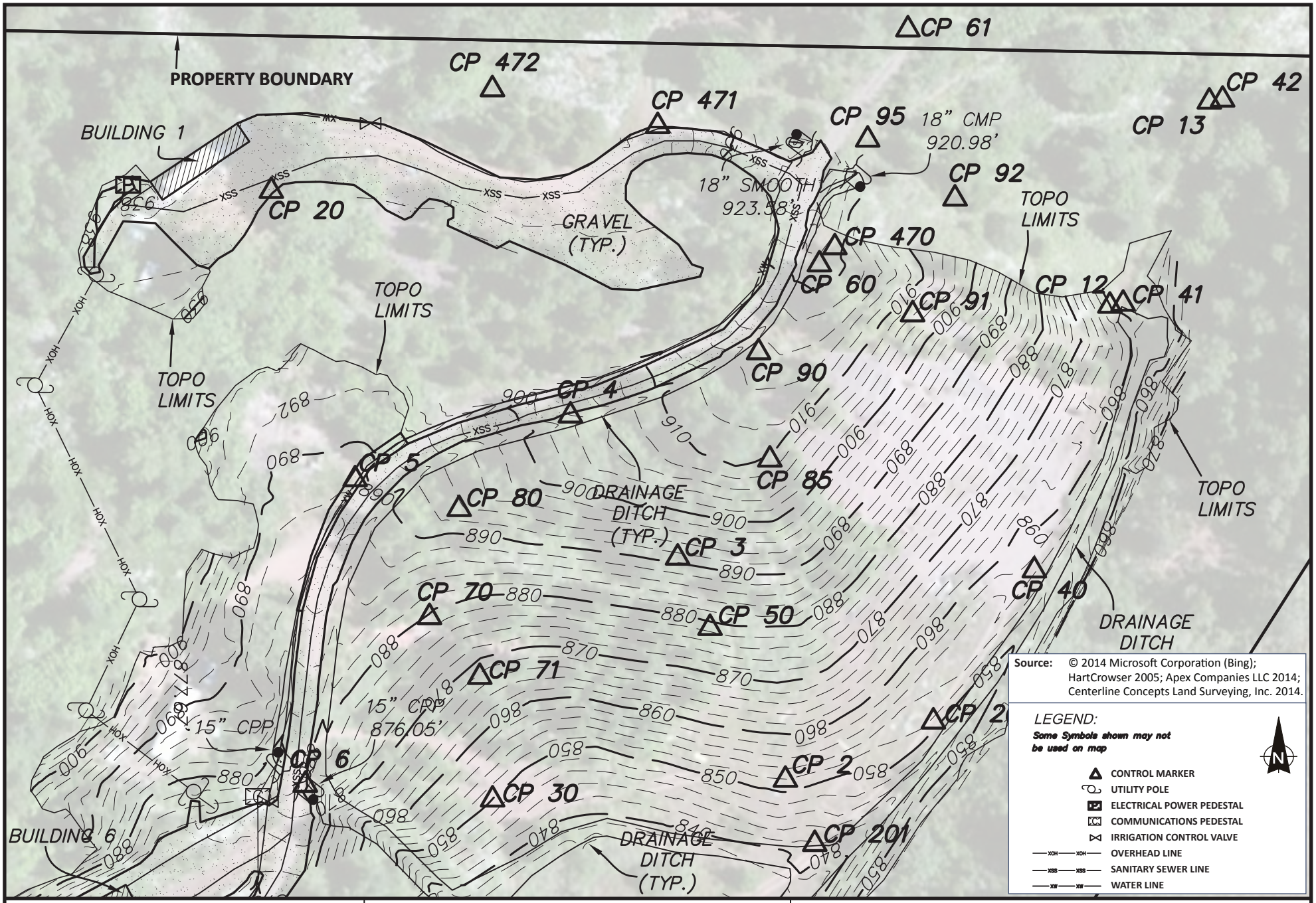

ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

0 50 100
Approximate Scale in Feet

Figure 4-1
FINAL EXISTING CONDITIONS REPOSITORY

Date:	Drawn by:	
7/8/15	AES	10:START-IV\14030011\fig 4-1

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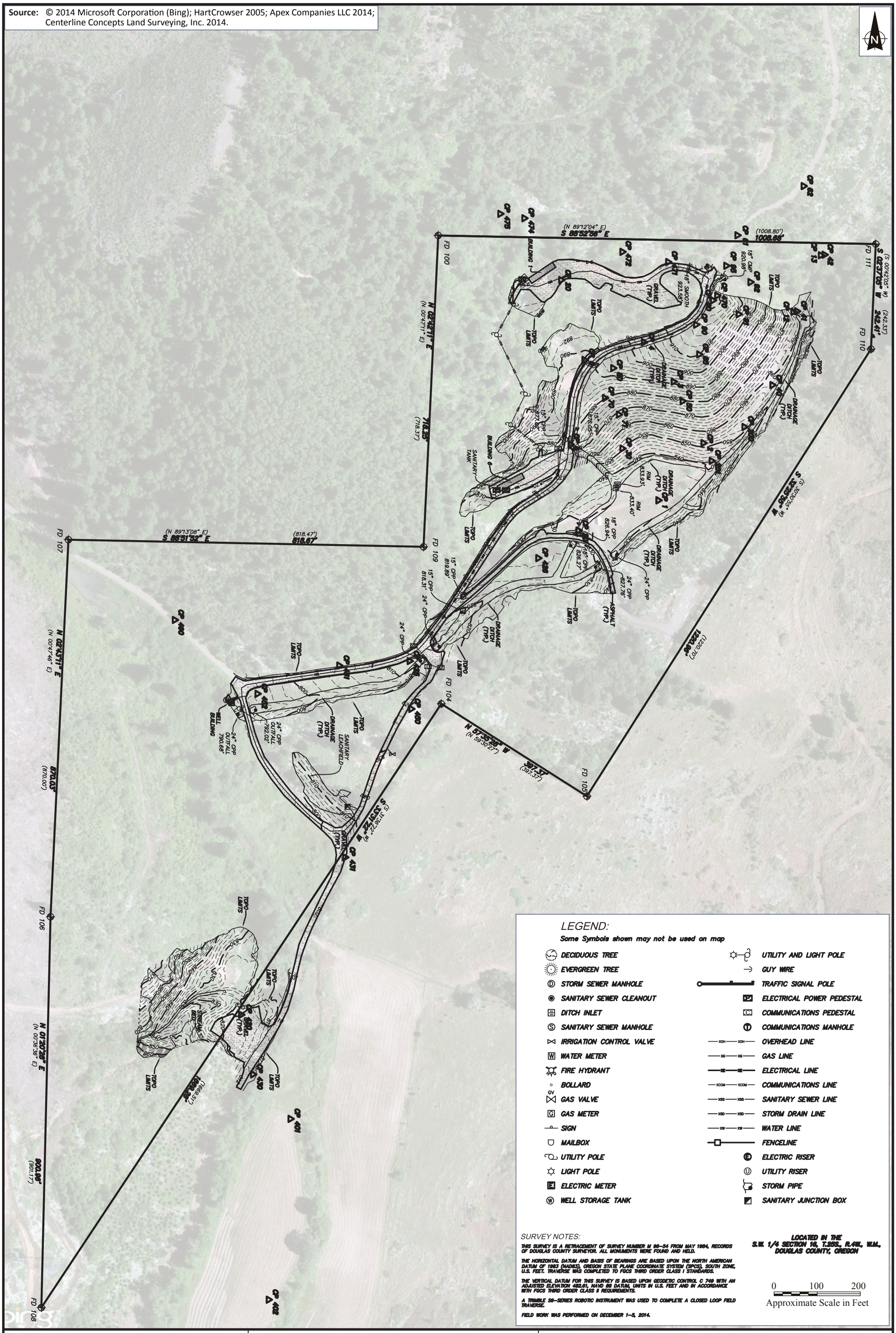
Source: © 2014 Microsoft Corporation (Bing); HartCrowser 2005; Apex Companies LLC 2014; Centerline Concepts Land Surveying, Inc. 2014.



LEGEND:

Some Symbols shown may not be used on map

- DECIDUOUS TREE
- EVERGREEN TREE
- STORM SEWER MANHOLE
- SANITARY SEWER CLEANOUT
- DITCH INLET
- SANITARY SEWER MANHOLE
- IRRIGATION CONTROL VALVE
- WATER METER
- FIRE HYDRANT
- BOLLARD
- GAS VALVE
- GAS METER
- SIGN
- MAILBOX
- UTILITY POLE
- LIGHT POLE
- ELECTRIC METER
- WELL STORAGE TANK
- UTILITY AND LIGHT POLE
- GUY WIRE
- TRAFFIC SIGNAL POLE
- ELECTRICAL POWER PEDESTAL
- COMMUNICATIONS PEDESTAL
- COMMUNICATIONS MANHOLE
- OVERHEAD LINE
- GAS LINE
- ELECTRICAL LINE
- COMMUNICATIONS LINE
- SANITARY SEWER LINE
- STORM DRAIN LINE
- WATER LINE
- FENCELINE
- ELECTRIC RISER
- UTILITY RISER
- STORM PIPE
- SANITARY JUNCTION BOX

SURVEY NOTES:

THIS SURVEY IS A RETRACEMENT OF SURVEY NUMBER M 96-54 FROM MAY 1994, RECORDS OF DOUGLAS COUNTY SURVEYOR. ALL MONUMENTS WERE FOUND AND HELD.

THE HORIZONTAL DATUM AND BASIS OF BEARINGS ARE BASED UPON THE NORTH AMERICAN DATUM OF 1983 (NAD83), OREGON STATE PLANE COORDINATE SYSTEM (SPCS), SOUTH ZONE, U.S. FEET. TRAVERSE WAS COMPLETED TO FGCS THIRD ORDER CLASS I STANDARDS.

THE VERTICAL DATUM FOR THIS SURVEY IS BASED UPON GEODETIC CONTROL C 749 WITH AN ADJUSTED ELEVATION 482.81, NAVD 88 DATUM, UNITS IN U.S. FEET AND IN ACCORDANCE WITH FGCS THIRD ORDER CLASS II REQUIREMENTS.

A TRIMBLE S6-SERIES ROBOTIC INSTRUMENT WAS USED TO COMPLETE A CLOSED LOOP FIELD TRAVERSE.

FIELD WORK WAS PERFORMED ON DECEMBER 1-5, 2014.

LOCATED IN THE
S.W. 1/4 SECTION 16, T.29S., R.4W., W.M.,
DOUGLAS COUNTY, OREGON

0 100 200
Approximate Scale in Feet

ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

Figure 4-2
FINAL EXISTING CONDITIONS SITE

Not to Scale

Date:	Drawn by:	
7/8/15	AES	10:START-IV\14030011\fig 4-2

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Source: © 2014 Microsoft Corporation (Bing); HartCrowser 2005; Apex Companies LLC 2014.

N

RESIDENCE 1

REPOSITORY

Service Pole and Meter

Gravel Backfill

MILL SITE

Vegetation

Rocked Drainage Swale

RESIDENCE 2

Service Pole and Meter

RESIDENCE 6

Bonanza Mine Road

Vegetation

AREA 1

Shallow Pond

Rocked Drainage Swale

Residence 3

AREA 2

Gravel Backfill

Vegetation

Residence 4

PUMP HOUSE

AREA 4

Drain Field

Residence 5

Property Boundary

Vegetation

Gravel Backfill

EPA COMMAND POST & BORROW SOURCE

Foster Creek

Bonanza Mine Road

Key:

- Creek
- Removal Action Areas
- Repository
- Project Boundary
- Drain Field
- Rocked Drainage Swale
- Current Home Location
- Gravel Backfill
- Vegetation
- Culvert

Note: Contamination may be present in all other areas not included in the removal action.

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Global Environmental Specialists
Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

Figure 4-3
POST-REMOVAL SITE FEATURES

Not to Scale

Date: 7/8/15

Drawn by: AES

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5 Field Monitoring and Sampling

Throughout Site operations, air monitoring was performed to ensure that construction BMPs were protective of workers, the community, and the environment from short-term construction impacts such as erosion and sedimentation. Field screening was performed with the XRF to guide removal decisions, and field sampling of air, soil and bulk material was performed to guide the removal action and ensure the appropriate selection of PPE. Field monitoring and sampling was performed in accordance with the SSSP and SPAF (E & E 2014b and E & E 2015, respectively).

5.1 Field Monitoring Activities

Fugitive dust air monitoring was conducted daily during dry conditions using DataRam 4000 dust monitoring instruments at separate locations. Field screening for mercury vapors was conducted on a routine basis in work zones and clean zones, including vehicles and work trailers. Monitoring of target contaminants in soil was performed both in-situ and ex-situ using the XRF.

5.1.1 Fugitive Dust Monitoring

In order to be protective of human health exposure to arsenic and mercury particulates, the Site-specific action level for fugitive dust was 1,400 $\mu g/m^3$. This value was based on the maximum concentrations of arsenic and mercury detected during the 2013 ODEQ Site visit, the lowest available exposure limit, and a safety factor of 3. The calculations for this action level are included in the SSSP (E & E 2014b).

Fugitive dust monitoring was conducted daily during dry weather conditions at the Site using three DataRam portable particulate monitors. The DataRams were not deployed during rainy conditions to protect the instruments and because the rain suppressed fugitive dust. On dry days, up to three water trucks were deployed to suppress fugitive dust on Site.

Up to three DataRams were deployed each day. In general, one DataRam was deployed near the staging area in Area 1 where the field crew donned and doffed PPE to be protective of worker health and safety. Another DataRam was deployed near Residence 3 or 4, depending on the location of Site activities, to be protective of Site residents. The third DataRam was deployed near activity that was most likely to result in generation of airborne particulates to be protective of worker health and determine the efficacy of dust suppression efforts. The nearest residence outside of the Site was approximately 0.5 miles to the north along Bonanza Mine Road. Accordingly, there was limited concern regarding fugitive dust migrating off Site.

The average daily particulate concentration was 17.1 $\mu g/m^3$, and the maximum daily concentration was 61.1 $\mu g/m^3$ which was considerably less than the action level of 1,400 $\mu g/m^3$. The average DataRam was deployed for 7 hours and 11 minutes each day, and programmed with a log period every 60 seconds at a flow rate of 2 liters per minute. In total, nearly 1,050 hours of particulate data was generated using the DataRam portable particulate monitors.

The daily TWA values for each location are found in Table 5-1. Over the course of the removal action, the monitoring results indicated low concentrations of particulates in the air, demonstrating that the dust suppression activities were effective.

5.1.2 Ambient Mercury Vapor Screening

Prior to conducting the removal action at the Bonanza Mine Site, the pre-existing sources of mercury vapors included the former mill site, waste rock pile, and calcine pile. During the removal action additional mercury vapors were generated during the exposure of free mercury and mercury-contaminated soil at the former mill site, construction of the repository, and excavation of contaminated soils throughout the Site. The distribution and concentration of mercury vapors during the removal action appeared to be influenced by multiple variables including temperature, humidity, wind speed, wind direction, Site activities, and proximity to the repository, among other factors.

The most heavily mercury-contaminated soil was encountered during August and September. During this period, the highest 1-second reading for mercury vapor was 90,000 ng/m^3 and the highest 10-second reading for mercury vapor was 54,000 ng/m^3, as determined by the Lumex MVA. Routine mercury vapor concentrations observed during excavation of the former mill site ranged from 8,000 to 45,000 ng/m^3; for reference, the NIOSH REL is 50,000 ng/m^3. During this period, all personnel in the exclusion zone remained in Level C PPE (with full-face respirator and mercury cartridges) because the mercury vapor concentrations were significantly greater than the Site action level of 1,000 ng/m^3.

On September 23, START performed two iterations of Lumex screening for mercury vapors at eleven targeted locations to assess daily variation in mercury concentrations at the Site. The first iteration took place in the morning and the second iteration around noon. At Residences 1, 2, and 6, the ambient concentration of mercury vapor in the early morning was moderately elevated (up to 1,100 ng/m^3) and tended to decrease by noon (up to 300 ng/m^3). During previous screening events, the mercury vapor concentrations increased to their highest concentrations in the mid- to late-afternoon, likely as a result of increased air temperature and wind velocity. The uncovered repository continued to be a likely source of mercury vapors, with concentrations up to 3,000 ng/m^3. Mercury vapor concentrations continued to exceed the Site action level of 1,000 ng/m^3 during this period of Site activities. All personnel in the repository and/or former mill site continued to operate in Level C PPE pending results of ongoing air monitoring.

No respirators were worn on September 24 due to intense rain. Additional precipitation and increased relative humidity in late September and October helped mitigate the mercury vapors, and the placement of clean fill containing a high percentage of clay in the excavated areas also contributed to lower mercury vapor concentrations. START performed periodic Lumex screening to confirm that mercury vapors were generally below action levels. In early October the only location requiring Level C PPE was the uncovered repository.

EPA directed START to assess the influence of the repository on mercury vapor concentrations by performing screening both before and after the repository was completely covered with a 6-inch layer of clean compacted top soil. Immediately prior to covering the repository on October 4 the mercury vapor concentrations at the residences and former mill site ranged from 11 to 673 ng/m^3 (Table 5-2). The maximum value recorded was nearly 70% of the ATSDR standard for the normal occupancy recommendation in residential settings (1,000 ng/m^3) which was also the Site action level. The repository was completely covered with a soil cap by October 7. A second

iteration of screening performed on October 9 found mercury concentrations from 30 to 189 ng/m^3, which was less than 20% of the ATSDR standard (Table 5-2). Based on these results it appeared that the repository was one of the primary sources of mercury vapors during the 2014 removal action. No respiratory protection was required in the work zones after the repository was covered on October 9.

On October 13, the START project manager and ERRS response manager used the Lumex mercury vapor instrument to screen ambient mercury vapors at Residence 1, Residence 2, Residence 6, and the former mill site. All locations were less than 100 ng/m^3 which was markedly below the NIOSH REL of 50,000 ng/m^3 and the ATSDR level for normal occupancy of 1,000 ng/m^3.

The property identified as Residence 4, also known as the Superintendent's house, was screened for mercury vapors by START and the OSC. Concentrations ranged from 67 to 116 ng/m^3; the rooms nearest the entrance were greater than 100 ng/m^3 and the rooms furthest from the entrance less than 100 ng/m^3. The area outside the house was screened with the Lumex with a range of non-detect to 150 ng/m^3. No further action was taken at Residence 4.

The Lumex MVA was used to screen the replacement homes to confirm the absence of pre-existing mercury contamination (Section 4.2.5.3), and during decontamination of heavy equipment in accordance with the *Draft Recommended Decontamination and Screening Protocol for Heavy Equipment* (Section 4.3.1).

5.1.3 Field Screening of Contaminated Soil

The XRF was used to perform field screening of soil at the Site. Results from the XRF were used to guide and support removal decisions related to the concentrations of arsenic and mercury in soil. Potential backfill sources and soil samples from proposed locations for the leach field were also screened with the XRF.

From August 18 to September 27, START performed nearly 1,100 field screenings with the XRF. The average arsenic concentration was 66 mg/kg with a maximum of 1,195 mg/kg detected in Area 2. Over 80 locations were greater than 170 mg/kg for arsenic, which had a cleanup level of 17 mg/kg. The average mercury reading was 272 mg/kg with a high of 11,167 mg/kg detected in Area 2. Nearly 200 locations had mercury concentrations greater than 230 mg/kg, which had a cleanup level of 23 mg/kg. The XRF was also used to screen soil around Residence 4 where ODEQ performed a removal action during a previous field event. The XRF was deployed around the entrance to the house at five locations; the concentrations of arsenic ranged from non-detect to 24 mg/kg, and mercury ranged from non-detect to 202 mg/kg. No further action was taken.

The XRF was used to quickly and economically characterize areas containing unanticipated levels of elevated contamination. In accordance with the EPA Region 10 XRF standard operating procedure (SOP) and EPA Method 6200, START performed routine screening of standard reference materials containing known quantities of arsenic and mercury to ensure instrument accuracy and precision.

A subset of locations on Site were screened with the XRF and submitted to an off-Site laboratory for confirmation analysis (Table 5-3). Additionally, four samples of backfill from Umpqua Quarry were screened with the XRF and submitted to an off-Site laboratory (Table 5-4).

5.2 Field Sampling Activities

During the removal action, START collected air, bulk, and soil samples at the Site. Site samples were collected and analyzed for one or more of the following analytical parameters at off-Site laboratories.

During the pre-removal sampling event in June 2014, soil samples were analyzed for:

- Arsenic and mercury, total (EPA 6020A and EPA 7471B, respectively); and
- Arsenic and mercury, SPLP (EPA 1312 for extraction; EPA 6010C for arsenic, and EPA 7470A for mercury).

During the removal action, the following samples were analyzed for:

- Arsenic and mercury in soil, total (EPA 6020A and EPA 7471B, respectively);
- Arsenic, lead, and mercury in bulk material, TCLP (EPA 1311 for extraction, EPA 6010C for arsenic and lead, EPA 7470A for mercury);
- Asbestos in bulk material (EPA 600/R-93/116);
- Arsenic particulates in air (NIOSH 7900);
- Mercury particulates in air (NIOSH 6009);
- Mercury vapor in air (OSHA ID-145);
- Repository liner sheet test (TBD)

Complete analytical data memoranda for each sampling phase, as described in the following subsections, are presented in Appendix C. The following subsections discuss the sampling and analytical activities for each Site phase/activity.

A pre-removal sampling event was conducted in June 2014. Field activities included the collection of soil samples for analysis of total metals and SPLP metals (Section 2.5.3). Analytical data memoranda from the pre-removal sampling event are included in Appendix C.

5.2.1 Asbestos and TCLP Sampling at the Manufactured Homes

During the first week of the removal action, an Asbestos Hazard Emergency Response Act (AHERA)-certified inspector from START performed an asbestos survey at the manufactured homes at Residence 1 and Residence 2. START collected 19 bulk samples from Residence 1 and 17 bulk samples from Residence 2 for asbestos analysis by PLM. Six samples from Residence 1 and four samples from Residence 2 were identified as ACM because they contained greater than 1% asbestos (Table 5-5). Prior to demolition, a certified subcontractor was procured to perform asbestos abatement at both homes. The ACM was transported off Site for disposal as asbestos waste at the Klamath County Landfill (Section 4.2.6).

During the bulk sampling for asbestos, START also prepared a composite of bulk material from each home for TCLP metals analysis for arsenic, lead, and mercury. The material included material such as ceiling material, exterior tin siding and skirting, chipboard, wood from front porch, carpet, couch (fabric and foam), mattress (fabric and foam), sheet vinyl flooring, clothing,

interior wood panels, and fiberglass insulation (Table 5-6). The TCLP results were less than the required criteria for RCRA Subtitle C disposal restrictions which will allow the debris from the Home Sites to be disposed at the municipal landfill (Section 4.2.6).

5.2.2 Air Sampling for Mercury and Arsenic

Air sampling for mercury and arsenic was performed in mid-August to assess potential exposure to the field crew during grubbing and clearing, excavation of the former mill site, and operations on the repository. START collected a total of eight samples for each of the following analyses: arsenic particulates by NIOSH 7303, mercury vapor by NIOSH 6009, and mercury particulates by OSHA ID-145.

The samples collected for arsenic particulate analysis were all below the instrument detection limits, and the samples collected for mercury particulates were all below sample quantitation limits (Table 5-7). Three of the samples collected for mercury vapor had measurable concentrations including one sample at 92,700 ng/m^3, which was in exceedance of the NIOSH REL (50,000 ng/m^3) and near the OSHA permissible exposure limit of 100,000 mg/m^3. The three elevated samples for mercury vapors were associated with a water truck operator and excavator operator at the former mill site, and a bulldozer operator on the repository (Table 5-7).

5.2.3 Soil Sampling of Mine-Waste Contaminated Material and Clean Backfill

Soil samples were collected from seven locations at the Site for confirmation analysis at an off-Site laboratory for arsenic and mercury via EPA Methods 6020 and 7471, respectively. Two grab samples were collected from the former mill site at eight feet bgs and one grab sample from Area 2 at 12 inches bgs; the location at Area 2 was chosen based on elevated readings by the XRF. Near the end of the removal action, four confirmation composite soil samples were collected from Residence 1 and Residence 2 at depths between 12 to 24 inches bgs. The laboratory results were compared to ex-situ XRF results, and the correlation for both arsenic and mercury was 0.999 (Table 5-3). The near-perfect correlation provided increased confidence in the accuracy and precision of field screening data generated by the XRF.

Four samples were collected from Umpqua Quarry stockpiles for off-Site laboratory analysis and ex-situ XRF screening to compare the concentration of metals in the backfill source to Site action limits. The concentration of mercury was less than equipment detection limits, and the average arsenic concentration was approximately 4 mg/kg, which was less than the Site action limit of 17 mg/kg (Table 5-4).

5.2.4 Liner Test

A START engineer was consulted on a proposal to reassess the cap thickness. Two interface friction tests were performed on the liner, per request of the START engineer. The first test was performed to simulate sheer forces on saturated backfill overlaying the Geonet liner. The second test simulated sheer forces on backfill with both the Geonet liner and LLDPE liner under dry conditions. The tests were coordinated through ERRS and the liner subcontractor, and the results were received on October 9 and October 15. The START engineer performed additional calculations using the geotechnical data and determined that a reduced cap thickness was acceptable. However, due to additional factors the original cap thickness was not altered.

Table 5-1

Dataram Particulate Air Monitoring Results
Bonanza Mine Site
Sutherlin, Oregon

Dataram ID	A60825	A60826	A60710	Dataram ID	A60825	A60826	A60710
Site-Specific Action Level (1,400 µg/m^3)				Site-Specific Action Level (1,400 µg/m^3)			
Daily Particulate Concentration (µg/m^3)				Daily Particulate Concentration (µg/m^3)			
6-Aug-14		1.2		11-Sep-14	30.3	36.1	22.4
7-Aug-14		1.3		12-Sep-14	36.4		12.1
8-Aug-14	4.9	8.8	33.4	13-Sep-14	34.5	45.5	14.4
9-Aug-14	14.1	2.0		15-Sep-14		39.0	24.4
11-Aug-14	16.8		61.1	16-Sep-14		44.4	
12-Aug-14	22.3	12.7	20.7	17-Sep-14		23.1	15.6
15-Aug-14	14.1	1.0	8.7	18-Sep-14	26.9	13.6	7.2
16-Aug-14	9.5	3.1	17.2	19-Sep-14	10.5	21.6	
18-Aug-14	12.6	5.4	34.2	20-Sep-14	17.9	24.6	8.8
19-Aug-14	10.6	5.5	31.7	22-Sep-14	18.7	12.5	6.7
20-Aug-14	3.5	0.9	16.1	23-Sep-14	16.0	8.0	5.5
21-Aug-14	3.6	4.6	36.6	25-Sep-14	13.2	0.5	4.2
22-Aug-14	3.8	43.2	25.9	26-Sep-14	4.0	1.7	3.3
23-Aug-14	7.4	24.5	53.7	27-Sep-14	6.1	6.4	7.0
25-Aug-14	14.4	61.1	39.1	28-Sep-14	9.0	11.0	9.1
26-Aug-14	13.6	35.5	51.6	29-Sep-14	13.1	5.4	6.0
27-Aug-14	33.3	38.2	15	30-Sep-14		11.9	7.7
28-Aug-14	14.0	30.9	9.0	1-Oct-14	15.7	14.1	6.8
29-Aug-14	14.7	12.0	4.6	2-Oct-14	15.6	10.5	6.2
2-Sep-14	9.3	12.4	7.0	3-Oct-14	21.8	10.4	8.4
3-Sep-14	8.8	5.9	8.1	4-Oct-14	25.8	2.0	5.9
4-Sep-14	30.5	26.3	15.8	6-Oct-14	36.2	15.7	19.1
5-Sep-14	20.5	24.9	12.4	8-Oct-14	59.6	16.0	5.9
6-Sep-14	26.9	33.7	18.9	10-Oct-14	22.4	14.3	11.1
8-Sep-14	28.9	29.8	26.2	11-Oct-14	42.1	11.8	5.2
9-Sep-14	13.8	9.6	5.4	13-Oct-14	12.3	6.8	5.6
10-Sep-14	38.7	30.4	10.7	14-Oct-14			

Key:

µg/m^3 = micrograms per cubic meter
ID = identification
TWA = time-weighted average
= not deployed on this date

Table 5-2

Mercury Vapor Concentrations Before and After Repository Cover Installation
Bonanza Mine Site
Sutherlin, Oregon

Location	Uncovered Repository (October 4, 2014)	Covered Repository (October 9, 2014)
Site-Specific Action Level (1,000 ng/m^3)		
Residence 1 (south)	620	30
Residence 1 (middle)	91	98
Residence 1 (north)	11	88
Residence 6 (south)	54	112
Residence 6 (north)	41	189
Former Mill Site	673	167
Average	**248**	**114**

Key:

ng/m^3 = nanograms per cubic meter

Table 5-3

Comparison of XRF Screening and Off-Site Laboratory Results of Mine-Waste Contaminated Material
Bonanza Mine Site
Sutherlin, Oregon

Sample Number	Sample Location	Sample Depth	Mercury (mg/kg)		Arsenic (mg/kg)	
			XRF	Lab	XRF	Lab
		Site-Specific Cleanup Level	17		23	
14080201	Former Mill Site (south)	8 feet	397	350	38	45
14080202	Former Mill Site (north)	8 feet	27	24	31	35
14080203	Area 2	1 foot	9079	5510	689	814
14080208	Residence 1 (south)	1 foot	162	266	66	63
14080209	Residence 1 (middle)	2 feet	167	349	110	118
14080210	Residence 1 (north)	1 foot	89	87	144	137
14080211	Residence 2 (homesite)	1 foot	79	74	51	52
		Correlation	0.999		0.999	

Key:

mg/kg = milligrams per kilogram

XRF = X-ray fluorescence spectrometer

= total arsenic or mercury values exceed the site-specific cleanup level

Table 5-4

Comparison of XRF Screening and Off-Site Laboratory Results of Backfill Samples from the Umpqua Quarry
Bonanza Mine Site
Sutherlin, Oregon

Sample Number	Sample Material	Sample Depth	Mercury (mg/kg)		Arsenic (mg/kg)	
			XRF	Lab	XRF	Lab
Site-Specific Cleanup Level			17		23	
14080204	topsoil	NA	ND	ND	**3**	**5**
14080205	washed sand	NA	ND	ND	**4**	**4**
14080206	3/4 inch minus	NA	ND	ND	**3**	**1**
14080207	2.5 inch minus	NA	ND	ND	**8**	**1**

Key:

mg/kg	= milligrams per kilogram
NA	= not applicable
ND	= not detected
XRF	= X-ray fluorescence spectrometer
	= total arsenic or mercury values exceed the site-specific cleanup level
Bold	= concentration is greater than the method reporting limit

Table 5-5

Bulk Asbestos Results from the Manufactured Homes
Bonanza Mine Site
Sutherlin, Oregon

Sample Number	Sample Location	Location ID	Location Description	Asbestos by PLM Results
14080001	Residence 2	R2-01	Sealing tape/caulk under trim around exterior vent of kitchen fan.	15% Chrysotile
14080002	Residence 2	R2-02	Paint and caulking along base of exterior trim siding.	NAD
14080003	Residence 2	R2-03	Sealing tape/caulk under trim around exterior window.	15% Chrysotile
14080004	Residence 2	R2-04	Sealing tape/caulk under trim around water heater door.	NAD
14080005	Residence 2	R2-05	Sheet vinyl flooring on wooden porch.	NAD
14080006	Residence 2	R2-06	Loose piece of apparent cement-board siding.	NAD
14080007	Residence 2	R2-07	Tape/caulk under exterior door trim.	15% Chrysotile
14080008	Residence 2	R2-08	Particle board with white paint and holes.	NAD
14080009	Residence 2	R2-09	Vinyl floor covering in kitchen	NAD
14080010	Residence 2	R2-10	Wire insuation for kitchen exhaust fan.	NAD
14080011	Residence 2	R2-11	Drywall patch in kitchen.	NAD
14080012	Residence 2	R2-12	Drywall patch in hallway.	NAD
14080013	Residence 2	R2-13	Black fiber construction board from ceiling.	NAD
14080014	Residence 2	R2-14	Vinyl floor covering - bedroom closet.	NAD
14080015	Residence 2	R2-15	Roofing sealant and application.	NAD
14080016	Residence 2	R2-16	Wiring insulation - main power line to trailer.	NAD
14080017	Residence 2	R2-17	Sealant around pipe jack in roof.	5% Chrysotile
14080020	Residence 1	R1-01	Window tape.	NAD
14080021	Residence 1	R1-02	Caulk around front door.	NAD
14080022	Residence 1	R1-03	Sealant on tin siding - friable	2% Chrysotile
14080023	Residence 1	R1-04	Entryway - vinyl floor covering (top layer).	NAD
14080024	Residence 1	R1-05	Entryway - vinyl floor covering (bottom layer).	NAD
14080025	Residence 1	R1-06	Kitchen - vinyl floor covering.	NAD
14080026	Residence 1	R1-07	Main bathroom - caulk around toilet connection.	NAD
14080027	Residence 1	R1-08	Main bathroom - caulk around bathroom tub.	NAD
14080028	Residence 1	R1-09	Main bathroom - ceiling tile.	NAD
14080029	Residence 1	R1-10	Gypsum wallboard in water heater compartment.	NAD
14080030	Residence 1	R1-11	Sheet vinyl in water heater compartment.	NAD
14080031	Residence 1	R1-12	Exterior window foam weather stripping.	NAD
14080032	Residence 1	R1-13	Black tar paper under trailer - outer layer of fiberglass insulation.	3% Chrysotile
14080033	Residence 1	R1-14	Roof tape with silver paint.	2% Chrysotile
14080034	Residence 1	R1-15	Black mastic under roof paint.	8% Chrysotile
14080035	Residence 1	R1-16	Field duplicate of R1-14.	2% Chrysotile
14080036	Residence 1	R1-17	RV Trailer - bathroom wall siding - pressed wood with black layer.	NAD
14080037	Residence 1	R1-18	Shed - roofing material.	8% Chrysotile
14080038	Residence 1	R1-19	Shed - felt paper.	NAD

Key:

%	= percent
ID	= identification
NAD	= no asbestos detected
PLM	= polarized light microscopy
	= concentration greater than or equal to one percent asbestos

Table 5-6

TCLP Metals Results from the Manufactured Homes
Bonanza Mine Site
Sutherlin, Oregon

Sample Number	Sample Location	Arsenic	Lead	Mercury
	TCLP Limit	5.0	5.0	0.2
14080018	Residence 2	**0.18**	0.02 U	**0.0007 JQ**
14080019	Residence 2 (field duplicate)	**0.16**	0.02 U	**0.0007 JQ**
14080039	Residence 1	**0.06**	0.02 U	**0.0003 JQ**
14080040	Residence 1 (field duplicate)	**0.05 JQ**	0.02 U	**0.0005 JQ**

Key:

JQ	= the analyte was positively identified, and the assoicated numerical value with an unknown direction of bias
mg/L	= milligrams per liter
TCLP	= toxicity characteristic leaching procedure
U	= the analyte was analyzed for, but not deteted above the reported sample quantitation limit
	= total arsenic, lead, or mercury values exceed TCLP limits
Bold	= concentration is greater than the method reporting limit

Table 5-7

Air Sample Results for Arsenic and Mercury
Bonanza Mine Site
Sutherlin, Oregon

Sample Number	Sample Date	Location ID	Remarks	Arsenic Particulates (ng/m3)		Mercury Particulates (ng/m3)		Mercury Vapor (ng/m3)	
			OSHA PEL	**10,000 (TWA)**		**100,000 (TWA)**		**100,000 (TWA)**	
			NIOSH REL	**2,000 (short term**		**10,000 (short term)**		**50,000 (TWA)**	
14080101	9-Aug-14	EX-1	Excavator operator clearing trees and vegetation.	26,300	U	--		--	
14080102	9-Aug-14	EX-2	Excavator operator clearing trees and vegetation.	--		6,200	U	3,240	U
14080103	9-Aug-14	WK-1	ERRS worker cutting trees in exclusion zone.	24,000	U	--		--	
14080104	9-Aug-14	WK-2	START worker in exclusion zone while ERRS is clearing trees.	--		8,300	U	4,320	U
14080108	12-Aug-14	EX-03	D8 Dozer operator working on top of waste rock pile.	21,300	U	--		--	
14080110	12-Aug-14	EX-04	D8 Dozer operator working on waste rock pile.	--		5,100	UJL	2,640	U
14080109	12-Aug-14	WK-03	ERRS worker at water truck and refueling equipment.	26,100	U	--		--	
14080111	12-Aug-14	WK-04	START worker screening the repository area with the Lumex.	--		5,000	UJL	2,590	U
14080112	12-Aug-14	EX-05	Excavator operator in former mill site.	27,900	U	--		--	
14080114	12-Aug-14	EX-06	Excavator operator in former mill site.	--		5,500	UJL	**92,700**	
14080113	12-Aug-14	WK-05	Water truck operator in rormer mill site.	26,700	U	--		--	
14080115	12-Aug-14	WK-06	Water truck operator in rormer mill site.	--		5,400	UJL	**11,100**	
14080119	13-Aug-14	EX-07	D8 dozer operator on repository.	9,270	U	--		--	
14080121	13-Aug-14	EX-08	D8 dozer operator on repository.	--		1,800	UJL	**11,100**	
14080120	13-Aug-14	EX-09	Vibratory compacter operator on repository.	8,980	U	--		--	
14080122	13-Aug-14	EX-10	Vibratory compacter operator on repository.	--		30,500	UJL	15,900	U

Key:

--	= not applicable / no data
ID	= identification
JL	= the analyte was positively identified, and the assoicated numerical value has a low bias
ng/m3	= nanograms per cubic meter
NIOSH	= National Institute of Occupational Safety and Health
OSHA	= Occupational Safety and Health Administration
PEL	= Permissible Exposure Limit
REL	= Recommended Exposure Limit
TWA	= time-weighted average
U	= the analyte was analyzed for, but not deteted above the reported sample quantitation limit
	= air sample results exceed an action level
Bold	= detected above the sample reporting limit

6 Maintenance, Monitoring and Repair

The MM&R plan describes the activities that are required to ensure the effectiveness and integrity of the removal action so that the action remains protective of human health and the environment. The plan was prepared for the property owner with assistance and oversight provided by ODEQ to ensure the continuing effectiveness of the removal action and to monitor Site conditions. As part of the monitoring component, annual, semi-annual and/or episodic inspections of the protective barrier integrity and performance and surface water drainage systems will be required, and as part of the maintenance and repair component, the landowner will be required to perform the needed maintenance and repairs. The following sections include brief summaries of the MM&R plan requirements. A complete version of the plan is included in Appendix D.

6.1 Monitoring Activities

Monitoring activities are needed to periodically assess the condition and functionality of the protective barriers and drainage and erosion control features installed during the removal action. Periodic monitoring events are categorized as Semi-Annual, Annual, Storm Event, and Reported Incidents, and will generally include inspections, documentation, and reporting. Inspections, conducted by the owner, will identify any situations warranting maintenance or repairs associated with removal action features. Examples include drainage and erosion control, gravel backfill, on-Site repository, vegetation, and signage. Detailed inspection activities and locations are discussed at depth in the full MM&R plan. Results of the inspections should be documented on the Field Inspection Log which was included in the MM&R plan.

6.2 Maintenance and Repair

Maintenance and repair activities will be conducted to maintain the integrity of removal action features. Repairs will be implemented to restore removal action features to functioning conditions within 60 working days of initial identification, if feasible. Repairs required to address a breach in the on-Site repository cap, capped waste rock areas, or physical or safety hazards will be expedited and/or temporary measures will be implemented until a more permanent remedy can be designed and constructed.

6.3 Best Management Practices

BMPs will be used while conducting inspections, monitoring, and maintenance and repair activities. These activities will be conducted in a manner that minimizes disturbance to the Site. When construction activities are required to conduct repairs at the Site, the limits of the work area will be delineated prior to initiating construction. Where appropriate, temporary erosion control measures (examples: silt fencing, straw bales) will be installed to protect vegetation, Foster Creek, and Calapooya Creek from sediment runoff.

If excavation of contaminated material is necessary to conduct repairs, appropriate measures will be taken to segregate contaminated material from non-contaminated material on the Site. Excavated material will be placed on a temporary liner or in bins and covered with a tarp to minimize erosion by wind, precipitation, and/or surface water. Silt-fence and/or straw bales might also be used as appropriate. Contaminated materials will either be reconsolidated beneath

the cap or, with prior approval of ODEQ, may be hauled off-Site to an appropriate facility for disposal. Appropriate procedures will be used to decontaminate tools, equipment, and vehicles that contact contaminated materials. Any non-hazardous debris or waste generated as part of the maintenance and repair activities will be transported off-Site for disposal at an appropriate facility.

6.4 Exposure Reduction Measures

As previously noted, the Site was once a mercury mine and mill and an indeterminate amount of mine-waste contaminated material remain at certain areas beyond the cleanup boundaries. These materials are likely calcine, the by-product of the mercury recovery process, which is easily recognizable because of their scarlet-red, pinkish-red or brownish-red color.

People should not enter areas where calcine is observed or suspected; however, if someone were to enter such an area, certain ERMs are recommended. ERMs are simple, day-to-day things that individuals can do to limit or reduce exposure to soil contaminants. Examples include washing hands frequently, removing shoes before entering homes, wet mopping to clean surfaces indoors, and frequently bathing pets and washing toddler toys.

6.5 Record Keeping and Reporting

The MM&R plan directs the property owner to provide ODEQ with copies of all project-related documents, including: inspection, MM&R, and monitoring records; summaries of inspection, MM&R, and monitoring activities; and all other pertinent records. Specifically, the ODEQ Western Regional Cleanup Program will be the point of contact for the property owner. The MM&R plan states that the requirements of said plan can only be amended or modified in a writing signed by the ODEQ and the owners of the Site.

7 Community Relations

During the first week of the removal action, project staff coordinated with the community including nearby neighbors, the Douglas County Sheriff, the Douglas Forest Protective Association, Douglas County Planning Department, Douglas County Library, Pacific Power and Light, and other local agencies and persons. EPA continued to engage with local official and first responders throughout the duration of the removal action. On September 3, EPA hosted the Roseburg City Manager, Fire Chief, and Deputy Fire Chief at the Site. Later that month a five-person contingent of the Douglas County HazMat Team visited the Site for a tour by OSC Franklin.

A representative from the ODEQ Western Region visited the Site on a routine basis, and was integrated into the project organization, as appropriate. Two members of OHA visited the Site on October 9 along with the ODEQ Western Region representative for an update on removal activities to date.

Lone Rock owns a significant portion of property surrounding the Site. EPA coordinated with Lone Rock in mid-September to gain access to their property in order to take photographs of the Site from the surrounding hillside. OSC Franklin continued to coordinate with Lone Rock regarding increased vehicle traffic on nearby roads due to hunting and road construction. Later, on November 12, OSC Franklin contacted Lone Rock to discuss restoration efforts in the EPA command post parking area which was inadvertently constructed on their property.

EPA provided ongoing coordination with residents who remained on-Site during the removal action. As the removal action progressed, the property owner met with EPA to discuss potential locations for relocating one or more of the replacement manufactured homes. In early October, OSC Heister informed the owner that Residence 1 and Residence 6 were the preferred locations for the replacement homes, and the owner expressed his agreement with this decision. On November 12, OSC Franklin met with Mr. Smith to review restoration efforts on the borrow source area located behind the EPA command post. The property owner expressed satisfaction with the restoration which included grading, seeding, and placement of slash and straw. Finally, on November 20, OSC Liverman and OSC Heister met with the owner to review the transfer agreement for the manufactured homes. The ODEQ Western Representative was also available to discuss requirements of the MM&R plan in addition to planned deed restrictions and concern regarding open adit(s) related to the Bonanza Mine workings on adjacent property.

A website (http://www.epaosc.org/BonanzaMineandMill) was established to provide updates on Site activities. Periodic pollution reports (PolReps) were also distributed throughout the duration of the project (Appendix E).

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8 Quality Assurance/Quality Control

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware and reagents. Specific QC requirements for laboratory analyses are incorporated in the *EPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods* (EPA 2014c). These QC requirements or equivalent requirements found in the analytical methods were followed for analytical work on the project. This section describes the QA/QC measures taken for the project and provides an evaluation of the usability of data presented in this report.

Data from the START-subcontracted commercial laboratory were reviewed and validated by a START chemist. Data qualifiers and labels were applied as necessary according to the following guidance:

- *EPA National Functional Guidelines for Inorganic Superfund Data Review* (EPA 2014c).
- *Guidance for Labeling Externally Validated Laboratory Data for Superfund Use* (EPA 2009).

In the absence of other QC guidance, method- and/or SOP-specific QC limits were also utilized to apply qualifiers to the data.

8.1 Satisfaction of Data Quality Objectives

The following guidance document was used to establish data quality objectives (DQOs) for this project:

- (EPA 2006) *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4), EPA/240/B-06/001.

EPA determined that definitive data without error and bias determination would be used for the sampling and analyses conducted during the field activities. The data quality achieved during the field work produced sufficient data that met the DQOs stated in the SSSP (E & E 2014b). A detailed discussion of accomplished project objectives is presented in the following sections.

8.2 QA/QC Samples

Rinsate blank and trip blank QA samples were not collected for this project. Rinsate blank samples are collected for samples associated with non-dedicated sampling equipment; all samples for this project were collected using dedicated equipment. Trip blank samples are only collected for samples associated with volatile organic compound and/or gasoline-range organics analyses. QC samples included matrix spike/matrix spike duplicate (MS/MSD) and/or blank spike (BS) samples at a rate of one MS/MSD and/or BS per 20 samples per matrix.

8.3 Project-Specific Data Quality Objectives

The laboratory data were reviewed to ensure that DQOs for the project were met. The following describes the laboratories' and/or field team's abilities to meet project DQOs for precision, accuracy, and completeness and the field team's ability to meet project DQOs for

representativeness and comparability. The laboratories and the field team were able to meet DQOs for the project.

8.3.1 Precision

Precision measures the reproducibility of the sampling and analytical methodology. Laboratory and field precision is defined as the relative percent difference (RPD) between duplicate sample analyses. The laboratory duplicate samples or MS/MSD samples measure the precision of the analytical method. The RPD values were reviewed for all commercial laboratory samples. A total of 10 sample results (approximately 5.7% of the data) were qualified as estimated quantities based on duplicate results.

8.3.2 Accuracy

Accuracy indicates the conformity of the measurements to fact. Laboratory accuracy is defined as the MS/MSD/BS percent recoveries (%Rs) for all laboratory analyses.The %R values were reviewed for all MS/MSD/BS analyses. All spike results were within QC limits; therefore the project DQO for accuracy of 90% was met.

8.3.3 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All laboratory data were reviewed for data validation and usability. No sample results were rejected; therefore the project DQO for completeness of 90% was met.

8.3.4 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or environmental condition. The number and selection of samples were determined in the field to account accurately for Site variations and sample matrices. The DQO for representativeness was met.

8.3.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this Site followed applicable field sampling techniques and specific analytical methodology. The DQO for comparability was met.

8.4 Laboratory QA/QC Parameters

The laboratory data also were reviewed for holding times/temperatures/sample containers, laboratory blank samples, and serial dilution analyses. These QA/QC parameters are summarized below.

8.4.1 Holding Times/Temperatures/Sample Containers

All holding times, sample temperatures, and containers were acceptable.

8.4.2 Laboratory Blanks

All laboratory blanks met the frequency criteria. The following potential contaminants of concern were detected in the laboratory blanks:

- Inorganics: Arsenic and thallium.

See the data validation memoranda for results qualified based on blank contamination.

8.4.3 Serial Dilution Analyses

Serial dilution analyses met the frequency criteria. All serial dilution results were within QC limits.

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9 Health and Safety

EPA maintained ultimate authority and responsibility for Site safety during the removal action. ERRS and START each developed a health and safety plan (HASP), which were then incorporated into EPA's Site HASP. EPA conducted a general Site safety meeting at the beginning of the removal action to establish the health and safety procedures for the Site. Daily safety meetings were conducted at the beginning of each day of Site work and attended by all personnel present, including EPA, ERRS, and START. During the daily safety meetings, Site personnel discussed the planned activities for that day; any reoccurring task-specific health and safety issues such as communications, conduct in or near excavations, and traffic safety; and other safety alerts such as potential energy in stacked lumber, the presence of swarming stinging insects, and the widespread distribution of poison oak.

The main physical hazards present at the Site were heavy equipment (e.g., haul trucks, excavators, dozer, compactor, and water truck), open excavations, uneven terrain, and obscured mine shafts and adits. The minimum level of PPE for the Site was Level D, including safety glasses, hard hat, high visibility safety vest, and steel-toed safety shoes. Other safety equipment, such as gloves and hearing protection, were required as warranted by activity and/or Site conditions.

The main chemical hazards present at the Site were mercury vapor in air and arsenic- and mercury-contaminated soil. The required PPE for various work zones was largely dependent on the results of air screening with the Lumex mercury vapor analyze, dust monitoring with the DataRams, and XRF screening results of contaminated soil. Level C PPE, including full-face respirators with mercury vapor cartridges, was required in the work zones until September 24 with the exception of the repository which required respiratory protection for mercury vapors until October 9. A Respiratory Protection Plan was formulated to clearly state Site action levels and the boundaries of exclusion zones. A *Draft Recommended Decontamination and Screening Protocol for Heavy Equipment* was prepared to ensure that bulldozers, haul trucks, excavators, and other heavy equipment used on Site were sufficiently decontaminated for future use without respiratory protection.

Due to an extreme regional fire hazard, supplemental wild fire prevention and suppression precautions were implemented, including maintaining three 4,000-gallon water trucks on-Site and equipping each motorized vehicle with hand tools such as an axe, Pulaski, or shovel. While other activities in remote rural areas such as timber harvesting had to cease operations every day at 1300 hours due to the fire hazard, the supplemental project-related wild fire prevention and suppression precautions enabled cleanup activities to extend beyond 1300 hours each work day (EPA 2014a). By October the threat of wildfire was replaced by heavy rains which created additional hazards to the removal work, including wet road and soil surfaces and increased risk of vehicle and equipment accidents, and added risk of trench collapse.

A health and safety audit was conducted by the EPA Region 10's Removal Program Health and Safety Program Coordinator. The audit consisted of a detailed and objective assessment of the HASP to determine whether health and safety regulations, EPA policies, and contractor policies were being adequately implemented and followed. The audit disclosed no significant health and

safety issues. During the course of the removal action there were no significant worker injuries or other health and safety-related incidents on the Site.

10 Difficulties Encountered

The following difficulties that affected the removal action were encountered:

- Free Mercury at the Former Mill Site: The presence of free mercury at depths up to 14 feet bgs presented specific challenges related to the disposal of free mercury as well as the excavation of heavily-contaminated soil. Additional effort was required to review the Mercury Export Ban Act and arrange for disposal at the correct facility. Ultimately, the free mercury was captured using a mercury vacuum and disposed of at a facility where it was retired via sulfide treatment. Two separate 55-gallon drums containing contaminated soil and other debris was transported to a separate facility for macro-encapsulation.

- Procuring Replacement Manufactured Homes: The secondary market for manufactured homes was is not necessarily conducive to the standard government acquisition processes. Specifically, the business model operates on fast turnarounds and small margins often resulting in prospective homes being sold before EPA arranged for inspection. It was also difficult to find replacement manufactured homes of the same vintage as the original homes that were in decent, safe, and sanitary condition. Finally, the transportation of the purchased homes to the Site presented additional logistical challenges.

- Home Site Selection: The distribution and concentration of mercury vapors appeared to be affected by multiple variables, including temperature, humidity, wind speed, wind direction, Site activities, and proximity to the repository, among other factors. Even the excavated areas and surrounding hillsides were initially considered potential source(s) of mercury vapors. In early October, OSC Heister and START performed detailed and repeated screening for mercury vapors at potential home site locations. Based on the results of these surveys, along with consultation with the property, the decision was made to place the replacement homes at Residence 1 and Residence 6. The former location was selected in part because of its elevated location in relation to the repository, and the latter location was selected in part because of its distance from the repository.

- Home Site Utilities: During the course of the removal action it became clear that the preexisting condition of the utilities and the impact of removal activities would necessitate the reinstallation of all utilities to the replacement home sites. The septic system proved to be the most difficult because of the challenge in identifying a suitable leach field and installing conduit for sewage in the roadway which was overbuilt to support 40-ton haul trucks. The power utility connection required coordination with the local power authority and an electrical subcontractor. The drinking water on Site was sourced from a nearby spring with a storage tank and dilapidated pump house near Area 4. The pump house was demolished and replaced with a polyethylene tool shed, and the water lines were replaced to both Residence 1 and Residence 6. Additional water connections were upgraded to the property owner's home to the south of Area 4. Communication lines were also restored prior to demobilization from the Site.

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11 Summary and Conclusions

From August 4 through December 6, 2014, EPA performed a removal action at the Bonanza Mine Site. The removal action was intended to mitigate the potential human health and ecological threats posed by exposure to mercury and arsenic, including direct contact, ingestion, and inhalation pathways. EPA performed work at the former mill site and targeted areas downgradient of the mine waste rock and calcine piles, and two additional locations associated with recently inhabited manufactured homes were also identified for removal activities.

EPA excavated 38,500 yd^3 of mine-waste contaminated material during the removal action. The excavated material was placed in the on-Site repository along with approximately 130,000 yd^3 of preexisting calcine and waste rock. The total face of the repository was 196,000 ft^2, or nearly five acres in size. The excavated areas were backfilled and graded with 44,500 yd^3 of clean backfill obtained from off-Site quarries and on-Site sources. Pre-existing grades were restored and disturbed areas were stabilized by placing erosion control slash material and seeding. A post-removal satellite image of the Site from May 2015 clearly identifies the areas that were excavated and restored during the EPA removal action (Figures 11-1 and 11-2).

Surface water drainage systems were rebuilt to accommodate increased volumes of runoff from the repository face. The utilities were completely restored including a new leach field, septic tanks, water lines, power connections, and communication lines. Two replacement manufactured homes were procured along with basic furniture items to replace contaminated material that was discarded during the removal action. The homes were transported to the Site and connected to the utilities.

Construction and green removals BMPs were employed, and daily monitoring confirmed the effectiveness of the BMPs for control of short-term construction impacts. A long-term MM&R plan was prepared for the property owner with assistance and oversight provided by ODEQ to ensure the continuing effectiveness of the removal action and to monitor Site conditions.

ecology and environment, inc. Global Environmental Specialists Seattle, Washington	BONANZA MINE SITE Sutherlin, Oregon	Figure 11-1 POST-REMOVAL SATELLITE IMAGE – NORTH SECTION		
	Not to Scale	Date: 7/8/15	Drawn by: AES	10:START-IV\14030011\fig 11-1

ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

Figure 11-2
POST-REMOVAL SATELLITE IMAGE – SOUTH SECTION

Not to Scale

Date: 7/8/15

Drawn by: AES

10:START-IV\14030011\fig 11-2

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A Photographic Documentation

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BONANZA MINE SITE
Sutherlin, Oregon

TDD Number: 14-06-0006
Photographed by: Tom Campbell (TC), Jason Coury-ERRS RM (JC), Bryan Ciecko (BC), Steve Hall (SH), Jake Moersen (JM)

Photo 1 Pre-existing signage provided by ODEQ.

Direction: *Closeup* *Date: 4/23/14* *Time: 11:21* *Taken by: TC*

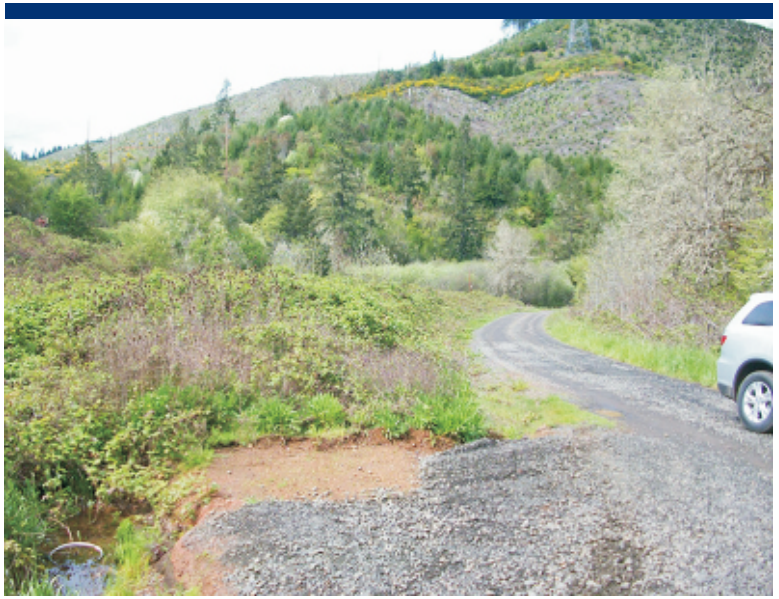

Photo 2 Area 4.

Direction: *South* *Date: 3/17/14* *Time: 09:07* *Taken by: JC*

Photo 3 Area 2.

Direction: *South* *Date: 4/23/14* *Time: 11:24* *Taken by: TC*

Photo 4 Area 2 in the foreground, Area 1 behind the gate.

Direction: *Northeast* *Date: 3/17/14* *Time: 09:23* *Taken by: JC*

Photo 5 Road between Area 1 and Area 2 leading to Residence 3.

Direction: *East* *Date: 3/17/14* *Time: 09:27* *Taken by: JC*

Photo 6 Pile of waste rock. The plastic tarp covers soil removed by ODEQ.

Direction: *North* *Date: 6/20/14* *Time: 12:08* *Taken by: BC*

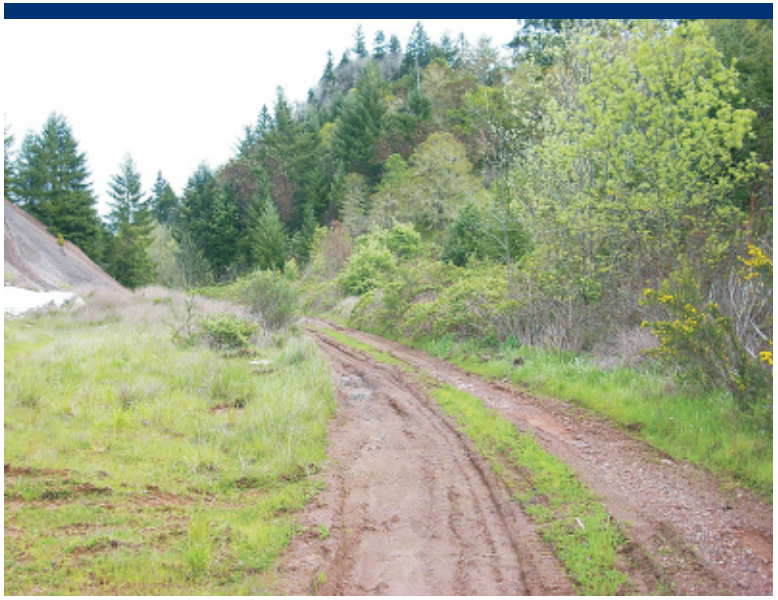

Photo 7 Access road around the future toe of the repository in Area 1.

Direction: *Northeast* *Date: 3/17/14* *Time: 09:33* *Taken by: JC*

Photo 8 Calcine pile.

Direction: *Date: 4/23/14* *Time: 11:44* *Taken by: TC*

Photo 9 Residence 2.

Direction: West Date: 3/17/14 Time: 09:45 Taken by: JC

Photo 10 Residence 2.

Direction: South Date: 6/20/14 Time: 11:16 Taken by: BC

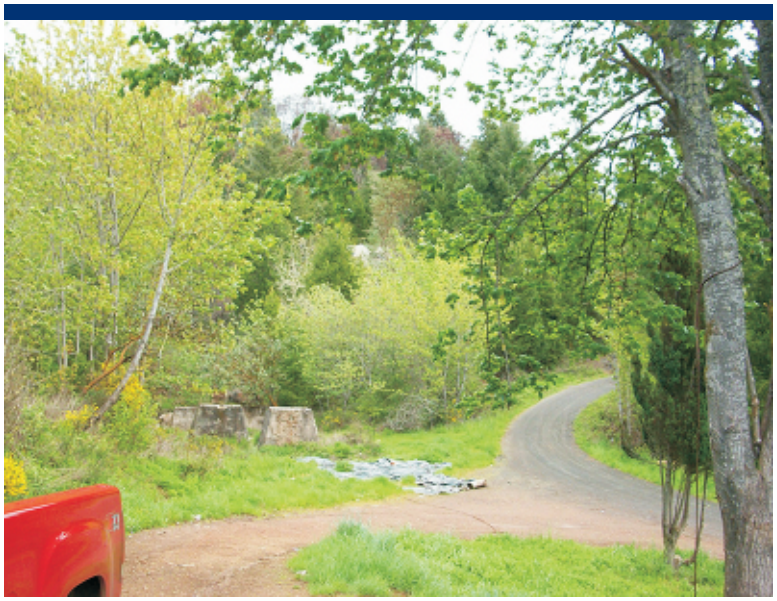

Photo 11 Former Mill Site viewed from Residence 2.

Direction: Northeast Date: 3/17/14 Time: 10:01 Taken by: JC

Photo 12 Residence 1.

Direction: West Date: 6/20/14 Time: 10:34 Taken by: BC

Photo 13 Area 1 in the foreground with Residence 3 on the hillside.

Direction: *Southwest* *Date: 3/17/14* *Time: 11:16* *Taken by: JC*

Photo 14 Area 1.

Direction: *North* *Date: 6/20/14* *Time: 13:18* *Taken by: BC*

Photo 15 Ready line at Area 1.

Direction: *North* *Date: 8/11/14* *Time: 16:58* *Taken by: SH*

Photo 16 Conex box containing personal effects from the displaced residents.

Direction: *South* *Date: 8/15/14* *Time: 10:48* *Taken by: SH*

Photo 17 Dilapidated travel trailer supported by fire bricks from the former Mill Site at Residence 6.

Direction: *South* *Date: 8/15/14* *Time: 10:49* *Taken by: SH*

Photo 18 Shaping the waste rock pile; clearing and grubbing Area 1.

Direction: *North* *Date: 8/11/14* *Time: 16:59* *Taken by: SH*

Photo 19 View from the top of the waste rock pile toward the ready line.

Direction: *South* *Date: 8/11/14* *Time: 09:00* *Taken by: SH*

Photo 20 Shaping the calcine pile into the base for the on-Site repository.

Direction: *Northwest* *Date: 8/12/14* *Time: 11:22* *Taken by: SH*

Photo 21 Excavation of the former Mill Site.

Direction: *North* *Date: 8/15/14* *Time: 10:36* *Taken by: SH*

Photo 22 Exposed timbers and narrow gauge rail in the former Mill Site.

Direction: *North* *Date: 8/15/14* *Time: 10:20* *Taken by: SH*

Photo 23 Exposed sidewall containing red calcine in the former Mill Site.

Direction: *North* *Date: 8/15/14* *Time: 10:21* *Taken by: SH*

Photo 24 Excavation of the former Mill Site; a section containing free mercury was marked with orange spray paint.

Direction: *West* *Date: 8/15/14* *Time: 10:20* *Taken by: SH*

Photo 25 OSC Liverman at the section containing free mercury.

Direction: West *Date: 8/15/14* *Time: 10:22* *Taken by: SH*

Photo 26 Free mercury at the former Mill Site.

Direction: Closeup *Date: 8/15/14* *Time: 10:23* *Taken by: SH*

Photo 27 Field screening of soil using the XRF at the former Mill Site.

Direction: South *Date: 8/16/14* *Time: 09:44* *Taken by: JC*

Photo 28 Field screening for mercury vapors at the former Mill Site.

Direction: West *Date: 8/16/14* *Time: 09:35* *Taken by: JC*

Photo 29 Construction of the repository with excavated mine waste material from the former Mill Site.

Direction: *West* *Date: 8/15/14* *Time: 10:15* *Taken by: SH*

Photo 30 Repository construction with DataRam 4000 particulate monitor in the foreground.

Direction: *North* *Date: 8/21/14* *Time: 11:43* *Taken by: SH*

Photo 31 Excavation of Area 2.

Direction: *North* *Date: 8/16/14* *Time: 13:25* *Taken by: SH*

Photo 32 Excavation of Area 2.

Direction: *South* *Date: 8/19/14* *Time: 11:20* *Taken by: JM*

Photo 33 Sidewall in Area 2 containing visible layers of discolored soil.

Direction: *East* *Date: 8/20/14* *Time: 10:04* *Taken by: JM*

Photo 34 South section of Area 2 facing Area 4 (not visible).

Direction: *South* *Date: 8/20/14* *Time: 10:01* *Taken by: JM*

Photo 35 Gelatinous grey material from the mine feature in Area 2.

Direction: *Closeup* *Date: 8/20/14* *Time: 11:57* *Taken by: JM*

Photo 36 Excavated mine feature in Area 2 to a depth of 8 feet bgs.

Direction: *Closeup* *Date: 8/20/14* *Time: 12:03* *Taken by: JM*

Photo 37 OSC Heister reviewing the excavated mine feature.

Direction: *Southeast* *Date: 8/20/14* *Time: 08:52* *Taken by: JM*

Photo 38 Mine feature backfilled with 4- to 8-inch rock.

Direction: *East* *Date: 8/22/14* *Time: 14:58* *Taken by: JM*

Photo 39 Replacing a culvert leading to Residence 3 from Area 2.

Direction: *North* *Date: 9/10/14* *Time: 15:05* *Taken by: JM*

Photo 40 New 24 inch culvert installed between Area 1 and Area 2 leading to Residence 3.

Direction: *South* *Date: 9/10/14* *Time: 17:04* *Taken by: JM*

Photo 41 Excavation of Area 4.

Direction: *South* *Date: 8/22/14* *Time: 08:19* *Taken by: JM*

Photo 42 Field screening of discolored soil using the XRF in the southwest section of Area 4.

Direction: *North* *Date: 8/22/14* *Time: 16:48* *Taken by: JM*

Photo 43 Excavation in Area 4 prior to installation of culverts.

Direction: *South* *Date: 8/29/14* *Time: 11:31* *Taken by: EL*

Photo 44 Expanding the repository to the west to accommodate increased volume of excavated material.

Direction: *Northwest* *Date: 8/23/14* *Time: 07:42* *Taken by: JM*

Photo 45 Grading and shaping the repository with heavy equipment.

Direction: *Northeast* *Date: 8/27/14* *Time: 14:44* *Taken by: JM*

Photo 46 Warning signs attached to the gate on the road leading to the top of the repository.

Direction: *North* *Date: 8/25/14* *Time: 17:03* *Taken by: EL*

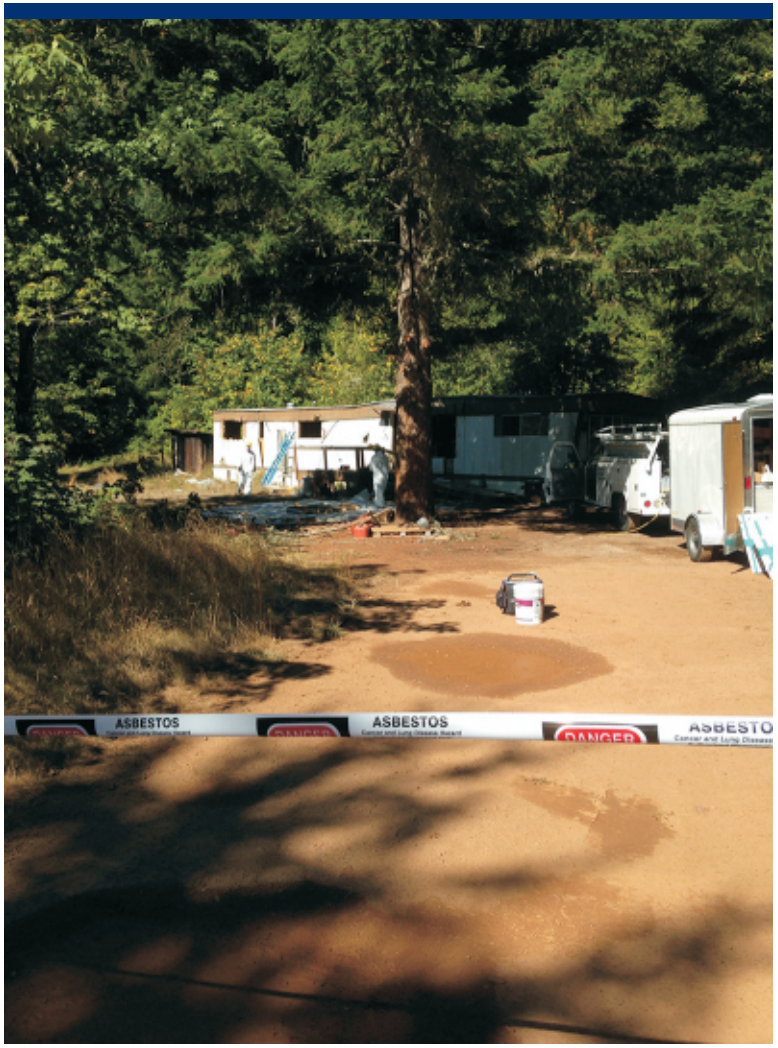

Photo 47 Asbestos abatement of Residence 1.

Direction: *Southwest* *Date: 8/29/14* *Time: 10:30* *Taken by: EL*

Photo 48 Demolition of Residence 1.

Direction: *Southwest* *Date: 9/3/14* *Time: 16:55* *Taken by: EL*

Photo 49 Demolition of Residence 2.

Direction: *North* *Date: 9/4/14* *Time: 13:49* *Taken by: EL*

Photo 50 Excavation of mine-waste material at Residence 2 along the upper road.

Direction: *South* *Date: 9/9/14* *Time: 11:20* *Taken by: JM*

Photo 51 Excavation of mine-waste material in the south section of Residence 1.

Direction: *Southwest* *Date: 9/18/14* *Time: 13:47* *Taken by: JM*

Photo 52 Two boreholes with elevated mercury vapors were filled with bentonite and marked with paint in Residence 1.

Direction: *South* *Date: 9/18/14* *Time: 13:50* *Taken by: JM*

Photo 53 Excavation of mine waste material in Area 1.

Direction: *North* *Date: 9/13/14* *Time: 08:13* *Taken by: JM*

Photo 54 Field screening with the XRF in Area 1.

Direction: *Closeup* *Date: 9/13/14* *Time: 09:42* *Taken by: JM*

Photo 55 Reconstruction of access road in Area 2.

Direction: *West* *Date: 9/9/14* *Time: 09:40* *Taken by: JM*

Photo 56 Reconstruction of access road in Area 2 leading to Residence 3.

Direction: *East* *Date: 9/9/14* *Time: 09:40* *Taken by: JM*

Photo 57 Staging clean backfill in Area 2.

Direction: *North* *Date: 9/19/14* *Time: 08:05* *Taken by: JM*

Photo 58 Armored channel and culvert in Area 4.

Direction: *Northeast* *Date: 10/23/14* *Time: 16:00* *Taken by: JM*

Photo 59 Road leading past Area 4 with water line temporarily exposed along the north side of the road.

Direction: *Northeast* *Date: 11/12/14* *Time: 15:08* *Taken by: JM*

Photo 60 Installation of toe drain at the foot of the repository.

Direction: *South* *Date: 11/8/14* *Time: 11:15* *Taken by: JM*

Photo 61 Installed septic tank at Residence 1.

Direction: *Closeup* *Date: 11/12/14* *Time: 15:50* *Taken by: JM*

Photo 62 Installed septic tank at Residence 6.

Direction: *Closeup* *Date: 11/12/14* *Time: 16:12* *Taken by: JM*

Photo 63 Installation of the power pole at Residence 6.

Direction: *West* *Date: 11/6/14* *Time: 11:25* *Taken by: JM*

Photo 64 View of the finished repository face and upper road from the entrance to Residence 6.

Direction: *Northeast* *Date: 11/12/14* *Time: 16:13* *Taken by: JM*

Photo 65 View down the upper road with Residence 6 on the right.

Direction: *South* *Date: 11/12/14* *Time: 16:13* *Taken by: JM*

Photo 66 Manufactured home at Residence 6 with exposed water line and new power pole in the foreground.

Direction: *Southwest* *Date: 11/12/14* *Time: 16:10* *Taken by: JM*

Photo 67 Upper road leading past repository toward Residence 6 prior to installation of the water line.

Direction: *Southwest* *Date: 11/12/14* *Time: 15:47* *Taken by: JM*

Photo 68 Replacement manufactured home located at Residence 6.

Direction: *Southwest* *Date: 12/5/14* *Time: 08:26* *Taken by: JC*

Photo 69 View from Residence 3 facing the repository, Residence 6 (on the left) and Residence 1 (upper right).

Direction: *North* *Date: 12/5/14* *Time: 10:58* *Taken by: JC*

Photo 70 Armored channel leading past Area 1 and the repository.

Direction: *Northeast* *Date: 12/5/14* *Time: 10:58* *Taken by: JC*

Photo 71 View of Area 1 with the finished repository in the background and multiple armored drainage channels.

Direction: *Northeast* *Date: 12/5/14* *Time: 10:58* *Taken by: JC*

Photo 72 View of the finished repository face and warning sign.

Direction: *Northeast* *Date: 12/5/14* *Time: 08:27* *Taken by: JC*

Photo 73 View from the finished repository face and western side drainage facing Area 1 in the background.

Direction: *North* *Date: 12/5/14* *Time: 08:27* *Taken by: JC*

B Decontamination and Screening Protocol

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Draft Recommended Decontamination and Screening Protocol for Heavy Equipment at Bonanza Mine Site

Background: Contaminants of concern at the Bonanza Mine Site include mercury vapor, mercury in soil, and arsenic in soil. Elevated concentrations of site contaminants have been documented using field screening equipment and/or off-site laboratory analysis. Specifically, the concentration of mercury vapor has been known to exceed the NIOSH REL and/or OSHA PEL at some locations on the site. In response, a *Draft Recommended Decontamination and Screening Protocol for Heavy Equipment* has been prepared to ensure that bulldozers, haul trucks, excavators, and other heavy equipment used on site are adequately decontaminated for general use in Level D PPE.

Action Level: 1000 ng/m^3 per indoor air guidance from ATSDR

Decontamination of Vehicle Exterior:

1. Clean metal housing of engine filter and vehicle interior with compressed air
2. Replace outer cardboard engine filter
3. Gross dry decon of vehicle exterior
4. Fine wet decon of vehicle exterior on the decon pad with the pressure washer
5. Fine wet decon of vehicle interior on the decon pad with the pressure washer
6. Replace cabin filter
7. Run vehicle for 30 minutes with heat on and doors closed, followed immediately by screening with the Lumex mercury vapor analyzer of ambient air, seat, floor and vents
8. If Lumex screening results are greater than the Action Level, then additional targeted fine wet decon will be performed
9. Run vehicle for 30 minutes with heat on and doors closed, followed immediately by screening with the Lumex mercury vapor analyzer of ambient air, seat, floor and vents

Documentation: The results from Lumex screening will be recorded on a field form by START or designated representative.

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C Data Memoranda

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Global Environmental Specialists
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Seattle, Washington 98104
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MEMORANDUM

DATE: July 7, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review, Bonanza Mine Site, Sutherlin, Oregon**

REF: TDD: 14-03-0011 PAN: EE-004534-0060-01TTO

The data quality assurance review of 10 soil samples collected from the Bonanza Mine site in Sutherlin, Oregon, has been completed. Total arsenic and mercury and synthetic precipitation leaching procedure (SPLP) analyses (EPA Methods 1312, 6010C, 6020A, 7470A, and/or 7471B) were performed by Eurofins Lancaster Laboratory, Lancaster, Pennsylvania. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

10ZZ-0001	10ZZ-0002	10ZZ-0003	10ZZ-0004	10ZZ-0005
10ZZ-0006	10ZZ-0007	10ZZ-0008	10ZZ-0009	10ZZ-0010

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were maintained at < 6°C. The samples were collected on June 20, 2014, and were extracted and analyzed by July 1, 2014, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury).

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Satisfactory.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks except SPLP arsenic (0.0028 ug/L) in continuing calibration blank 2. Associated sample results less than five times the SPLP arsenic result was qualified as not detected (U).

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning and end of each sequence or at least twice every 8 hours, whichever was more frequent. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. ICP Serial Dilution: Acceptable.

A serial dilution analysis was performed per matrix per concentration or per sample delivery group, whichever was more frequent. All serial dilution results were within QC limits.

8. Matrix Spike Analysis: Acceptable.

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike and spike duplicate recoveries were within the QC limits.

9. Duplicate Analysis: Satisfactory.

A laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits except total mercury. Associated sample results were qualified as estimated quantities with an unknown bias (JK or UJK).

10. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

11. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

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Analysis Report

Sample Description: 10ZZ-0001 WR01WR 0.5-1.0 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510183
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 10:10 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0001 SDG#: EUR21-19

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals	**SW-846 6020A**		mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	185	0.0886	0.830	2
	SW-846 7471B		mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	691 JK	10.2	203	1000
Wet Chemistry	**SM 2540 G-1997**		%	%	%	
00111	Moisture	n.a.	6.4	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 09:49	Choon Y Tian	2
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 11:56	Damary Valentin	1000
10637	SW SW846 (IV)ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

*=This limit was used in the evaluation of the final result

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Analysis Report

Sample Description: 10ZZ-0001 WR01WR 0.5-1.0 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510184
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 10:10 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0001 SDG#: EUR21-20*

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	~~N.D.~~	0.0072 U	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	~~N.D.~~	0.000060 U	0.00020	1

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 23:56	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 12:43	Damary Valentin	1
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

JMW 7-7-14

*=This limit was used in the evaluation of the final result

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Analysis Report

Sample Description: 10ZZ-0002 MA01SS 0-0.5 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510159
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 10:50 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0002 SDG#: EUR21-01

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals	**SW-846 6020A**		mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	130	0.0915	0.857	2
	SW-846 7471B		mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	96.5 JK	2.23	44.5	200
Wet Chemistry	**SM 2540 G-1997**		%	%	%	
00111	Moisture	n.a.	11.1	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 09:32	Choon Y Tian	2
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 11:37	Damary Valentin	200
10637	SW SW846 (IV) ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

*=This limit was used in the evaluation of the final result

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Analysis Report

Sample Description: 10ZZ-0002 MA01SS 0-0.5 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510160
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 10:50 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0002 SDG#: EUR21-02

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	0.0325 JQ	0.0072	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	0.0413	0.0015	0.0050	25

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 22:49	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 13:24	Damary Valentin	25
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0003 HS01SS 0-0.5 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510161
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 11:12 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0003 SDG#: EUR21-03

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals		**SW-846 6020A**	mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	30.9	0.0950	0.890	2
		SW-846 7471B	mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	64.6 JK	1.12	22.4	100
Wet Chemistry		**SM 2540 G-1997**	%	%	%	
00111	Moisture	n.a.	11.0	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 09:33	Choon Y Tian	2
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 11:39	Damary Valentin	100
10637	SW SW846 (IV)ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0003 HS01SS 0-0.5 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510162
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 11:12 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0003 SDG#: EUR21-04

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	0.0108 ~~J~~ U	0.0072	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	0.0093	0.00030	0.0010	5

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 23:29	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 13:33	Damary Valentin	5
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

MW 7-14

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Analysis Report

Sample Description: 10ZZ-0004 CA01CA 0.5-1.0 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510163
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 11:21 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0004 SDG#: EUR21-05

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals	**SW-846 6020A**		mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	202	0.227	2.13	5
	SW-846 7471B		mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	54.0 JK	1.05	20.9	100
Wet Chemistry	**SM 2540 G-1997**		%	%	%	
00111	Moisture	n.a.	8.7	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 09:54	Choon Y Tian	5
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 11:41	Damary Valentin	100
10637	SW SW846 (IV) ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0004 CA01CA 0.5-1.0 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510164
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 11:21 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0004 SDG#: EUR21-06

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	0.0266 J Q	0.0072	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	0.0096	0.00030	0.0010	5

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 23:33	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 13:35	Damary Valentin	5
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0005 CA01QC Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510165
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 11:40 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0005 SDG#: EUR21-07FD

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals	**SW-846 6020A**		mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	257	0.227	2.12	5
	SW-846 7471B		mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	51.5 JK	1.07	21.5	100
Wet Chemistry	**SM 2540 G-1997**		%	%	%	
00111	Moisture	n.a.	8.6	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 09:56	Choon Y Tian	5
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 10:58	Damary Valentin	100
10637	SW SW846 (IV)ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0006 WR02WR 0-0.5 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510173
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 12:05 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0006 SDG#: EUR21-09

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals		**SW-846 6020A**	mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	74.6	0.0914	0.857	2
		SW-846 7471B	mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	122 JK	2.03	40.6	200
Wet Chemistry		**SM 2540 G-1997**	%	%	%	
00111	Moisture	n.a.	6.6	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 09:42	Choon Y Tian	2
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 11:48	Damary Valentin	200
10637	SW SW846 (IV)ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0006 WR02WR 0-0.5 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510174
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 12:05 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0006 SDG#: EUR21-10

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	~~N.D~~	0.0072 V	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	~~N.D~~	0.000060 U	0.00020	1

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 23:37	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 12:27	Damary Valentin	1
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

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Analysis Report

Sample Description: 10ZZ-0007 A101SS 0-0.5 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510175
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 12:20 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0007 SDG#: EUR21-11

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals		**SW-846 6020A**	mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	414	0.235	2.20	5
		SW-846 7471B	mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	572 JK	11.0	219	1000
Wet Chemistry		**SM 2540 G-1997**	%	%	%	
00111	Moisture	n.a.	9.1	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 10:00	Choon Y Tian	5
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 11:13	Damary Valentin	1000
10637	SW SW846 (IV) ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0007 A101SS 0-0.5 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510176
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 12:20 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0007 SDG#: EUR21-12

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	0.0614	0.0072	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	0.0524	0.0015	0.0050	25

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 23:40	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 13:37	Damary Valentin	25
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0008 CA02CA 0-0.5 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510177
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 12:45 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0008 SDG#: EUR21-13

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals		**SW-846 6020A**	mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	155	0.0915	0.857	2
		SW-846 7471B	mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	124 JK	2.10	42.0	200
Wet Chemistry		**SM 2540 G-1997**	%	%	%	
00111	Moisture	n.a.	8.5	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 09:46	Choon Y Tian	2
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 11:50	Damary Valentin	200
10637	SW SW846 (IV) ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

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Analysis Report

Sample Description: 10ZZ-0008 CA02CA 0-0.5 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510178
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 12:45 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0008 SDG#: EUR21-14

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	0.0270 J Q	0.0072	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	0.0357	0.0012	0.0040	20

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 23:44	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 13:39	Damary Valentin	20
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

MW 7-7-14

*=This limit was used in the evaluation of the final result

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Analysis Report

Sample Description: 10ZZ-0009 RD01SS 0-0.5 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510179
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 12:55 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0009 SDG#: EUR21-15

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals		**SW-846 6020A**	mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	178	0.219	2.05	5
		SW-846 7471B	mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	84.1 JK	2.14	42.9	200
Wet Chemistry		**SM 2540 G-1997**	%	%	%	
00111	Moisture	n.a.	7.2	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 10:16	Choon Y Tian	5
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 11:52	Damary Valentin	200
10637	SW SW846 (IV)ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

MW 7-7-14

*=This limit was used in the evaluation of the final result

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Analysis Report

Sample Description: 10ZZ-0009 RD01SS 0-0.5 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510180
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 12:55 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0009 SDG#: EUR21-16

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	0.0088	0.0072	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	0.0021	0.000060	0.00020	1

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 23:48	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 12:38	Damary Valentin	1
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

MW 7-7-14

*=This limit was used in the evaluation of the final result

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Analysis Report

Sample Description: 10ZZ-0010 RD02SS 0-0.5 Grab Soil
TDD: 14-03-0011

LL Sample # SW 7510181
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 13:25 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

Z0010 SDG#: EUR21-17

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
Metals	**SW-846 6020A**		mg/kg	mg/kg	mg/kg	
06125	Arsenic	7440-38-2	196	0.224	2.10	5
	SW-846 7471B		mg/kg	mg/kg	mg/kg	
00159	Mercury	7439-97-6	87.4 JK	2.03	40.6	200
Wet Chemistry	**SM 2540 G-1997**		%	%	%	
00111	Moisture	n.a.	7.6	0.50	0.50	1

Moisture represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
06125	Arsenic	SW-846 6020A	1	141780637001A	06/30/2014 10:19	Choon Y Tian	5
00159	Mercury	SW-846 7471B	1	141780638001	07/01/2014 12:03	Damary Valentin	200
10637	SW SW846 (IV) ICP/ICPMS Digest	SW-846 3050B	1	141780637001	06/29/2014 11:03	James L Mertz	1
10638	SW SW846 (IV) Hg Digest	SW-846 7471B	1	141780638001	07/01/2014 07:55	Damary Valentin	1
00111	Moisture	SM 2540 G-1997	1	14177820003B	06/26/2014 19:11	Scott W Freisher	1

7-7-14

*=This limit was used in the evaluation of the final result

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Analysis Report

Sample Description: 10ZZ-0010 RD02SS 0-0.5 Grab Soil
SPLP NVE
TDD: 14-03-0011

LL Sample # TL 7510182
LL Group # 1484211
Account # 13589

Project Name: 14-03-0011

Collected: 06/20/2014 13:25 by BC

Submitted: 06/24/2014 09:15
Reported: 07/02/2014 14:21

Eurofins Air Toxics, Inc.
180 Blue Ravine Road
Suite B
Folsom CA 95630

-0010 SDG#: EUR21-18

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit*	As Received Limit of Quantitation	Dilution Factor
Metals		**SW-846 6010C**	mg/l	mg/l	mg/l	
07035	Arsenic	7440-38-2	N.D.	0.0072 U	0.0400	1
		SW-846 7470A	mg/l	mg/l	mg/l	
00259	Mercury	7439-97-6	0.0022	0.000060	0.00020	1

General Sample Comments

State of Washington Lab Certification No. C457

If the analysis is for determination of Hazardous Waste Characteristics, see Table 1 in EPA Code of Federal Regulations 40 CFR 261.24.

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07035	Arsenic	SW-846 6010C	1	141780636001	06/30/2014 23:52	John P Hook	1
00259	Mercury	SW-846 7470A	1	141785713003	06/30/2014 12:41	Damary Valentin	1
10636	WW/TL SW846 (IV) ICP Dig (tot)	SW-846 3010A	1	141780636001	06/30/2014 09:06	Micaela L Dishong	1
05713	WW SW846 Hg Digest	SW-846 7470A	1	141785713003	06/30/2014 07:45	Damary Valentin	1
01567	Synthetic Precipitation Leach	SW-846 1312	1	1417724861567B	06/26/2014 12:00	Christina A Huber	n.a.

MW 7-7-14

*=This limit was used in the evaluation of the final result

ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: August 21, 2014

TO: Steve Hall, START-4 Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, WA

SUBJ: **Asbestos Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 17 bulk samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Polarized light microscopy (PLM) asbestos analyses were performed by EMLab P&K, Inc., San Bruno, CA. All sample analyses were evaluated following EPA's Stage 2B Data Validation Manual Process (S2BVM).

The samples were numbered:

14080001	14080002	14080003	14080004	14080005
14080006	14080007	14080008	14080009	14080010
14080011	14080012	14080013	14080014	14080015
14080016	14080017			

Data Qualifications:

The samples were collected on August 9, 2014, and were analyzed by August 19, 2014. No discrepancies were noted in the laboratory case narrative.

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004) and the analytical method. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

EMLab P&K
1150 Bayhill Drive, Suite 100, San Bruno, CA 94066
(866) 888-6653 Fax (650) 829-5852 www.emlab.com

Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 58007494

Date of Sampling: 08-09-2014
Date of Receipt: 08-12-2014
Date of Report: 08-15-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Total Samples Submitted:	17
Total Samples Analysed:	17
Total Samples with Layer Asbestos Content > 1%:	4

Location: 14080001 (580-45018-1) Lab ID-Version‡: 5669780-1

Sample Layers	Asbestos Content
Gray Semi-Fibrous Material	15% Chrysotile
Sample Composite Homogeneity:	Good

Location: 14080002 (580-45018-2) Lab ID-Version‡: 5669781-1

Sample Layers	Asbestos Content
Light Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

Location: 14080003 (580-45018-3) Lab ID-Version‡: 5669782-1

Sample Layers	Asbestos Content
Gray Semi-Fibrous Material	15% Chrysotile
Sample Composite Homogeneity:	Good

Location: 14080004 (580-45018-4) Lab ID-Version‡: 5669783-1

Sample Layers	Asbestos Content
Transparent Non-Fibrous Material with Paint	ND
Sample Composite Homogeneity:	Good

Location: 14080005 (580-45018-5) Lab ID-Version‡: 5669784-1

Sample Layers	Asbestos Content
Green Sheet Flooring	ND
Sample Composite Homogeneity:	Good

MW 8-21-14

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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1150 Bayhill Drive, Suite 100, San Bruno, CA 94066
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Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 58007494

Date of Sampling: 08-09-2014
Date of Receipt: 08-12-2014
Date of Report: 08-15-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 14080006 (580-45018-6) Lab ID-Version‡: 5669785-1

Sample Layers	Asbestos Content
Brown Fibrous Material	ND
Composite Non-Asbestos Content:	80% Cellulose 15% Synthetic Fibers
Sample Composite Homogeneity:	Good

Location: 14080007 (580-45018-7) Lab ID-Version‡: 5669786-1

Sample Layers	Asbestos Content
Gray Semi-Fibrous Material	15% Chrysotile
Sample Composite Homogeneity:	Good

Location: 14080008 (580-45018-8) Lab ID-Version‡: 5669787-1

Sample Layers	Asbestos Content
Brown Fibrous Material	ND
Composite Non-Asbestos Content:	95% Cellulose
Sample Composite Homogeneity:	Good

Location: 14080009 (580-45018-9) Lab ID-Version‡: 5669788-1

Sample Layers	Asbestos Content
Beige Sheet Flooring with Backing	ND
Composite Non-Asbestos Content:	25% Cellulose 10% Glass Fibers
Sample Composite Homogeneity:	Good

MW 8-21-14

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K
1150 Bayhill Drive, Suite 100, San Bruno, CA 94066
(866) 888-6653 Fax (650) 829-5852 www.emlab.com

Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 58007494

Date of Sampling: 08-09-2014
Date of Receipt: 08-12-2014
Date of Report: 08-15-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 14080010 (580-45018-10) Lab ID-Version‡: 5669789-1

Sample Layers	Asbestos Content
White Wiring Insulation	ND
Composite Non-Asbestos Content:	30% Cellulose
Sample Composite Homogeneity:	Good

Location: 14080011 (580-45018-11) Lab ID-Version‡: 5669790-1

Sample Layers	Asbestos Content
White Compound	ND
Sample Composite Homogeneity:	Good

Location: 14080012 (580-45018-12) Lab ID-Version‡: 5669791-1

Sample Layers	Asbestos Content
White Compound	ND
Sample Composite Homogeneity:	Good

Location: 14080013 (580-45018-13) Lab ID-Version‡: 5669792-1

Sample Layers	Asbestos Content
Brown/Black Fibrous Material	ND
Composite Non-Asbestos Content:	95% Cellulose
Sample Composite Homogeneity:	Good

8-21-14

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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(866) 888-6653 Fax (650) 829-5852 www.emlab.com

Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 58007494

Date of Sampling: 08-09-2014
Date of Receipt: 08-12-2014
Date of Report: 08-15-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 14080014 (580-45018-14) Lab ID-Version‡: 5669793-1

Sample Layers	Asbestos Content
Beige Sheet Flooring with Backing	ND
Composite Non-Asbestos Content:	25% Cellulose 10% Glass Fibers
Sample Composite Homogeneity:	Good

Location: 14080015 (580-45018-15) Lab ID-Version‡: 5669794-1

Sample Layers	Asbestos Content
Silver Paint	ND
Sample Composite Homogeneity:	Good

Location: 14080016 (580-45018-16) Lab ID-Version‡: 5669795-1

Sample Layers	Asbestos Content
Beige Woven Material	ND
Composite Non-Asbestos Content:	95% Cellulose
Sample Composite Homogeneity:	Good

Location: 14080017 (580-45018-17) Lab ID-Version‡: 5669796-1

Sample Layers	Asbestos Content
Black Non-Fibrous Material with Paint	5% Chrysotile
Sample Composite Homogeneity:	Good

8-21-14

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: August 21, 2014

TO: Steve Hall, START-4 Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, WA MW

SUBJ: **Asbestos Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 19 bulk samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Polarized light microscopy (PLM) asbestos analyses were performed by EMLab P&K, Inc., San Bruno, CA. All sample analyses were evaluated following EPA's Stage 2B Data Validation Manual Process (S2BVM).

The samples were numbered:

14080020	14080021	14080022	14080023	14080024
14080025	14080026	14080027	14080028	14080029
14080030	14080031	14080032	14080033	14080034
14080035	14080036	14080037	14080038	

Data Qualifications:

The samples were collected on August 14, 2014, and were analyzed by August 19, 2014. No discrepancies were noted in the laboratory case narrative.

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004) and the analytical method. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

EMLab P&K
17461 Derian Ave, Suite 100, Irvine, CA 92614
(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 10NE-09

Date of Submittal: 08-14-2014
Date of Receipt: 08-15-2014
Date of Report: 08-19-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Total Samples Submitted:	19
Total Samples Analysed:	19
Total Samples with Layer Asbestos Content > 1%:	6

Location: 14080020, R1-01 Lab ID-Version‡: 5677196-1

Sample Layers	Asbestos Content
Gray Foam Tape	ND
Sample Composite Homogeneity:	Good

Location: 14080021, R1-02 Lab ID-Version‡: 5677197-1

Sample Layers	Asbestos Content
White Caulk	ND
Sample Composite Homogeneity:	Good

Location: 14080022, R1-03 Lab ID-Version‡: 5677198-1

Sample Layers	Asbestos Content
Silver Sealant	2% Chrysotile
Sample Composite Homogeneity:	Good

Location: 14080023, R1-04 Lab ID-Version‡: 5677199-1

Sample Layers	Asbestos Content
White Sheet Flooring with Fibrous Backing	ND
Yellow Mastic	ND
Composite Non-Asbestos Content:	30% Cellulose 5% Glass Fibers
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K
17461 Derian Ave, Suite 100, Irvine, CA 92614
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Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 10NE-09

Date of Submittal: 08-14-2014
Date of Receipt: 08-15-2014
Date of Report: 08-19-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 14080024, R1-05

Lab ID-Version‡: 5677200-1

Sample Layers	Asbestos Content
Cream Sheet Flooring with Fibrous Backing	ND
Brown Mastic	ND
Composite Non-Asbestos Content:	30% Cellulose 10% Synthetic Fibers
Sample Composite Homogeneity:	Good

Location: 14080025, R1-06

Lab ID-Version‡: 5677201-1

Sample Layers	Asbestos Content
White Sheet Flooring with Fibrous Backing	ND
Composite Non-Asbestos Content:	30% Cellulose 10% Synthetic Fibers
Sample Composite Homogeneity:	Good

Location: 14080026, R1-07

Lab ID-Version‡: 5677202-1

Sample Layers	Asbestos Content
White Fibrous Material	ND
White Leveling Compound	ND
Composite Non-Asbestos Content:	30% Cellulose
Sample Composite Homogeneity:	Good

Location: 14080027, R1-08

Lab ID-Version‡: 5677203-1

Sample Layers	Asbestos Content
White Caulk	ND
Sample Composite Homogeneity:	Good

8-21-14

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K
17461 Derian Ave, Suite 100, Irvine, CA 92614
(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 10NE-09

Date of Submittal: 08-14-2014
Date of Receipt: 08-15-2014
Date of Report: 08-19-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 14080028, R1-09 Lab ID-Version‡: 5677204-1

Sample Layers	Asbestos Content
Brown Ceiling Tile with Paint	ND
Composite Non-Asbestos Content:	90% Cellulose
Sample Composite Homogeneity:	Good

Location: 14080029, R1-10 Lab ID-Version‡: 5677205-1

Sample Layers	Asbestos Content
White Drywall	ND
Composite Non-Asbestos Content:	5% Cellulose
Sample Composite Homogeneity:	Good

Location: 14080030, R1-11 Lab ID-Version‡: 5677206-1

Sample Layers	Asbestos Content
White Sheet Flooring with Fibrous Backing	ND
Composite Non-Asbestos Content:	30% Cellulose 5% Synthetic Fibers
Sample Composite Homogeneity:	Good

Location: 14080031, R1-12 Lab ID-Version‡: 5677207-1

Sample Layers	Asbestos Content
Gray Foam Tape	ND
Sample Composite Homogeneity:	Good

8/20/14

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 10NE-09

Date of Submittal: 08-14-2014
Date of Receipt: 08-15-2014
Date of Report: 08-19-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 14080032, R1-13 Lab ID-Version‡: 5677208-1

Sample Layers	Asbestos Content
Black Tar (Top)	3% Chrysotile
Brown Paper	ND
Black Tar (Middle)	ND
Brown Paper	ND
Composite Non-Asbestos Content:	70% Cellulose 10% Glass Fibers
Sample Composite Homogeneity:	Good

Location: 14080033, R1-14 Lab ID-Version‡: 5677209-1

Sample Layers	Asbestos Content
Silver Coating	2% Chrysotile
Black Tar	9% Chrysotile
Composite Non-Asbestos Content:	20% Glass Fibers
Sample Composite Homogeneity:	Good

Location: 14080034, R1-15 Lab ID-Version‡: 5677210-1

Sample Layers	Asbestos Content
Black Roofing Mastic	8% Chrysotile
Sample Composite Homogeneity:	Good

Location: 14080035, R1-16 Lab ID-Version‡: 5677211-1

Sample Layers	Asbestos Content
Silver Coating	2% Chrysotile
Black Tar	9% Chrysotile
Composite Non-Asbestos Content:	20% Glass Fibers
Sample Composite Homogeneity:	Good

8-21-14

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K
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(800) 651-4802 Fax (623) 780-7695 www.emlab.com

Client: TestAmerica-Seattle
C/O: Ms. Kristine Allen
Re: 10NE-09

Date of Submittal: 08-14-2014
Date of Receipt: 08-15-2014
Date of Report: 08-19-2014

ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Location: 14080036, R1-17

Lab ID-Version‡: 5677212-1

Sample Layers	Asbestos Content
Brown/White Sheet Flooring with Fibrous Backing	ND
Tan Mastic	ND
Composite Non-Asbestos Content:	30% Cellulose 5% Synthetic Fibers
Sample Composite Homogeneity:	Good

Location: 14080037, R1-18

Lab ID-Version‡: 5677213-1

Sample Layers	Asbestos Content
Black Roofing Tar	8% Chrysotile
Black Roofing Shingle with White Stones	ND
Composite Non-Asbestos Content:	30% Glass Fibers
Sample Composite Homogeneity:	Good

Location: 14080038, R1-19

Lab ID-Version‡: 5677214-1

Sample Layers	Asbestos Content
Black Tar Felt	ND
Composite Non-Asbestos Content:	90% Cellulose
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: September 3, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 2 bulk samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Selected Toxicity Characteristic Leaching Procedure (TCLP) metals analyses (EPA Methods 1311, 6010C, and 7470A) were performed by ALS Kelso, Inc., Kelso, WA. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered: 14080039 14080040

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were maintained at < 6°C. The samples were collected on August 14, 2014, and were extracted and analyzed by August 20, 2014, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury).

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. The mercury correlation coefficient was > 0.995. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Acceptable.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks.

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning of each sequence. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. ICP Serial Dilution: Not Applicable.

No sample results were greater than 50 times the method detection limit, therefore serial dilution analyses were not applicable.

8. Matrix Spike Analysis: Acceptable.

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike recoveries were within the QC limits.

9. Duplicate Analysis: Acceptable.

A laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

10. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

11. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

TCLP Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Ecology And Environment, Incorpo	**Service Request:**	K1408655
Project No.:	NA	**Date Collected:**	08/14/14
Project Name:	1004530.0004.064.02	**Date Received:**	08/15/14
Matrix:	TCLP	**Units:**	mg/L
		Basis:	NA

Sample Name: 14080039 **Lab Code:** K1408655-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6010C	0.05	0.03	5.0	08/19/14	08/20/14	0.06		
Lead	6010C	0.05	0.02	5.0	08/19/14	08/20/14	0.02	U	
Mercury	7470A	0.0010	0.0001	1.0	08/19/14	08/20/14	0.0003	J	Q

Comments:

MW 9-3-14

TCLP Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Ecology And Environment, Incorpo	**Service Request:**	K1408655
Project No.:	NA	**Date Collected:**	08/14/14
Project Name:	1004530.0004.064.02	**Date Received:**	08/15/14
Matrix:	TCLP	**Units:**	mg/L
		Basis:	NA

Sample Name: .14080040 **Lab Code:** K1408655-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6010C	0.05	0.03	5.0	08/19/14	08/20/14	0.05	J	Q
Lead	6010C	0.05	0.02	5.0	08/19/14	08/20/14	0.02	U	
Mercury	7470A	0.0010	0.0001	1.0	08/19/14	08/20/14	0.0005	J	Q

Comments:

MW 9-3-14

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Global Environmental Specialists
720 Third Avenue, Suite 1700
Seattle, Washington 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: August 22, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 2 bulk samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Selected Toxicity Characteristic Leaching Procedure (TCLP) metals analyses (EPA Methods 1311, 6010C, and 7470A) were performed by ALS Kelso, Inc., Kelso, WA. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered: 14080018 14080019

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were maintained at < 6°C. The samples were collected on August 9, 2014, and were extracted and analyzed by August 15, 2014, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury).

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Acceptable.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks.

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning of each sequence. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. ICP Serial Dilution: Acceptable.

A serial dilution analysis was performed per matrix per concentration or per sample delivery group, whichever was more frequent. All serial dilution results were within QC limits.

8. Matrix Spike Analysis: Acceptable.

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike and spike duplicate recoveries were within the QC limits.

9. Duplicate Analysis: Acceptable.

A laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

10. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

11. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

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JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the Minimum Detection Limit (MDL) and the Method Reporting Limit (MRL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

TCLP Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Ecology And Environment, Incorpo	Service Request:	K1408477
Project No.:	NA	Date Collected:	08/09/14
Project Name:	10NE	Date Received:	08/12/14
Matrix:	TCLP	Units:	mg/L
		Basis:	NA

Sample Name: 14080018 Lab Code: K1408477-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6010C	0.05	0.03	5.0	08/15/14	08/15/14	0.18		
Lead	6010C	0.05	0.02	5.0	08/15/14	08/15/14	0.02	U	
Mercury	7470A	0.0010	0.0001	1.0	08/15/14	08/15/14	0.0007	J	Q

Comments:

MW 8-22-14

TCLP Metals

- 1 -

INORGANIC ANALYSIS DATA PACKAGE

Client:	Ecology And Environment, Incorpo	**Service Request:**	K1408477
Project No.:	NA	**Date Collected:**	08/09/14
Project Name:	10NE	**Date Received:**	08/12/14
Matrix:	TCLP	**Units:**	mg/L
		Basis:	NA

Sample Name: 14080019 **Lab Code:** K1408477-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6010C	0.05	0.03	5.0	08/15/14	08/15/14	0.16		
Lead	6010C	0.05	0.02	5.0	08/15/14	08/15/14	0.02	U	
Mercury	7470A	0.0010	0.0001	1.0	08/15/14	08/15/14	0.0007	J	Q

Comments:

MW 8-22-14

ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: August 21, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review,**
Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 7 air filter samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Arsenic and mercury analyses (NIOSH Methods 7303 and 6009, respectively) were performed by TestAmerica Phoenix, Inc., Arizona. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

14080101 14080102 14080103 14080104 14080105 14080106
14080107

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were collected on August 12, 2014, and were extracted and analyzed by August 15, 2014, therefore meeting QC criteria of less than 30 days between collection, extraction, and analysis.

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Acceptable.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks.

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning of each sequence. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. Duplicate Analysis: Satisfactory.

A laboratory spike duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All spike duplicate results were within QC limits.

8. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

9. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client Sample Results

Client: Ecology and Environment, Inc.
Project/Site: Metals in air

TestAmerica Job ID: 550-29704-1
SDG: 10NE-03

Client Sample ID: 14080101

Lab Sample ID: 550-29704-1

Date Collected: 08/09/14 00:00
Date Received: 08/13/14 09:30
Sample Air Volume: 94.96 L

Matrix: Air
Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<2.50	U	2.50	ug/Sample		08/14/14 11:47	08/15/14 10:44	1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.0263	U	0.0263	mg/m3		08/14/14 11:47	08/15/14 10:44	1

Client Sample ID: 14080102

Lab Sample ID: 550-29704-2

Date Collected: 08/09/14 00:00
Date Received: 08/13/14 09:30
Sample Air Volume: 8.04 L

Matrix: Air
Sample Container: IH - Anasorb C300, 200 mg

Method: 6009 - Mercury (CVAA)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0260	U	0.0260	ug/Sample		08/14/14 11:37	08/14/14 13:42	1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.00324	U	0.00324	mg/m3		08/14/14 11:37	08/14/14 13:42	1

Client Sample ID: 14080103

Lab Sample ID: 550-29704-3

Date Collected: 08/09/14 00:00
Date Received: 08/13/14 09:30
Sample Air Volume: 104.27 L

Matrix: Air
Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<2.50	U	2.50	ug/Sample		08/14/14 11:47	08/15/14 10:47	1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<0.0240	U	0.0240	mg/m3		08/14/14 11:47	08/15/14 10:47	1

Client Sample ID: 14080104

Lab Sample ID: 550-29704-4

Date Collected: 08/09/14 00:00
Date Received: 08/13/14 09:30
Sample Air Volume: 6.03 L

Matrix: Air
Sample Container: IH - Anasorb C300, 200 mg

Method: 6009 - Mercury (CVAA)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0260	U	0.0260	ug/Sample		08/14/14 11:37	08/14/14 13:47	1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.00432	U	0.00432	mg/m3		08/14/14 11:37	08/14/14 13:47	1

Client Sample ID: 14080105

Lab Sample ID: 550-29704-5

Date Collected: 08/11/14 00:00
Date Received: 08/13/14 09:30
Sample Air Volume: 0 L

Matrix: Air
Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<2.50	U	2.50	ug/Sample		08/14/14 11:47	08/15/14 10:50	1

MW 8-21-14

TestAmerica Phoenix

Client Sample Results

Client: Ecology and Environment, Inc.
Project/Site: Metals in air

TestAmerica Job ID: 550-29704-1
SDG: 10NE-03

Client Sample ID: 14080106
Lab Sample ID: 550-29704-6
Date Collected: 08/11/14 00:00
Matrix: Air
Date Received: 08/13/14 09:30
Sample Air Volume: 0 L
Sample Container: IH - Anasorb C300, 200 mg

Method: 6009 - Mercury (CVAA)

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0260	U	0.0260		ug/Sample		08/14/14 11:37	08/14/14 13:48	1

Client Sample ID: 14080107
Lab Sample ID: 550-29704-7
Date Collected: 08/11/14 00:00
Matrix: Air
Date Received: 08/13/14 09:30
Sample Air Volume: 0 L
Sample Container: IH - Anasorb C300, 200 mg

Method: 6009 - Mercury (CVAA)

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Mercury	<0.0260	U	0.0260		ug/Sample		08/14/14 11:37	08/14/14 13:50	1

8-21-14

TestAmerica Phoenix

ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: August 28, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington

SUBJ: **Inorganic Data Quality Assurance Review,**
Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 11 air filter samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Arsenic and mercury analyses (NIOSH Methods 6009 and 7303) were performed by TestAmerica Phoenix, Inc., Arizona. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

14080108	14080109	14080110	14080111	14080112	14080113
14080114	14080115	14080116	14080117	14080118	

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were collected on August 12, 2014, and were extracted and analyzed by August xx, 2014, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury).

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Acceptable.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks.

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning of each sequence. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. Blank Spike Analysis: Acceptable.

Blank spike/blank spike duplicate analyses were performed per SDG or per matrix per concentration level, whichever was more frequent. Spike and spike duplicate recoveries were within the QC limits.

8. Duplicate Analysis: Acceptable.

Spike duplicate analyses were performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

9. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client Sample Results

Client: Ecology and Environment, Inc.
Project/Site: Metals in air

TestAmerica Job ID: 550-29818-1
SDG: 10NE-05

Client Sample ID: EX-03

Lab Sample ID: 550-29818-1
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 117.35 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result ug/Sample	Result mg/m3	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Arsenic	2.50 U	0.0213 U			2.50	08/14/14 11:47	08/15/14 11:18	1

Client Sample ID: WK-03

Lab Sample ID: 550-29818-2
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 95.88 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result ug/Sample	Result mg/m3	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Arsenic	2.50 U	0.0261 U			2.50	08/14/14 11:47	08/15/14 11:21	1

Client Sample ID: EX-04

Lab Sample ID: 550-29818-3
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 9.88 L

Sample Container: IH - Coconut Shell Charcoal Tube, 150 mg

Method: 6009 - Mercury (CVAA)

Analyte	Result ug/Sample	Result mg/m3	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Mercury	0.0260 U	0.00264 U			0.0260	08/14/14 11:37	08/14/14 13:51	1

Client Sample ID: WK-04

Lab Sample ID: 550-29818-4
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 10.06 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 6009 - Mercury (CVAA)

Analyte	Result ug/Sample	Result mg/m3	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Mercury	0.0260 U	0.00259 U			0.0260	08/14/14 11:37	08/14/14 13:53	1

Client Sample ID: EX-05

Lab Sample ID: 550-29818-5
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 89.65 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result ug/Sample	Result mg/m3	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Arsenic	2.50 U	0.0279 U			2.50	08/14/14 11:47	08/15/14 11:24	1

MW 8-28-14

Client Sample Results

Client: Ecology and Environment, Inc.
Project/Site: Metals in air

TestAmerica Job ID: 550-29818-1
SDG: 10NE-05

Client Sample ID: WK-05

Lab Sample ID: 550-29818-6
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 93.49 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result ug/Sample	Result mg/m3	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Arsenic	<2.50 U	<0.0267 U			2.50	08/14/14 11:47	08/15/14 11:27	1

Client Sample ID: EX-06

Lab Sample ID: 550-29818-7
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 9.04 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 6009 - Mercury (CVAA)

Analyte	Result ug/Sample	Result mg/m3	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Mercury	0.838	0.0927			0.0260	08/14/14 11:37	08/14/14 13:54	1

Client Sample ID: WK-06

Lab Sample ID: 550-29818-8
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 9.19 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 6009 - Mercury (CVAA)

Analyte	Result ug/Sample	Result mg/m3	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Mercury	0.102	0.0111			0.0260	08/14/14 11:37	08/14/14 14:09	1

Client Sample ID: As-Bk-2

Lab Sample ID: 550-29818-9
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 0 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result ug/Sample	Result	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Arsenic	<2.50 U				2.50	08/15/14 05:42	08/15/14 11:40	1

Client Sample ID: Hg-Bk-3

Lab Sample ID: 550-29818-10
Matrix: Air

Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 0 L

Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 6009 - Mercury (CVAA)

Analyte	Result ug/Sample	Result	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Mercury	<0.0260 U				0.0260	08/18/14 11:27	08/18/14 13:25	1

MW 8-28-14

Client: Ecology and Environment, Inc.
Project/Site: Metals in air

TestAmerica Job ID: 550-29818-1
SDG: 10NE-05

Client Sample ID: Hg-Bk-4
Date Collected: 08/12/14 00:00
Date Received: 08/14/14 09:40
Sample Air Volume: 0 L

Lab Sample ID: 550-29818-11
Matrix: Air
Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 6009 - Mercury (CVAA)

Analyte	Result ug/Sample	Result	Result	Qualifier	RL ug/Sample	Prepared	Analyzed	Dil Fac
Mercury	<0.0260 U				0.0260	08/18/14 11:27	08/18/14 13:27	1

MW 8-28-14

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MEMORANDUM

DATE: August 31, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 4 air filter samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Arsenic and mercury analyses (NIOSH Methods 6009 and 7303) were performed by TestAmerica Phoenix, Inc., Arizona. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

14080119 14080120 14080121 14080122

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were collected on August 13, 2014, and were extracted and analyzed by August 18, 2014, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury).

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Acceptable.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks.

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning and end of each sequence or at least twice every 8 hours, whichever was more frequent. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. ICP Serial Dilution: Not Applicable.

A serial dilution analysis was not applicable as no sample results were more than 50 times the reporting limit.

8. Blank Spike Analysis: Acceptable.

A blank spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Blank spike and blank spike duplicate recoveries were within the QC limits.

9. Duplicate Analysis: Acceptable.

A laboratory spike duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All spike duplicate results were within QC limits.

10. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Client Sample ID: 14080119

Lab Sample ID: 550-29907-1

Date Collected: 08/13/14 00:00
Matrix: Air
Date Received: 08/15/14 10:00
Sample Air Volume: 269.8 L
Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.50	U	2.50	ug/Sample		08/15/14 11:41	08/15/14 19:02	1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00927	U	0.00927	mg/m3		08/15/14 11:41	08/15/14 19:02	1

Client Sample ID: 14080120

Lab Sample ID: 550-29907-2

Date Collected: 08/13/14 00:00
Matrix: Air
Date Received: 08/15/14 10:00
Sample Air Volume: 278.5 L
Sample Container: IH - MCE, 0.8 micron, 37-mm Filter

Method: 7303 - NIOSH Method 7303

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.50	U	2.50	ug/Sample		08/15/14 11:41	08/15/14 19:05	1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00898	U	0.00898	mg/m3		08/15/14 11:41	08/15/14 19:05	1

Client Sample ID: 14080121

Lab Sample ID: 550-29907-3

Date Collected: 08/13/14 00:00
Matrix: Air
Date Received: 08/15/14 10:00
Sample Air Volume: 27.05 L
Sample Container: IH - Anasorb C300, 200 mg

Method: 6009 - Mercury (CVAA)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.301		0.0260	ug/Sample		08/18/14 11:27	08/18/14 13:39	1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.0111		0.000963	mg/m3		08/18/14 11:27	08/18/14 13:39	1

Client Sample ID: 14080122

Lab Sample ID: 550-29907-4

Date Collected: 08/13/14 00:00
Matrix: Air
Date Received: 08/15/14 10:00
Sample Air Volume: 1.64 L
Sample Container: IH - Anasorb C300, 200 mg

Method: 6009 - Mercury (CVAA)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.0260	U	0.0260	ug/Sample		08/18/14 11:28	08/18/14 13:41	1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.0159	U	0.0159	mg/m3		08/18/14 11:28	08/18/14 13:41	1

8-31-14

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Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: September 13, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington

SUBJ: **Inorganic Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 3 air filter samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Mercury analyses (OSHA Method ID-145) were performed by Analytics Corporation, Ashland, Virginia. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

14080102 14080104 14080106

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were collected on August 9, 2014, and were extracted and analyzed by August 14, 2014, therefore meeting QC criteria of less than 30 days between collection, extraction, and analysis.

2. Initial and Continuing Calibration: Acceptable.

The initial calibration correlation coefficient was > 0.995. No results were greater than 110% of the highest calibration standard. All results were within QC limits.

3. Blanks: Acceptable.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. There were no detections in any blanks.

4. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

5. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

6. Duplicate Analysis: Acceptable.

A laboratory spike duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

7. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

8. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

ANALYTICS

Analytics Corporation
10329 Stony Run Lane
Ashland, Va 23005
Phone: (804) 365-3000 Fax: (804) 365-3002
AIHA Accreditation # 176, ID 100531

Final Report

Work Order S225013

TESTAMERICA INC
SUITE 189
4625 E COTTON CENTER BLVD
PHOENIX, AZ 85040

Customer: 02809015
Attention: CARLENE MCCUTCHEON
PO Number 55003485

Date Received: 08/13/14
Client Project ID 1004530.0004.064.02

Lab ID: S225013001 Sample ID: 550-29598-1 14080102 EX-2 Media: 0.8 micron MCE filter Sample Date: 8/9/2014 Sampling Time:

Analyte	Method	Analysis Date	Volume		Reporting Limit	Front	Rear	Total	Concentration
Mercury	OSHA ID 145	08/14/14	8.04	L	0.05 ug			< 0.05 ug U	< 0.0062 mg/M3 U

Lab ID: S225013002 Sample ID: 550-29598-2 14080104 WK-2 Media: 0.8 micron MCE filter Sample Date: 8/9/2014 Sampling Time:

Analyte	Method	Analysis Date	Volume		Reporting Limit	Front	Rear	Total	Concentration
Mercury	OSHA ID 145	08/14/14	6.03	L	0.05 ug			< 0.05 ug U	< 0.0083 mg/M3 U

Lab ID: S225013003 Sample ID: 550-29598-3 14080106 HG-BK-1 Media: 0.8 micron MCE filter Sample Date: 8/9/2014 Sampling Time:

Analyte	Method	Analysis Date	Volume		Reporting Limit	Front	Rear	Total	Concentration
Mercury	OSHA ID 145	08/14/14	0	L	0.05 ug			< 0.05 ug U	--

MW 8/8/14

6/23/2015

ecology and environment, inc.
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MEMORANDUM

DATE: September 13, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington

SUBJ: **Inorganic Data Quality Assurance Review,**
Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 5 air filter samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Mercury analyses (OSHA Method ID-145) were performed by Analytics Corporation, Ashland, Virginia. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M). The samples were numbered: 14080110 14080111 14080114 14080115 14080117

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were collected on August 12, 2014, and were extracted and analyzed by August 15, 2014, therefore meeting QC criteria of less than 30 days between collection, extraction, and analysis.

2. Initial and Continuing Calibration: Acceptable.

The initial calibration correlation coefficient was > 0.995. No results were greater than 110% of the highest calibration standard. All results were within QC limits.

3. Blanks: Acceptable.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. There were no detections in any blanks.

4. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

5. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

6. Duplicate Analysis: Acceptable.

A laboratory spike duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

7. Laboratory Control Sample Analysis: Satisfactory.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS and LCS duplicate results were below QC limits; associated sample quantitation limits were qualified as estimated quantities with a low bias (UJL).

8. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

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Group No. S226-003
Account No. 02809015
Report Date: 08/15/14

CARLENE MCCUTCHEON
TESTAMERICA INC
SUITE 189
4625 E COTTON CENTER BLVD
PHOENIX, AZ 85040

**** FINAL REPORT ****

Date Received: 08/14/14
Sample Type: 5 - Air Sample(s)
Project: EPA R10 LAB(MEL) PO Number: 10NE-06

Analytical Results

Lab	Parameter	Volume	Amount	LOQ	Concentration	Analysis
-001	14080110 Samp Date: 08/12/14		EX-04	0.8 micron MCE filter		
-	Part. Hg/Cmpds.	9.88 L	< 0.05 ug	.05 ug	< 0.0051 mg/M3	08/15/14
-002	14080111 Samp Date: 08/12/14		WK-04	0.8 micron MCE filter		
-	Part. Hg/Cmpds.	10.06 L	< 0.05 ug	.05 ug	< 0.005 mg/M3	08/15/14
-003	14080114 Samp Date: 08/12/14		EX-06	0.8 micron MCE filter		
-	Part. Hg/Cmpds.	9.04 L	< 0.05 ug	.05 ug	< 0.0055 mg/M3	08/15/14
-004	14080115 Samp Date: 08/12/14		WK-06	0.8 micron MCE filter		
-	Part. Hg/Cmpds.	9.19 L	< 0.05 ug	.05 ug	< 0.0054 mg/M3	08/15/14
-005	14080117 Samp Date: 08/12/14		HG-BK-3	0.8 micron MCE filter		
-	Part. Hg/Cmpds.	0 L	< 0.05 ug	.05 ug	--	08/15/14

Laboratory Control Sample Recoveries of 68% & 67% for mercury anasorb were outside acceptance limits of 80-120%.

Abbreviations: ug = micrograms, mg = milligrams, mg/M3 = milligrams per cubic meter of air, g = grams, ug/M3 = micrograms per cubic meter of air, L = liters, all Volumes given in liters, ppm = parts per million, ppb = parts per billion, Areas given in square feet; ND = Not Detected; ug/wp = ug/wipe; NVG = No Volume Given. NAG = No Area Given, NTG = No Time Given, LOQ = Limit of Quantitation.

8-14

ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: September 13, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington

SUBJ: **Inorganic Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 2 air filter samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Mercury analyses (OSHA Method ID-145) were performed by Analytics Corporation, Ashland, Virginia. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered: 14080121 14080122

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were collected on August 13, 2014, and were extracted and analyzed by August 15, 2014, therefore meeting QC criteria of less than 30 days between collection, extraction, and analysis.

2. Initial and Continuing Calibration: Acceptable.

The initial calibration correlation coefficient was > 0.995. No results were greater than 110% of the highest calibration standard. All results were within QC limits.

3. Blanks: Acceptable.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. There were no detections in any blanks.

4. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

5. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

6. Duplicate Analysis: Acceptable.

A laboratory spike duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

7. Laboratory Control Sample Analysis: Satisfactory.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS and LCS duplicate results were below QC limits; associated sample quantitation limits were qualified as estimated quantities with a low bias (UJL).

8. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

ANALYTICS CORPORATION
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Group No. S227-005
Account No. 02809015
Report Date: 08/15/14

CARLENE MCCUTCHEON
TESTAMERICA INC
SUITE 189
4625 E COTTON CENTER BLVD
PHOENIX, AZ 85040

**** FINAL REPORT ****

Date Received: 08/15/14
Sample Type: 2 - Air Sample(s)
Project: 1004530.0004.064.02 PO Number: N/A

Analytical Results

Lab	Parameter	Volume	Amount	LOQ	Concentration	Analysis
-001	14080121 Samp Date: 08/13/14			0.8 micron MCE filter		
-	Part. Hg/Cmpds.	27.05 L	< 0.05 ug	.05 ug	< 0.0018 mg/M3	08/15/14
-002	14080122 Samp Date: 08/13/14			0.8 micron MCE filter		
-	Part. Hg/Cmpds.	1.64 L	< 0.05 ug	.05 ug	< 0.0305 mg/M3	08/15/14

Laboratory Control Sample Recoveries of 68% & 67% for mercury anasorb were outside acceptance limits of 80-120%.

Abbreviations: ug = micrograms, mg = milligrams, mg/M3 = milligrams per cubic meter of air, g = grams, ug/M3 = micrograms per cubic meter of air, L = liters, all Volumes given in liters, ppm = parts per million, ppb = parts per billion, Areas given in square feet; ND = Not Detected; ug/wp = ug/wipe; NVG = No Volume Given. NAG = No Area Given, NTG = No Time Given, LOQ = Limit of Quantitation.

8-14

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Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
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MEMORANDUM

DATE: September 8, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 3 soil samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Selected metals analyses (EPA Methods 6020A and 7471B) were performed by ALS Kelso, Inc., Kelso, WA. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered: 14080201 14080202 14080203

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were maintained at < 6°C. The samples were collected on August 16, 2014, and were extracted and analyzed by August 29, 2014, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury).

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. The mercury correlation coefficient was > 0.995. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Satisfactory.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks except arsenic (0.08 ug/L) in CCB4; no actions were taken based on this result as all sample concentrations were more than five times the blank concentration.

4. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

5. **Performance Evaluation Sample Analysis: Not Provided.**

Performance evaluation samples were not provided to the laboratory.

6. **ICP Serial Dilution: Acceptable.**

Serial dilution results were within QC limits.

7. **Matrix Spike Analysis: Acceptable.**

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike recoveries were within the QC limits.

8. **Duplicate Analysis: Acceptable.**

A laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

9. **Laboratory Control Sample Analysis: Acceptable.**

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

10. **Overall Assessment of Data for Use**

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

ALS Group USA, Corp.
dba ALS Environmental

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Service Request: K1409123
Project No.: EE-004534-0064-01TT0
Date Collected: 08/16/14
Project Name: START IV BOA 2014
Date Received: 08/27/14
Matrix: SOIL
Units: mg/Kg
Basis: DRY

Sample Name: 14080201
Lab Code: K1409123-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.55	0.04	5.0	08/28/14	08/29/14	44.6		
Mercury	7471B	10.9	1.09	500.0	08/28/14	08/28/14	350		

% Solids: 84.2

Comments:

MW 9-8-14

ALS Group USA, Corp.
dba ALS Environmental

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Project No.: EE-004534-0064-01TT0
Project Name: START IV BOA 2014
Matrix: SOIL

Service Request: K1409123
Date Collected: 08/16/14
Date Received: 08/27/14
Units: mg/Kg
Basis: DRY

Sample Name: 14080202
Lab Code: K1409123-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.54	0.04	5.0	08/28/14	08/29/14	35.4		
Mercury	7471B	3.95	0.395	200.0	08/28/14	08/28/14	23.7		

% Solids: 82.8

Comments:

MW 9-8-14

ALS Group USA, Corp.
dba ALS Environmental

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client:	Ecology And Environment, Incorpo	**Service Request:**	K1409123
Project No.:	EE-004534-0064-01TT0	**Date Collected:**	08/16/14
Project Name:	START IV BOA 2014	**Date Received:**	08/27/14
Matrix:	SOIL	**Units:**	mg/Kg
		Basis:	DRY

Sample Name: 14080203 **Lab Code:** K1409123-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.54	0.04	5.0	08/28/14	08/29/14	814		
Mercury	7471B	424	42.4	20000.0	08/28/14	08/28/14	5510		

% Solids: 88.7

Comments:

MW 9-8-14

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Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
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MEMORANDUM

DATE: September 2, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review, Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon**

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 4 soil samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Selected metals analyses (EPA Methods 6020 and 7471B) were performed by ALS Kelso, Inc., Kelso, WA. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered: 14080204 14080205 14080206 14080207

Data Qualifications:

1. Sample Holding Times: Acceptable.

The samples were maintained at < 6°C. The samples were collected on August 26, 2014, and were extracted and analyzed by August 28, 2014, therefore meeting QC criteria of less than 6 months between collection and analysis (28 days for mercury).

2. Initial and Continuing Calibration: Acceptable.

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. Blanks: Satisfactory.

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks except thallium (0.009 ug/L in CCB3 and 0.014 ug/L in CCB5); associated sample results less than five times the blank results were qualified as not detected (U).

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning of each sequence. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. ICP Serial Dilution: Acceptable.

A serial dilution analysis was performed per matrix per concentration or per sample delivery group, whichever was more frequent. All serial dilution results were within QC limits.

8. Matrix Spike Analysis: Acceptable.

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Spike recoveries were within the QC limits.

9. Duplicate Analysis: Acceptable.

A laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

10. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

11. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the Minimum Detection Limit (MDL) and the Method Reporting Limit (MRL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Service Request: K1409122
Project No.: NA
Date Collected: 08/26/14
Project Name: START IV BOA 2014
Date Received: 08/27/14
Matrix: SOIL
Units: mg/Kg
Basis: DRY

Sample Name: 14080204
Lab Code: K1409122-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.48	0.04	5.0	08/27/14	08/28/14	5.08		
Beryllium	6020A	0.019	0.005	5.0	08/27/14	08/28/14	0.416		
Cadmium	6020A	0.019	0.007	5.0	08/27/14	08/28/14	0.078		
Chromium	6020A	0.19	0.06	5.0	08/27/14	08/28/14	46.8		
Cobalt	6020A	0.019	0.006	5.0	08/27/14	08/28/14	13.8		
Copper	6020A	0.10	0.04	5.0	08/27/14	08/28/14	23.9		
Lead	6020A	0.095	0.019	5.0	08/27/14	08/28/14	3.97		
Manganese	6020A	0.10	0.02	5.0	08/27/14	08/28/14	503		
Mercury	7471B	0.021	0.002	1.0	08/28/14	08/28/14	0.033		
Nickel	6020A	0.19	0.03	5.0	08/27/14	08/28/14	61.9		
Selenium	6020A	0.96	0.07	5.0	08/27/14	08/28/14	0.12	J	Q
Thallium	6020A	0.019	0.002	5.0	08/27/14	08/28/14	0.056		
Vanadium	6020A	0.19	0.02	5.0	08/27/14	08/28/14	64.5		

% Solids: 91.1

Comments:

9-2-14

Metals
- I -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Project No.: NA
Project Name: START IV BOA 2014
Matrix: SOIL

Service Request: K1409122
Date Collected: 08/26/14
Date Received: 08/27/14
Units: mg/Kg
Basis: DRY

Sample Name: 14080205
Lab Code: K1409122-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.48	0.04	5.0	08/27/14	08/28/14	3.66		
Beryllium	6020A	0.019	0.005	5.0	08/27/14	08/28/14	0.243		
Cadmium	6020A	0.019	0.007	5.0	08/27/14	08/28/14	0.064		
Chromium	6020A	0.19	0.06	5.0	08/27/14	08/28/14	38.0		
Cobalt	6020A	0.019	0.006	5.0	08/27/14	08/28/14	10.9		
Copper	6020A	0.10	0.04	5.0	08/27/14	08/28/14	15.1		
Lead	6020A	0.097	0.019	5.0	08/27/14	08/28/14	2.44		
Manganese	6020A	0.10	0.02	5.0	08/27/14	08/28/14	421		
Mercury	7471B	0.021	0.002	1.0	08/28/14	08/28/14	0.023		
Nickel	6020A	0.19	0.03	5.0	08/27/14	08/28/14	57.5		
Selenium	6020A	0.97	0.07	5.0	08/27/14	08/28/14	0.09	J	Q
Thallium	6020A	0.019	0.002	5.0	08/27/14	08/28/14	0.036		
Vanadium	6020A	0.19	0.02	5.0	08/27/14	08/28/14	41.8		

% Solids: 92.5

Comments:

MW 9-2-14

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Service Request: K1409122
Project No.: NA
Date Collected: 08/26/14
Project Name: START IV BOA 2014
Date Received: 08/27/14
Matrix: SOIL
Units: mg/Kg
Basis: DRY

Sample Name: 14080206
Lab Code: K1409122-004

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.49	0.04	5.0	08/27/14	08/28/14	0.59		
Beryllium	6020A	0.019	0.005	5.0	08/27/14	08/28/14	0.345		
Cadmium	6020A	0.019	0.007	5.0	08/27/14	08/28/14	0.088		
Chromium	6020A	0.20	0.06	5.0	08/27/14	08/28/14	6.83		
Cobalt	6020A	0.019	0.006	5.0	08/27/14	08/28/14	25.7		
Copper	6020A	0.10	0.04	5.0	08/27/14	08/28/14	155		
Lead	6020A	0.097	0.019	5.0	08/27/14	08/28/14	0.526		
Manganese	6020A	0.10	0.02	5.0	08/27/14	08/28/14	493		
Mercury	7471B	0.018	0.002	1.0	08/28/14	08/28/14	0.002	J	Q
Nickel	6020A	0.20	0.03	5.0	08/27/14	08/28/14	44.9		
Selenium	6020A	0.97	0.07	5.0	08/27/14	08/28/14	0.44	J	Q
Thallium	6020A	0.019	0.002	5.0	08/27/14	08/28/14	0.013	~~J~~	~~Q~~ U
Vanadium	6020A	0.20	0.02	5.0	08/27/14	08/28/14	141		

% Solids: 92.6

Comments:

MW 9-2-14

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Service Request: K1409122
Project No.: NA
Date Collected: 08/26/14
Project Name: START IV BOA 2014
Date Received: 08/27/14
Matrix: SOIL
Units: mg/Kg
Basis: DRY

Sample Name: 14080207
Lab Code: K1409122-005

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.49	0.04	5.0	08/27/14	08/28/14	0.93		
Beryllium	6020A	0.020	0.005	5.0	08/27/14	08/28/14	0.433		
Cadmium	6020A	0.020	0.007	5.0	08/27/14	08/28/14	0.116		
Chromium	6020A	0.20	0.06	5.0	08/27/14	08/28/14	19.6		
Cobalt	6020A	0.020	0.006	5.0	08/27/14	08/28/14	35.6		
Copper	6020A	0.10	0.04	5.0	08/27/14	08/28/14	155		
Lead	6020A	0.098	0.020	5.0	08/27/14	08/28/14	1.19		
Manganese	6020A	0.10	0.02	5.0	08/27/14	08/28/14	831		
Mercury	7471B	0.021	0.002	1.0	08/28/14	08/28/14	0.003	J	Q
Nickel	6020A	0.20	0.03	5.0	08/27/14	08/28/14	51.5		
Selenium	6020A	0.98	0.07	5.0	08/27/14	08/28/14	0.77	J	Q
Thallium	6020A	0.020	0.002	5.0	08/27/14	08/28/14	0.019	~~J~~	~~Q~~ U
Vanadium	6020A	0.20	0.02	5.0	08/27/14	08/28/14	181		

% Solids: 93.6

Comments:

9-2-14

ecology and environment, inc.
Global Environmental Specialists
720 Third Avenue, Suite 1700, Seattle, WA 98104
Tel: (206) 624-9537, Fax: (206) 621-9832

MEMORANDUM

DATE: September 24, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Inorganic Data Quality Assurance Review,**
Bonanza Mine 2014 Removal Action Site, Sutherlin, Oregon

REF: TDD: 14-06-0006 PAN: 1004530.0004.064.02

The data quality assurance review of 4 soil samples collected from the Bonanza Mine 2014 Removal Action site in Sutherlin, Oregon, has been completed. Selected Target Analyte List (TAL) metals analyses (EPA Methods 6020A and 7471B) were performed by ALS Kelso, Inc., Kelso, WA. All sample analyses were evaluated following EPA's Stage 2 and/or 4 Data Validation Electronic and/or Manual Process (S2B/4VE/M).

The samples were numbered:

14090208 14090209 14090210 14090211

Data Qualifications:

1. **Sample Holding Times: Acceptable.**

The samples were maintained at < 6°C. The samples were collected on September 10 and 11, 2014, and were analyzed by September 19, 2014, therefore meeting QC criteria of less than 6 months between collection, extraction, and analysis (28 days for mercury).

2. **Initial and Continuing Calibration: Acceptable.**

A minimum of one calibration standard and a blank were analyzed at the beginning of the ICP analysis sequence and after every 10 samples. No results were greater than 110% of the highest calibration standard. All ICP recoveries were within the QC limits. All AA recoveries were within QC limits.

3. **Blanks: Satisfactory.**

A preparation blank was analyzed for each 20 samples or per matrix per concentration level. Blanks were analyzed after each Initial or Continuing Calibration Verification. There were no detections in any blanks except mercury (-0.021 ug/L) in continuing calibration blank #3. No actions were required as all sample results were more than five times the absolute value of the blank results.

4. ICP Interference Check Sample: Acceptable.

An Interference Check Sample (ICS) was analyzed at the beginning of each sequence. All ICS (solution AB) results were within QC limits of 80% - 120% recovery.

5. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

6. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

7. ICP Serial Dilution: Acceptable.

A serial dilution analysis was performed per matrix per concentration or per sample delivery group, whichever was more frequent. All serial dilution results were within QC limits.

8. Matrix Spike Analysis: Acceptable.

A matrix spike analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. Applicable spike recoveries were within the QC limits.

9. Duplicate Analysis: Acceptable.

A laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

10. Laboratory Control Sample Analysis: Acceptable.

A Laboratory Control Sample (LCS) was analyzed per SDG per matrix. All LCS results were within the established control limits.

11. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical methods, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Service Request: K1409792
Project No.: 1004530.0004.064.02
Date Collected: 09/10/14
Project Name: START IV BOA 2014
Date Received: 09/12/14
Matrix: SOIL
Units: mg/Kg
Basis: DRY

Sample Name: 14080208
Lab Code: K1409792-001

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.43	0.04	5.0	09/12/14	09/16/14	63.4		
Mercury	7471B	10.1	1.01	500.0	09/18/14	09/19/14	266		

% Solids: 95.9

Comments:

MW
9-24-14

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Service Request: K1409792
Project No.: 1004530.0004.064.02
Date Collected: 09/10/14
Project Name: START IV BOA 2014
Date Received: 09/12/14
Matrix: SOIL
Units: mg/Kg
Basis: DRY

Sample Name: 14080209
Lab Code: K1409792-002

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.39	0.03	5.0	09/12/14	09/16/14	118		
Mercury	7471B	9.72	0.972	500.0	09/18/14	09/19/14	349		

% Solids: 91.7

Comments:

MW 9-24-14

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Service Request: K1409792
Project No.: 1004530.0004.064.02
Date Collected: 09/10/14
Project Name: START IV BOA 2014
Date Received: 09/12/14
Matrix: SOIL
Units: mg/Kg
Basis: DRY

Sample Name: 14080210
Lab Code: K1409792-003

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.38	0.03	5.0	09/12/14	09/16/14	137		
Mercury	7471B	4.22	0.422	200.0	09/18/14	09/19/14	87.3		

% Solids: 93.7

Comments:

MW 9-24-14

Metals
- 1 -
INORGANIC ANALYSIS DATA PACKAGE

Client: Ecology And Environment, Incorpo
Service Request: K1409792
Project No.: 1004530.0004.064.02
Date Collected: 09/10/14
Project Name: START IV BOA 2014
Date Received: 09/12/14
Matrix: SOIL
Units: mg/Kg
Basis: DRY

Sample Name: 14080211
Lab Code: K1409792-004

Analyte	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020A	0.37	0.03	5.0	09/12/14	09/16/14	52.2		
Mercury	7471B	3.93	0.393	200.0	09/18/14	09/19/14	73.8		

% Solids: 93.1

Comments:

9-24-14

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D MM&R Plan

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MAINTENANCE, MONITORING, AND REPAIR PLAN
BONANZA MINE SITE, NONPAREIL, OREGON

December 2014

Maintenance, Monitoring, and Repair Plan
Bonanza Mine Site, Nonpariel, Oregon

Attachments

1.0 INTRODUCTION

The Bonanza Mine Site (Site) is located near the small community of Nonpareil, 6 miles east of Sutherlin, Douglas, County, Oregon (Figure 1 and Figure 2). The Site is located in the SW ¼ of Section 16 of Township 25 South, Range 4 West, Willamette Meridian (latitude N43° 23'46", longitude W123°10'54"). The Site is owned by Donald C. Smith (Owner).

This Monitoring, Maintenance, and Repair (MM&R) Plan specifies the requirements for MM&R activities for the United States Environmental Protection Agency (EPA) removal action at the Site, which was conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), 42 U.S.C. §9601 et seq.

This MM&R Plan describes the activities that are required to ensure the effectiveness and integrity of the removal action so that such action remains protective of human health and the environment.

2.0 BACKGROUND

The Bonanza Mine is an abandoned mercury mine and mill that operated intermittently from the mid-1860s through 1960. The main mercury-containing mineral is cinnabar. Total recorded mercury production was 39,540 flasks (or 3,005,040 pounds).

The primary contaminants of concern are mercury and arsenic. Historic mercury mining, processing, and disposal operations caused the concentration of these metals, which contaminated the soil.

EPA performed a removal action at the Site from August to December 2014. The removal action addressed the areas shown on Figure 3, and generally included: excavating and consolidating approximately 40,000 cubic yards (yd^3) of mine-waste contaminated materials at an on-Site repository; grading and shaping the calcine (also referred to as tailings) and waste rock piles to form the footprint of the repository; and gravel backfilling of certain areas where mine-waste contaminated materials remain on-Site. The repository was covered with an impermeable geomembrane liner and cover soil.

Mine-waste contaminated materials may also remain in other areas of the Site where EPA did not perform cleanup activities (i.e., on steep and/or heavily vegetated slopes).

3.0 MONITORING ACTIVITIES

Monitoring activities are needed to periodically assess the condition and functionality of the protective barriers and drainage and erosion control features installed during the removal action. Inspections are categorized as Semi-Annual, Annual, Storm Event, and Reported

Incidents. Monitoring will generally include inspections, documentation, and reporting. Inspections shall be conducted by the Owner. Inspections will identify any situations warranting maintenance or repairs. Inspection activities and locations are discussed below. A Field Inspection Log is included as an attachment to this MM&R Plan.

3.1 Semi-Annual Inspections (May and September 2015)

The purpose of the semi-annual events is to assess actual and/or potential deficiencies associated with components of the removal action. Semi-annual events will include an inspection of removal action features and monitoring activities.

Semi-annual inspections shall be performed only in May and September commencing in 2015 and continue for one year. Upon completion of the semi-annual inspection period, inspections shall be conducted on an annual basis and shall continue as long as contaminants remain on-Site or until the Oregon Department of Environmental Quality (ODEQ) determines the inspections are no longer required. Annual inspections are discussed in Section 3.2 below.

3.1.1 Inspection Activities

Activities associated with inspections should include an evaluation of removal action features, including drainage and erosion control, gravel backfill, on-Site repository, and vegetation. The features to be inspected are shown on Figure 4.

3.1.1.1 Drainage and Erosion Control Features

Inspect drainage and erosion control features, including slope and channel protection and storm drainage shown on Figure 4. Inspections should document the condition of existing drainage and erosion control features, identify the need for repairs, and drainage and erosion patterns that could negatively affect the integrity of the on-Site repository and other Site features. Inspect drainage ditches for proper operation and potential changes in condition, such as the presence of debris, sediment, sloughing, scouring, or other similar types of disturbance that is obstructing diversions and/or drainage.

3.1.1.2 Gravel Backfill

Inspect the gravel backfill placed at certain areas identified on Figure 4 to ensure that the backfill material is covering the underlying soil. Any activity that damages or disturbs the integrity of the gravel backfill or otherwise results in the release or exposure to the environment of any mine-waste contaminated materials beneath the backfill material is prohibited and should be documented. Some examples of activities that are prohibited include drilling, digging, excavating, and piercing the surface with a rod, spike or similar item. Inspections will document the presence of any activity potentially damaging the backfill material. Inspections will note indications of ruts, erosion or similar types of

disturbance that indicate diminished backfill thickness and areas that may need repair.

3.1.1.3 On-Site Repository

Inspect the on-Site repository (see Figure 4). Any activity that damages or disturbs the integrity of the protective barrier or otherwise exposes underlying contaminated materials is prohibited and should be documented. Any motor-powered vehicle is prohibited from using the surface of the repository. Examples of other activities that are prohibited include drilling, digging, excavating, and piercing the surface with a rod, spike or similar item. Inspections will document the presence of any activity potentially damaging the protective barrier as well as erosion features such as rills or ruts that could compromise the integrity of the barrier. Inspections also will document the presence of plant species on the surface of the repository with root systems that could potentially penetrate the impermeable membrane liner.

3.1.1.4 Vegetation

Calcine and waste rock likely remain in certain areas of the Site where cleanup actions were not performed such as steep hillsides and/or heavily vegetated slopes. In these areas, vegetation should be left undisturbed to discourage use where calcine, a scarlet-red, pinkish-red, and/or brownish-red angular material, is present.

Additionally, vegetation was added to areas of the Site as part of the protective barriers installed during the removal action (see Figure 4), and these areas of vegetation should also not be disturbed.

3.1.1.5 Signs

Signs will be inspected to ensure that they are functioning as designed and constructed. Inspections will note whether the signs are visible, have become damaged or are no longer legible, are properly fastened to posts or vegetation, and identify the need for repair or replacement. Signs will warn against the on-Site hazards and will include an ODEQ telephone contact number. The locations of the signs are indicated on Figure 4 and the sign contents are shown in Figure 5.

3.1.2 Documentation and Reporting

The results of the inspections should be documented on the attached field inspection log, and in a brief MM&R report to be submitted to ODEQ each year no later than April 30th for annual inspections after the first year of semi-annual inspections. Reports to ODEQ shall be made as described in Section 6.

3.2 Annual Inspections

The purpose of the annual events is to assess the long-term integrity and durability of the removal action, and will include an inspection of removal action features only. The annual inspection will include the activities outlined in Sections 3.1.1.1 through 3.1.1.5 above.

3.3 Storm Event and Reported Incident Inspections

Storm event and/or reported incident inspections will be reported to ODEQ within five working days of a major storm event or reported incident. For the first two years, a major storm event is defined as 3 or more inches of precipitation within a 24-hour period as measured by the National Weather Service at Roseburg, Oregon. Thereafter, ODEQ will determine the reporting frequency based on the establishment of vegetation on the repository and other site conditions.

For the purposes of this plan, a reported incident is defined as any public or private notification reporting site activities and/or damage that could compromise the overall cleanup action.

3.3.1 Storm Event Inspections

The purpose of storm event inspections is to assess removal action features for damage potentially caused by flooding and/or erosion following a storm event. Storm event inspections will include the activities outlined in Sections 3.1.1.1 through 3.1.1.5, and may be reported via telephone (541-687-7424) or email to ODEQ as noted in Section 6.3.

If repairs to removal action features are required because of damage caused by the storm event, those repairs will be performed in accordance with Section 4 prior to the next semi-annual or annual inspection and the status of repairs will be documented in the following semi-annual and/or annual report.

3.3.2 Reported Incident Inspections

The purpose of reported incident inspections is to assess removal action features for damage potentially caused by the reported activity. Reported incident inspections will include the activities outlined in Sections 3.1.1.1 through 3.1.1.5, and will be reported in the following semi-annual or annual report.

If repairs to removal action features are required because of damage caused by the reported incident, those repairs will be performed in accordance with Section 4 prior to the next semi-annual or annual inspection and the status of repairs will be documented in the following semi-annual and/or annual report.

4.0 MAINTENANCE AND REPAIR

Maintenance and repair activities will be conducted to maintain the integrity of removal action features. Conditions requiring repairs likely will be identified during Site inspections as described in Section 3.0. Repairs will be implemented to restore removal action features to functioning conditions within 60 working days of initial identification, if feasible. Repairs required to address a breach in the on-Site repository cap, capped waste rock areas (i.e., areas with gravel backfill on Figure 4), or physical or safety hazards will be expedited and/or temporary measures will be implemented in consultation with ODEQ until a more permanent remedy can be designed and constructed. Best management practices (BMPs), outlined in Section 5.0, will be used during implementing maintenance and repair activities.

4.1 Drainage and Erosion Control Features

Drainage and erosion control features associated with the on-Site repository will be maintained or repaired when inspections indicate the presence of debris, sediment, sloughing, scouring, or other similar types of disturbance indicate they are not functioning as constructed. Debris and sediment that is obstructing diversions and/or drainage ditches will be removed to restore drainage.

4.2 Gravel Backfill

Gravel backfill areas will be repaired when erosion or similar types of disturbance penetrate greater than 50 percent of the thickness of the backfill at any given location. The eroded area will be backfilled to match adjacent undisturbed areas. Backfill material will meet the original design specifications. If the erosion/disturbance has penetrated the full thickness of the gravel backfill areas, then sampling and analysis may be required by ODEQ to document that contaminated material is removed during repairs and that adjacent portions of the backfill have not been contaminated by the eroded material. Excavated waste rock material will be backfilled in the eroded area and the exposed area will be covered with material meeting the original thickness.

4.3 On-Site Repository

The protective cap over the on-Site repository will be repaired when erosion or similar types of disturbance have exposed the impermeable membrane liner. The eroded area will be backfilled to match adjacent undisturbed areas for the barrier and in consultation with ODEQ. Backfill material will consist of material similar to that used to construct the repository cap.

If the erosion/disturbance has compromised the impermeable membrane liner, then sampling and analysis will be performed downgradient of the eroded area to document that contaminated material is removed during repairs and that adjacent portions or downgradient areas have not been contaminated by the eroded calcine and/or waste rock

material. Excavated material will be backfilled in the on-Site repository or transported off-Site for disposal. The exposed area of the repository will be covered with capping material meeting the original design specifications and design thickness.

Temporary repairs might be required if the on-Site repository cap is breached and it is not practical, because of inclement weather or other conditions, to perform permanent repairs within the 60 day timeframe. Under these circumstances, temporary repairs will be developed on a case-specific basis in consultation with ODEQ. The objectives of the temporary repairs will include: preventing cross-contamination of surrounding areas and covering exposed tailings until permanent repairs can be made. BMPs (see Section 5.0) will be used while implementing and maintaining temporary repairs. Temporary repairs will be maintained until the permanent repairs can be completed.

4.4 Vegetation

To the extent practicable, Site vegetation should be left undisturbed and allowed to grow under normal conditions to deter use in those areas where mine-waste contaminated materials remain. The only exception is the repository cover where trees or other vegetation with roots that may damage the liner should not be allowed to mature.

4.5 Signs

Signs will be repaired when the intended function is impaired or potentially compromised (e.g., damaged, weathered, or missing). When the required inspections indicate that maintenance or repair is necessary, the impaired signage will be replaced or repaired.

5.0 BEST MANAGEMENT PRACTICES

BMPs will be used while conducting inspections, monitoring, and maintenance and repair activities. These activities will be conducted in a manner that minimizes disturbance to the Site. When construction activities are required to conduct repairs at the Site, the limits of the work area will be delineated prior to initiating construction. Where appropriate, temporary erosion control measures (e.g., silt fencing, straw bales) will be installed to protect vegetation and Foster Creek and Calapooya Creek from sediment runoff.

If excavation of contaminated material is necessary to conduct repairs, appropriate measures will be taken to segregate contaminated material from non-contaminated material on the Site. Excavated material will be placed on a temporary liner or in bins and tarped to minimize erosion by wind, precipitation, and/or surface water. Silt-fence and/or straw bales might also be used as appropriate. Contaminated materials will either be reconsolidated beneath the cap or with prior approval of ODEQ may be hauled off-Site to an appropriate facility for disposal. Appropriate procedures will be used to decontaminate tools, equipment, and vehicles that contact contaminated materials. Any non-hazardous debris or

waste generated as part of the maintenance and repair activities will be transported off-Site for disposal at an appropriate facility.

5.1 Exposure Reduction Measures

As previously noted, the Site was once a mercury mine and mill and an indeterminate amount of mine-waste contaminated material remain at certain areas beyond the cleanup boundaries. These materials are likely calcine, the by-product of the mercury recovery process, which is easily recognizable because of their scarlet-red, pinkish-red or brownish-red color.

People should not enter areas where calcine is observed or suspected; however, if someone were to enter such an area, certain exposure reduction measures (ERMs) are recommended. ERMs are simple, day-to-day things that individuals can do to limit or reduce exposure to soil contaminants. Examples include washing hands frequently, removing shoes before entering homes, wet mopping to clean surfaces indoors, and frequently bathing pets and washing toddler toys.

6.0 RECORDKEEPING AND REPORTING

6.1 Record Keeping

The Owner will provide ODEQ with copies of all project-related documents, including: inspection, MM&R, and monitoring records; summaries of inspection, MM&R, and monitoring activities; and all other pertinent records.

6.2 Reporting

A written report shall be submitted by the Owner to ODEQ within 60 days following each inspection, MM&R, and/or monitoring activities. The report shall include: results of inspection and MM&R activities; areas of potential concerns/issues; and plans for repair and/or replacement of problems.

A Field Inspection Log is included as an attachment to this MM&R Plan.

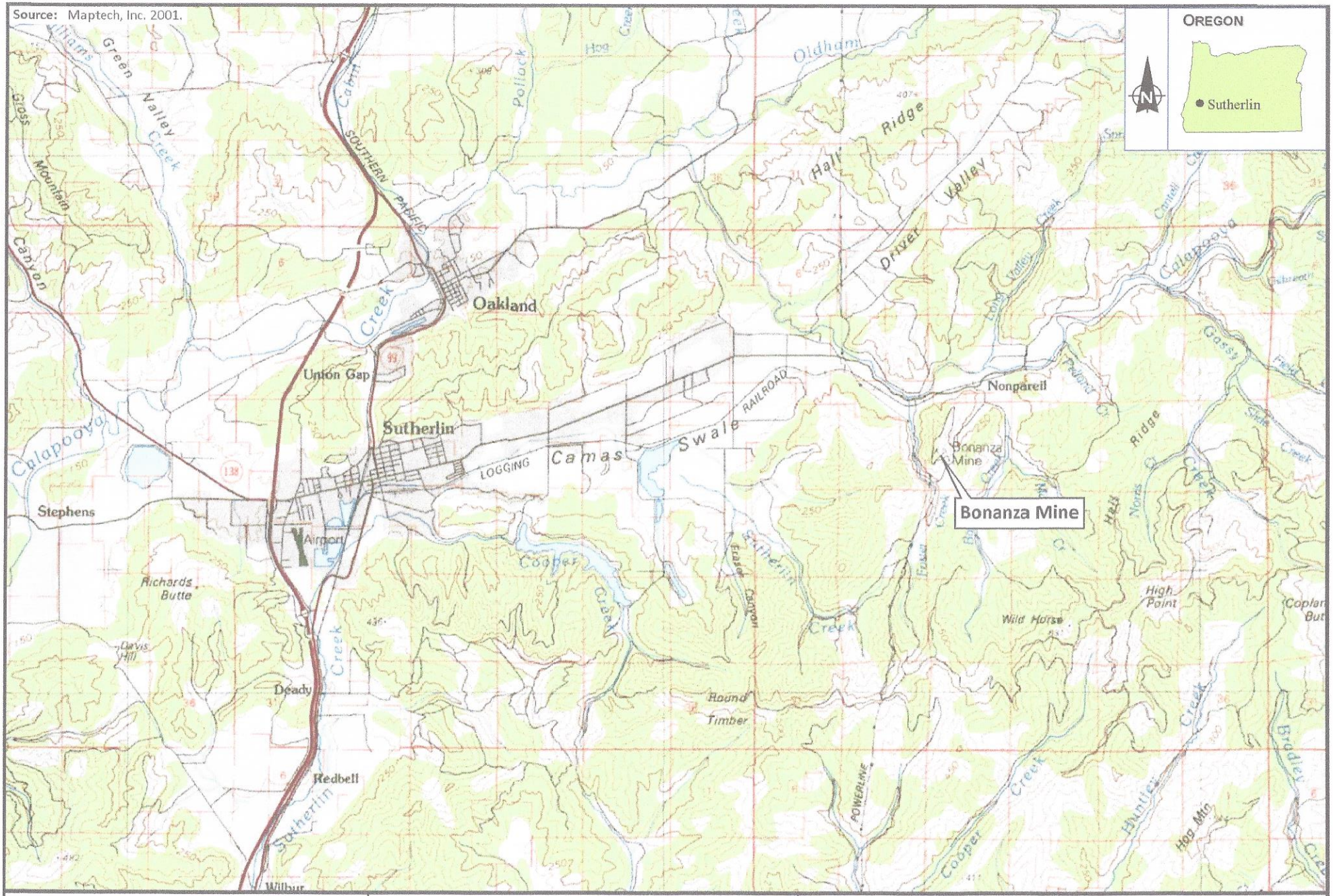
6.3 Notices and Submissions

All notices, reports or submissions required to be submitted to ODEQ under this MM&R Plan shall be sent to the person and address specified below, unless otherwise provided for by ODEQ in a written notice to the owners of the Site.

Attn: Bryn Thoms
Western Region Cleanup Program
Oregon Department of Environmental Quality
165 East 7th, Suite 100
Eugene, OR 97401

7.0 AMENDMENT

The requirements set forth in this MM&R Plan may only be amended or modified in a writing signed by the ODEQ and the Owner of the Site.



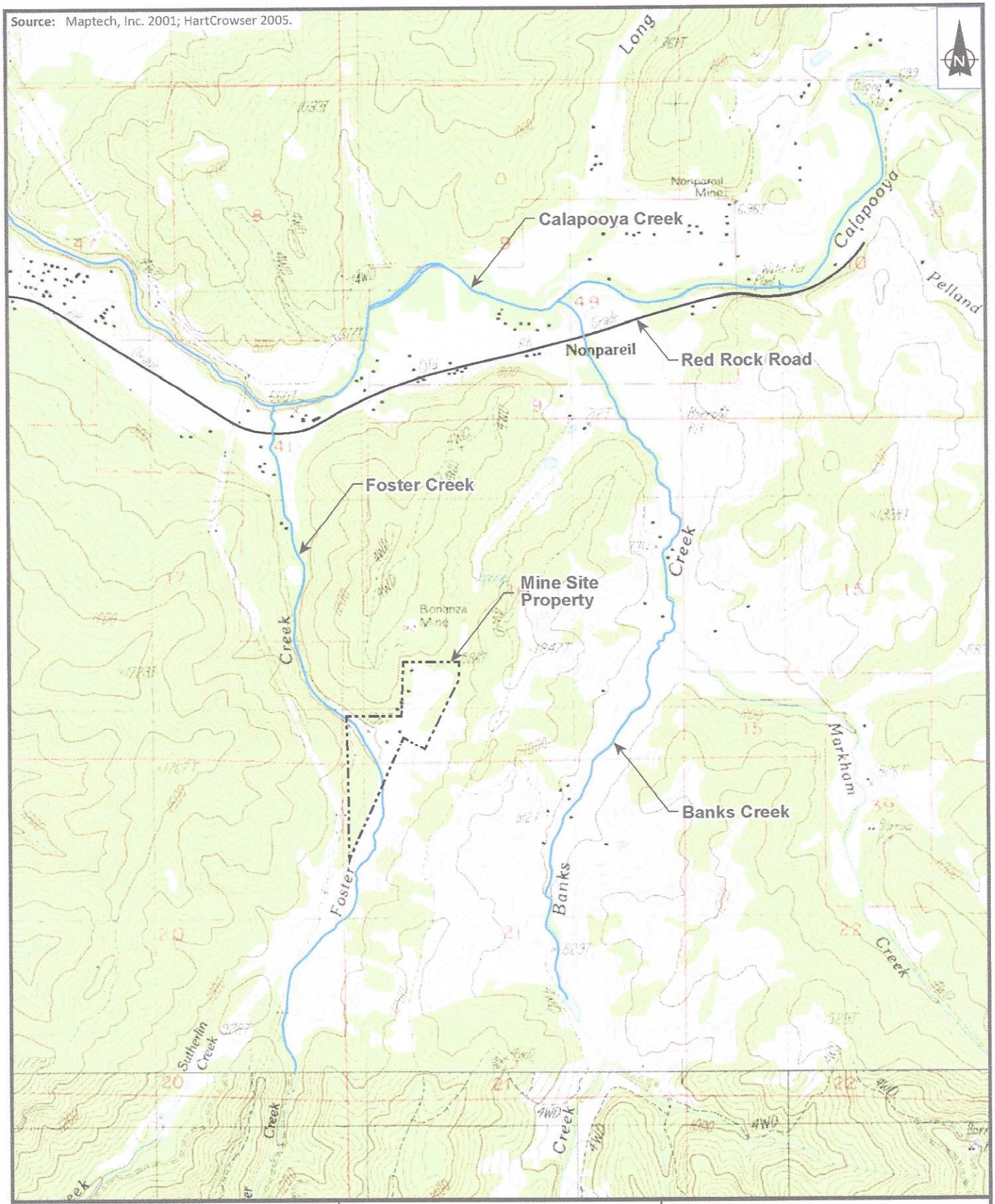
ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

0 .75 1.5
Approximate Scale in Miles

Figure 1
SITE LOCATION MAP

Date:	Drawn by:	
5/14/14	AES	10:START-IV\14030011\fig 1



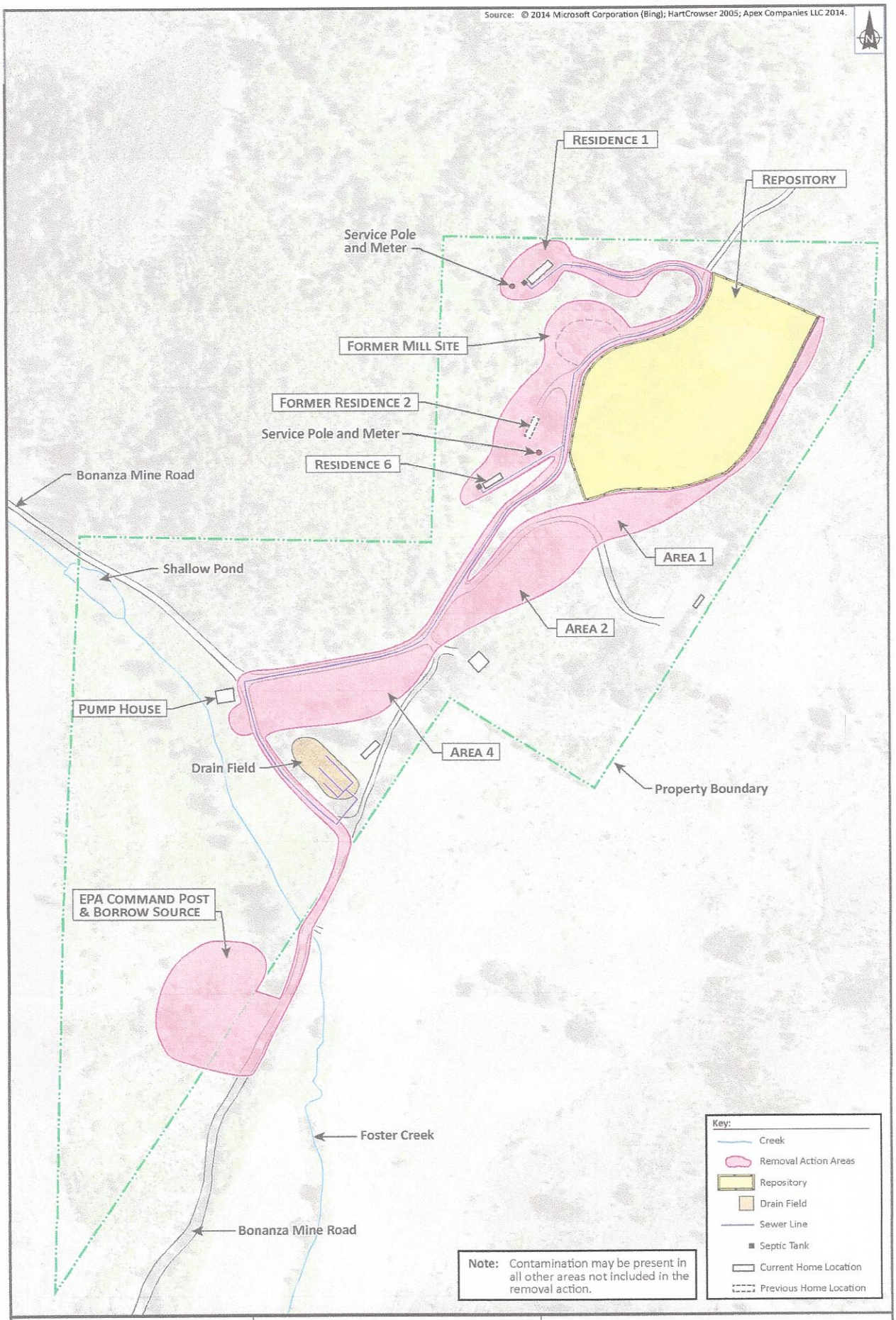
ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

BONANZA MINE SITE
Sutherlin, Oregon

0 1000 2000
Approximate Scale in Feet

Figure 2
SITE VICINITY MAP

Date:	Drawn by:	
5/14/14	AES	10:START-IV\14030011\fig 2



ecology and environment, inc. Global Environmental Specialists Seattle, Washington	BONANZA MINE SITE Sutherlin, Oregon	Figure 3 REMOVAL ACTION AREAS		
	Not to Scale	Date: 11/17/14	Drawn by: AES	10:START-IV\14030011\fig 3

ecology and environment, inc.
Global Environmental Specialists
Seattle, Washington

Not to Scale

BONANZA MINE SITE
Sutherlin, Oregon

Figure 4
LOCATION OF FEATURES TO BE INSPECTED

Date:	Drawn by:	
10/19/14	AES	10:START-IV\14030011\fig 4

FIGURE 5 – WARNING SIGNS

For the repository:

For other areas:

Bonanza Mine Site - Field Inspection Log

Inspected By: _____ Date Inspected: _____

Site Structure	Inspected (Yes/No)	Inspection Observations	Maintenance and Repair Work Performed
1. Drainage and Erosion Control Features			
▪ Evidence of debris, sediment, sloughing, scouring in drainage ditches			
▪ Debris accumulation at culverts			
Comments:			
2. Gravel Backfill			
▪ Evidence of ruts or similar disturbance			
Comments:			
3. Repository			
▪ Evidence of erosion of the cap			
▪ Presence of deep-rooting vegetation			
Comments:			
4. Vegetation			
▪ Evidence of foot trails, play sites, or similar disturbance			
Comments:			
5. **Signs**			
▪ Evidence of damaged, weathered, or missing signs			
Comments:			

E Pollution Reports

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U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Bonanza Mine and Mill - Removal Polrep
Initial Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region X

Subject:	**POLREP #1** **Initial** **Bonanza Mine and Mill** **Sutherlin, OR** **Latitude: 43.3899870 Longitude: -123.1845630**
To:	Rick Albright, EPA Region 10 (POLREP List) Anthony Barber, EPA Region 10 (POLREP List) Lori Cohen, EPA Region 10 (POLREP List) Chris Field, EPA Region 10 (POLREP List) John Irrizary, HQ OEM (POLREP LIST) Wally Moon, EPA Region 10 (POLREP List) Calvin Terada, EPA Region 10 (POLREP List)
From:	Earl Liverman, On-Scene Coordinator
Date:	8/7/2014
Reporting Period:	08/04/2014 - 08/09/2014

1. Introduction

1.1 Background

Site Number:	10NE	**Contract Number:**	START 14-06-0006
D.O. Number:	ERRS 0013/030309.0013	**Action Memo Date:**	6/4/2014
Response Authority:	CERCLA	**Response Type:**	Time-Critical
Response Lead:	EPA	**Incident Category:**	Removal Action
NPL Status:	Non NPL	**Operable Unit:**	
Mobilization Date:	8/4/2014	**Start Date:**	8/4/2014
Demob Date:	11/1/2014	**Completion Date:**	11/1/2014
CERCLIS ID:	ORN001001174	**RCRIS ID:**	
ERNS No.:		**State Notification:**	6/4/14
FPN#:		**Reimbursable Account #:**	

1.1.1 Incident Category

Abandoned historical mercury mine and mill.

1.1.2 Site Description

1.1.2.1 Location

The Bonanza Mine and Mill Site is located near the small community of Nonpareil, 6 miles east of Sutherlin, Douglas County, Oregon. The Site is located in the SW ¼ of Section 16 of Township 25 South, Range 4 West, Willamette Meridian (latitude N43° 23'46", longitude W123°10'54").

Except for one former building used as a residence, other mine and mill buildings are no longer present, leaving only the mill concrete foundations, calcine, and waste rock. The mine had 12 adits and more than three miles of subterranean tunnels and shafts. The mine adits have been abandoned and it is likely that they are open.
Five residences are located close to the mine, including two residences within 200 feet of the former mill. Besides roads and driveways leading to the residences, the land is undeveloped. The nearest off-Site residences are located about a half mile away, to the northeast, along Banks Creek Road.
The Bonanza Mine has an operation history extending from the mid-1860s through 1960. The main mercury-containing mineral is cinnabar, although metacinnabar and native mercury were also reported in the mine workings. Total recorded mercury production was 39,540 flasks (or 3,005,040 pounds).

1.1.2.2 Description of Threat

The data from numerous environmental investigations shows that environmental media are contaminated by elevated concentrations of mercury, arsenic, and other metals, and the source of metals is from historical mercury mining, processing, and disposal operations. Elevated metals concentrations are present in calcine, waste rock, and soil at the former mill site, the surrounding hillside, and valley floor.

1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results

Data regarding the nature and extent of the contaminants of concern found at the Site are summarized below.

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In September 2000, Hart Crowser, Inc. (HC) performed a Removal Assessment (RA) at the former mill site for ODEQ to gather additional data to delineate the extent of metals contamination at the Site. As part of this RA, 31 surface and near-surface soil samples were collected from the former mill site and surrounding hillside. Mercury concentrations ranged from 67.7 to 12,000 mg/kg, arsenic concentrations ranged from 20.3 to 314 mg/kg, and lead concentrations were generally below 70 mg/kg. Calcine, waste rock, and roadway soils also had elevated mercury and arsenic concentrations ranging up to 179 mg/kg and 246 mg/kg, respectively.

One sample each of the former mill soil and calcine were analyzed for mercury speciation. Methyl mercury was detected at 0.03765 mg/kg in soil and 0.00246 mg/kg in calcine. Sequential extraction on

soil and calcine indicated that most of the mercury was sulfide-bound, primarily in the form of cinnabar or metacinnabar. Volatile mercury was detected at 2,100 and 2,360 microgram per cubic meter ($\mu g/m^3$).

Water samples were collected from the on-Site well and water storage tank. Arsenic was detected at 0.0536 milligram per liter (mg/L) in a sample collected from the on-Site well and this concentration exceeds the Federal Maximum Contaminant Level (MCL) of 0.005 mg/L for drinking water. Reportedly, well water is used only for agricultural purposes and not for drinking water. Based on the findings of the removal assessment, the first of two removal actions described in Section 2.1.2 (Response Actions to Date) was performed by ODEQ in 2000 in certain areas to achieve prompt human health risk reduction. Water samples have been collected from the spring water storage tank and have consistently had no detections of mercury and arsenic using standard drinking water analytical methods.

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HC returned to the Site on behalf of ODEQ in 2003 to assess whether ecological receptors and/or exposure pathways were present or potentially present at or in the Bonanza Mine Site and along Foster Creek. Impacts to the Site and surrounding properties attributable to contaminated environmental media were not observed during the Site visit. Physical impacts from historical mining operations included the waste rock pile, mine access roads, and mine excavation. Based on the results of the Oregon Natural Heritage Information Center data search and information from the Oregon Department of Fish and Wildlife, HC concluded that there is a possibility that rare, threatened, and endangered species may be present at or near the Site.

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HC compiled and assessed available information for the Bonanza Mine in 2005 to assist in preparation of a forthcoming Remedial Investigation (RI) Work Plan. This report also developed a preliminary conceptual site model (CSM) for both human and ecological receptors at the Site and identified tasks to be performed during the RI to address data gaps. Volatile mercury was measured in soil from the former mill and calcine. No other environmental media samples were collected as part of this activity. The RI Work Plan has not yet been prepared.

2013 – Soil Assessment

In December 2013, ODEQ screened 118 soil samples using a field portable X-Ray fluorescence spectrometer (FPXRF) to gather additional data to identify those areas where soil concentrations are below a site-specific background concentration for arsenic and a residential risk-based concentration for mercury. Nine discrete soil samples were also collected and sent off-Site for laboratory analysis. The results of this assessment indicated that arsenic and mercury contamination is more widespread in the northern portion of the property than previously anticipated. The results also showed that arsenic and mercury contamination extends into the southern portion of the Site near two existing residences.

2. Current Activities

2.1 Operations Section

2.1.1 Narrative

2.1.2 Response Actions to Date

2.1.2.a The following removal actions have been undertaken by the Oregon Department of Environmental Quality (ODEQ) in the past:

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Based on the findings of the 2000 HC RA, HC performed a removal action at the former mill site for ODEQ from 14 through 29 September 2000. The objective of this action was to provide prompt risk reduction by excavating soil exceeding 230 mg/kg mercury in the mill area, and for arsenic and lead the cleanup goals were 50 mg/kg and 400 mg/kg, respectively. Eight yd^3 of soil were excavated from the mill furnace area, and this material was transported off-Site for disposal as hazardous waste. Approximately 240 yd^3 of mercury-contaminated soil was excavated from the mill area and placed in a lined and covered temporary storage cell near the base of the waste rock pile. This material was removed from the Site in April 2004 and transported off-Site for disposal. Larger debris such as concrete, firebrick, and

a metal furnace were placed in a subsurface vault located at the former mill site. Disturbed areas were restored, as closely as possible, to the original site conditions.

Confirmation soil samples were collected after the removal action. A few samples exceeded the mercury cleanup goal (up to 6,400 mg/kg); however, these sample areas are beneath two to six feet of clean material. Characterization samples collected from the surrounding hillside, calcine, waste rock pile, roads, driveways, and cell base had mercury concentrations ranging from 1.53 to 220 mg/kg. Four samples with greater than 230 mg/kg mercury were from the mine adit (306 mg/kg), the temporary repository (500 mg/kg), an area south of the former mill (930 mg/kg), and a small area where free mercury was observed (5,100 mg/kg).

2014 – Removal Action

NRC Environmental, with technical support and documentation from APEX, performed a second removal action at the Site for ODEQ in February 2014. The objective of this action was to achieve prompt human health risk reduction by removing and capping soil in certain inhabited areas of the Site that were impacted by elevated concentrations of mercury and arsenic. At the time this removal action was performed, the contaminants of concern were mercury and arsenic, and the cleanup goals were 23 mg/kg and 17 mg/kg, respectively.

Prior to implementation of the removal action, FPXRF screening was performed at 118 points scattered across the Site. Arsenic ranged from non-detect to 471 parts per million (ppm), and mercury concentrations ranged from non-detect to 1,200 ppm. Using this information, six areas were identified that had arsenic or mercury concentrations above the cleanup goals. During conduct of the removal action (12 through 21 February 2014) and follow-up site visit (12 March 2014), 39 additional data points were collected from across the Site with the purpose of better understanding the metals distribution across the Site. Arsenic concentrations in these points ranged from non-detect to 81 ppm, and mercury concentrations ranged from non-detect to 459 ppm. The results indicated that the mine-waste contamination from the mill site area is more widespread than previously anticipated, including contamination encountered near two existing home sites.

The largest areas of contaminated soil encompass about 16 acres, including the original mill site and calcine pile. ODEQ determined that these areas could not be excavated at this time due to resource constraints. Temporary fencing and gates were installed to restrict access to certain areas and the existing blackberry vegetation restricting access to Area 4 was left undisturbed. Approximately 60 yd^3 of contaminated soil and firebrick were excavated from the smaller areas, and this material was placed in a temporary cell near the base of the waste rock pile where it remains. Disturbed areas were restored, as closely as possible, to the original site conditions.

2.1.2.b. The following removal actions have been undertaken by EPA as part of this ongoing removal action:

Personnel and equipment were mobilized to the Site beginning August 4th. During the first week, initial activities focused on establishing the Site infrastructure, including clearing and constructing equipment storage and laydown areas, installing BMPs, setting up the project command post, and coordinating with on-Site residents. In addition, project staff coordinated with the community, including nearby neighbors, the Douglas County Sheriff, the Douglas Forest Protective Association, Douglas County Planning Department, Douglas County Library, Pacific Power and Light, and other local agencies and persons. Field personnel also began clearing (felling, trimming, and cutting trees) and grubbing (removal of tree stumps, roots, and bushes) to remove trees and vegetation from the calcine and waste rock piles where the repository will be constructed. Individual and perimeter air monitoring, soil screening and sampling, and BMP monitoring and inspection occur each day.

Heavy storms threatened work early the second week, but progress resumed. The footprint for the repository was verified. Field personnel started grading the waste rock pile to lower the elevation and to reduce the footprint of the pile, and to begin to cover the calcine pile with waste rock. Completed demolition of the concrete remnants of the former mill and excavation of approximately 3,296 yd^3 of mine-waste material from the mill area and consolidated these materials in the repository. Encountered significant volumes of material which by appearance looked to be free or elemental mercury on the ground surface and on woody debris in the mill area, which is not surprising since the mine and mill operated from the mid-1860s to the 1960s and produced more than 3,000,000 pounds of mercury. The

mercury was removed using a mercury recovery vacuum and hand tools. Due to the location of the mercury in combination with the method of recovery, the mercury could not be separated from the surrounding media in all instances during cleaup and was removed as a commingled waste along with soil and other debris such as wood and roots. Two 55-gallon drums of commingled waste has been recovered from the former mill area. This waste material will be transported off-Site for retorting (i.e., distillation of the waste material to recover the mercury for reuse). Started clearing and grubbing to remove trees and vegetation from Area 2 and started the excavation and removal of mine-waste contaminated material from this area. Completed coordination with affected homeowners for the removal and temporary storage of personal items removed from the trailers to be replaced, sampled the trailers to ensure proper waste characterization, and started the process for replacement of the trailers.

2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)

EPA has initiated a PRP search for this Site, and EPA will continue to collect and analyze additional information about mining companies involved with operations at the Site and/or owners of the Site.

2.1.4 Progress Metrics (as of 08/16/14)

Waste Stream	***Medium***	***Quantity***	***Manifest #***	***Treatment***	***Disposal***
Commingled Hg waste	Soil and other debris	2 55-gal drums		Retort	

As mentioned in 2.1.2.b, approximately 3,296 yd^3 of mine-waste material, which included micro de minimus quantities of mercury was excavated from the mill area and consolidated at the repository. The excavation extended to a maximum depth of about 14 feet below ground surface in certain areas due to the presence of recoverable mercury (i.e., about the size of a BB and larger). The overall area was over-excavated because it was the location of the former mill, the presence of recoverable free mercury, and the exceptionally high LUMEX mercury monitor readings.

2.2 Planning Section

2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities

The overall scope of the removal action, as described below, is intended to mitigate the potential human health and ecological threats posed by exposure to mercury and arsenic, including direct contact, ingestion, and inhalation pathways.

Adits

Two adits are located on the Site. The adits will be closed to prevent human entry. In consultation with federal and state agencies, if it is determined that the adits merits habitat preservation, the closure will be designed to both prevent human entry into the adits and to suit the specific needs of resident wildlife species.

Excavations

Mine-waste contaminated materials exceeding cleanup levels for mercury (i.e., 23 mg/kg) and arsenic (i.e., 17 mg/kg) will be excavated from certain areas and to a depth of 24 inches below ground surface. The limits and depths of the excavation areas will be determined in the field using field screening methods such as a field portable mercury screening instrument, FPXRF, and visual recognition. The excavated materials will be hauled to the vicinity of the waste rock pile using existing on-Site roadways. Disturbed areas will be restored, as closely as possible, to original conditions.

Areas to be excavated include: Area 2 where an estimated ± 2,400 yd^3 of mine-waste contaminated material will be excavated, including the roadway and sediment from the intermittent unnamed tributary; Area 4 where an estimated ± 3,200 yd^3 of mine-waste contaminated material will be excavated, including the roadway and sediment from the intermittent unnamed tributary; Home Sites1 and 2 where an estimated ± 2,750 yd^3 of mine-waste contaminated material will be excavated, including the road way and driveways; and the mill site where an estimated ± 2,000 yd^3 of mine-waste contaminated material will be excavated, including the mill concrete foundations.

Replacement of Property

The trailers used as residences at Home Sites 1 and 2 will be replaced because they cannot be saved and restored. The aged trailers have fallen in disrepair since the families were relocated in late 2013. The trailers are located on pads constructed of calcine.

The trailers must be relocated to enable excavation of the calcine pads. Because of the structural condition of the trailers, they cannot be moved and saved without incurring further damage and then restored to their original condition upon completion of the action. Additionally, contaminated items made of soft, permeable materials such as mattresses and sofas that cannot be decontaminated in an efficient and cost-effective manner may also be targeted for disposal and replaced with property of similar value.

Temporary Relocation

Five families live on-Site. ODEQ has provided for the temporary relocation of two of these families and is expected to continue to do so pending completion of the removal action described herein. The proposed removal action may also require the relocation of one or more of the remaining three families temporarily to ensure their health and safety or to allow EPA to conduct cleanup activities.

Repository

Excavated mine-waste materials, along with other ancillary debris such as the concrete mill foundations, will be consolidated at Area 1, against the calcine and waste rock piles and hillside in the north end of the valley floor. Other materials such the trailers and abandoned household furnishings, may be disposed of at the repository or transported off-Site for disposal at an approved disposal facility. Woody debris will be placed elsewhere on-Site. The calcine and waste rock piles will be consolidated to achieve a smaller footprint for the protective barrier. A protective barrier consisting of an impermeable geomembrane liner and a minimum of 24 inches of clean rock and/or soil imported from off-Site will be placed over the contaminated material.

Best Management Practices

Best Management Practices (BMPs) will be implemented during construction activities to protect workers, the community, and the environment from short-term construction impacts such as erosion, sedimentation, fugitive dust, noise, and other similar potential impacts.

Non-hazardous materials and wastes such as inert construction debris, will be disposed of or recycled in accordance with appropriate solid waste disposal or recycling requirements.

Greener Cleanup Best Management Practices (BMPs)

Appropriate and practicable greener cleanup BMPs will be implemented during cleanup activities, including, but not limited to, minimizing energy consumption, minimizing generation and transport of fugitive dust, minimizing waste generation through reuse and recycling, minimizing impacts to water resources, minimizing areas requiring activity or use limitations, minimizing unnecessary soil and habitat disturbance, and minimizing lighting and noise disturbance.

Long-term Monitoring and Maintenance and Repair (MM&R)

A long-term MM&R program to be performed by the property owner and with assistance and oversight provided by ODEQ will be implemented to ensure the continuing effectiveness of the removal action and

to monitor Site conditions. EPA will prepare the MM&R in concert with ODEQ and the landowner. As part of the monitoring component, annual, semi-annual and/or episodic inspections of the protective barrier integrity and performance and surface water drainage systems will be required, and as part of the maintenance and repair component, the landowner will be required to perform the needed maintenance and repairs.

Engineering and Institutional Controls

Engineering and institutional controls will regulate access to and use of the repository and other certain areas such as hillsides. An enforceable environmental covenant will be developed and put into effect to limit certain activities, thus promoting the long-term durability and protectiveness of the cleanup action. Additionally, ODEQ will ensure that environmental covenants restricting the disturbance of contaminated soil and land or resource use, as appropriate, are provided by the property owners.

2.2.1.2 Next Steps

The following removal activities are expected to occur during the next two week period (08/18/14 - 08/29/14): complete the excavation of mine-waste contaminated material from Areas 2 and 4; demolish the trailers and excavate mine-waste contamnated material from the trailer pads and driveways; continue placing mine-waste contaminated material into the repository and grading and shaping; and continue to monitor and measure Site conditions and to maintain Site BMPs.

2.2.2 Issues

The extraordinary hot and dry conditions have required that additional personnel and equipment be assigned to ensure that BMPs for minimizing generation and transport of fugitive dust are effective and efficient and to ensure that adequate precautions regarding wild fire prevention and suppression are in-place. The effort has included mobilizing an additional 4,000-gallon water truck with driver, and the purchase of other field equipment such as shovels, pulaskis, and fire extinguishers.

2.3 Logistics Section

All personnel and equipment and materials are on-Site.

2.4 Finance Section

2.4.1 Narrative

A project ceiling increase will likely be needed because the quantity of mine-waste material is increasingly greater than estimated and there are other lesser unanticipated expenses such as fire preparedness and suppression and replacement trailer-related electrical and septic requirements.

2.5 Other Command Staff

2.5.1 Safety Officer

Daily safety meetings are held. During each meeting, key personnel review the day's planned activities and any pertinent safety-related issues are highlighted. Personnel are also encouraged to present any particular concern or issues and any recommendation for improvement of project work and/or safety.

All personnel are at Level C PPE (with full-face respirator) while working in the hot zone to ensure protection against mercury vapors and mercury and arsenic particulates. Level C PPE may be downgraded in the future pending the results of ongoing air monitoring and sampling.

2.5.2 Liaison Officer

Outreach activities are being addressed by key project personnel on an as needed basis.

2.5.3 Information Officer

See 2.5.2. Additionally, a Community Invovement Coordinator (CIC) has been assigned to the project

and is available to also assist with outreach activities on an as needed basis.

3. Participating Entities

3.1 Unified Command

While UC is not established, ODEQ is integrated into the project organization, as appropriate.

3.2 Cooperating Agencies

N/A

4. Personnel On Site

EPA - 1
START - 1
ERRS - 12

5. Definition of Terms

N/A

6. Additional sources of information

6.1 Internet location of additional information/report

www.epaosc.org/BonanzaMineandMill

6.2 Reporting Schedule

POLREPs will be prepared about every two weeks to coincide with OSC rotation schedule.

7. Situational Reference Materials

(Reminder - Add certain background diocuments to the web site)

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Bonanza Mine and Mill - Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region X

Subject:	**POLREP #2** **Bonanza Mine POLREP #2** **Bonanza Mine and Mill** **Sutherlin, OR** **Latitude: 43.3899870 Longitude: -123.1845630**
To:	Rick Albright, EPA Region 10 (POLREP List) Anthony Barber, EPA Region 10 (POLREP List) Lori Cohen, EPA Region 10 (POLREP List) Chris Field, EPA Region 10 (POLREP List) John Irrizary, HQ OEM (POLREP LIST) Wally Moon, EPA Region 10 (POLREP List) Calvin Terada, EPA Region 10 (POLREP List)
From:	Dan Heister, On-Scene Coordinator
Date:	8/28/2014
Reporting Period:	8/18/14 to 8/29/14

1. Introduction

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D.O. Number:	ERRS 0013/030309.0013	**Action Memo Date:**	6/4/2014
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covered temporary storage cell near the base of the waste rock pile. This material was removed from the Site in April 2004 and transported off-Site for disposal. Larger debris such as concrete, firebrick, and a metal furnace were placed in a subsurface vault located at the former mill site. Disturbed areas were restored, as closely as possible, to the original site conditions.

Confirmation soil samples were collected after the removal action. A few samples exceeded the mercury cleanup goal (up to 6,400 mg/kg); however, these sample areas are beneath two to six feet of clean material. Characterization samples collected from the surrounding hillside, calcine, waste rock pile, roads, driveways, and cell base had mercury concentrations ranging from 1.53 to 220 mg/kg. Four samples with greater than 230 mg/kg mercury were from the mine adit (306 mg/kg), the temporary repository (500 mg/kg), an area south of the former mill (930 mg/kg), and a small area where free mercury was observed (5,100 mg/kg).

2014 – Removal Action

NRC Environmental, with technical support and documentation from APEX, performed a second removal action at the Site for ODEQ in February 2014. The objective of this action was to achieve prompt human health risk reduction by removing and capping soil in certain inhabited areas of the Site that were impacted by elevated concentrations of mercury and arsenic. At the time this removal action was performed, the contaminants of concern were mercury and arsenic, and the cleanup goals were 23 mg/kg and 17 mg/kg, respectively.

Prior to implementation of the removal action, FPXRF screening was performed at 118 points scattered across the Site. Arsenic ranged from non-detect to 471 parts per million (ppm), and mercury concentrations ranged from non-detect to 1,200 ppm. Using this information, six areas were identified that had arsenic or mercury concentrations above the cleanup goals. During conduct of the removal action (12 through 21 February 2014) and follow-up site visit (12 March 2014), 39 additional data points were collected from across the Site with the purpose of better understanding the metals distribution across the Site. Arsenic concentrations in these points ranged from non-detect to 81 ppm, and mercury concentrations ranged from non-detect to 459 ppm. The results indicated that the mine-waste contamination from the mill site area is more widespread than previously anticipated, including contamination encountered near two existing home sites.

The largest areas of contaminated soil encompass about 16 acres, including the original mill site and calcine pile. ODEQ determined that these areas could not be excavated at this time due to resource constraints. Temporary fencing and gates were installed to restrict access to certain areas and the existing blackberry vegetation restricting access to Area 4 was left undisturbed. Approximately 60 yd^3 of contaminated soil and firebrick were excavated from the smaller areas, and this material was placed in a temporary cell near the base of the waste rock pile where it remains. Disturbed areas were restored, as closely as possible, to the original site conditions.

2.1.2.b. The following removal actions have been undertaken by EPA as part of this ongoing removal action:

Personnel and equipment were mobilized to the Site beginning August 4th. During the first week, initial activities focused on establishing the Site infrastructure, including clearing and constructing equipment storage and laydown areas, installing BMPs, setting up the project command post, and coordinating with on-Site residents. In addition, project staff coordinated with the community, including nearby neighbors, the Douglas County Sheriff, the Douglas Forest Protective Association, Douglas County Planning Department, Douglas County Library, Pacific Power and Light, and other local agencies and persons. Field personnel also began clearing (felling, trimming, and cutting trees) and grubbing (removal of tree stumps, roots, and bushes) to remove trees and vegetation from the calcine and waste rock piles where the repository will be constructed. Individual and perimeter air monitoring, soil screening and sampling, and BMP monitoring and inspection occur each day.

Heavy storms threatened work early the second week, but progress resumed. The footprint for the repository was verified. Field personnel started grading the waste rock pile to lower the elevation and to reduce the footprint of the pile, and to begin to cover the calcine pile with waste rock. Completed demolition of the concrete remnants of the former mill and excavation of approximately 3,296 yd^3 of mine-waste material from the mill area and consolidated these materials in the repository. Encountered significant volumes of material which by appearance looked to be free or elemental mercury on the

ground surface and on woody debris in the mill area, which is not surprising since the mine and mill operated from the mid-1860s to the 1960s and produced more than 3,000,000 pounds of mercury. The mercury was removed using a mercury recovery vacuum and hand tools. Due to the location of the mercury in combination with the method of recovery, the mercury could not be separated from the surrounding media in all instances during cleaup and was removed as a commingled waste along with soil and other debris such as wood and roots. Two 55-gallon drums of commingled waste has been recovered from the former mill area. Started clearing and grubbing to remove trees and vegetation from Area 2 and started the excavation and removal of mine-waste contaminated material from this area. Completed coordination with affected homeowners for the removal and temporary storage of personal items removed from the trailers to be replaced, sampled the trailers to ensure proper waste characterization, and started the process for replacement of the trailers.

2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)

EPA has initiated a PRP search for this Site, and EPA will continue to collect and analyze additional information about mining companies involved with operations at the Site and/or owners of the Site.

2.1.4 Progress Metrics (as of 08/29/14)

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
Co-mingled Hg Waste	Soil and other Debris	(3) 55-gallon drums	-	Permanent retirement	TBD
Elemental Hg (approx. 1 pint)	Hg mixed with soil	(1) 5-gallon pail	-	Macro-encapsulation	RCRA Subtitle C Facility (TBD)

As mentioned in 2.1.2.b, approximately 3,296 yd^3 of mine-waste material, which included micro de minimus quantities of mercury was excavated from the mill area and consolidated at the repository. The excavation extended to a maximum depth of about 14 feet below ground surface in certain areas due to the presence of recoverable mercury (i.e., about the size of a BB and larger). The overall area was over-excavated because it was the location of the former mill, the presence of recoverable free mercury, and the exceptionally high LUMEX mercury monitor readings.

2.2 Planning Section

2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities

Excavations

The FPXRF was deployed in Area 2 to assess the concentration of site contaminants at a depth of 24 inches below ground surface (bgs), which was the planned extent of contamination. The maximum concentration of arsenic and mercury at this depth was 579 mg/kg and 5626 mg/kg, respectively. OSC Heister conferred with OSC Liverman to extend the depth of excavation to 36 inches bgs. An unknown adit was discovered by the excavator operator at a depth of 36 inches in the southern section of Area 2. After the adit was uncovered the ambient air was screened with the Lumex mercury vapor analyzer (50,000 ng/m^3) and soil screened with the FPXRF (980 mg/kg of arsenic and 2675 mg/kg of mercury). The adit was excavated to a depth of approximately 8 feet bgs then backfilled with bentonite and 4 to 8 inch gabion rock. The total volume of excavated mine-waste material from Area 2 was 9120 yd^3 (as of 8/26/14), which was nearly 4 times the initial estimate of 2400 yd^3.

Excavation of mine-waste material at Area 4 ranged from 18 – 36 inches bgs and was guided by the FPXRF. The eastern section of Area 4 had limited concentrations of site contaminants while hot spots were identified in the western and northern sections and required excavation to a depth of 36 inches bgs. One screening location near the road in Area 4 had a concentration of mercury (7059 mg/kg) at 18 inches bgs which was the highest recorded on site by the FPXRF. The access road along the western

edge of Area 4 was excavated on 8/27 and 8/28. The total volume of excavated mine-waste material from Area 4 was 2540 yd^3 (as of 8/26/14).

Area 1 south of the repository and east of the staging area was cleared and grubbed. This section was excavated to a depth of 2 feet bgs and screened with the FPXRF. The total volume of excavated mine-waste material from Area 1 was 1360 yd^3 (as of 8/26/14).

Excavation at the Mill Site was performed during the first reporting period which is detailed in Polrep #1. The total volume of excavated mine-waste material from the Mill Site was 3488 yd^3, and the total volume of concrete debris from the Mill Site was 96 yd^3.

A total of 8 soil samples were submitted to an off-Site laboratory for confirmation analysis of arsenic and mercury via EPA Methods 6020 and 7471, respectively. The samples were collected from the Mill Site, Area 2, and the anticipated borrow source. Expected turn-around time for results ranges from 48 hours to 5 business days.

Residential Screening and Sampling
The property identified as Residence 4, also known as the Superintendent's house, was screened with field instrumentation. Concentrations of mercury vapor ranged from 67 to 116 ng/m^3; the rooms nearest the entrance were greater than 100 ng/m^3 and the rooms furthest from the entrance less than 100 ng/m^3. The area outside the house was screened with the Lumex with a range of non-detect to 150 ng/m^3. The FPXRF was deployed around the entrance to the house at 5 locations; the concentration of arsenic ranged from non-detect to 24 mg/kg, and mercury ranged from non-detect to 202 mg/kg.

Previously submitted bulk samples collected from Home Sites 1 and 2 identified asbestos-containing material (ACM) that will require abatement prior to disposal; the abatement was tentatively scheduled for 8/29. In addition, toxicity characteristic leaching procedure (TCLP) results for both Home Sites were less than the required criteria for RCRA Subtitle C disposal restrictions which will allow the debris from the Home Sites to be disposed at the municipal landfill.

Repository
Continued placing mine-waste contaminated material into the repository and grading and shaping. The cleared and grubbed vegetation from throughout the site was staged near the southeast perimeter of the repository.

Best Management Practices
Continued to monitor and measure Site conditions and maintain Site BMPs. Continued to deploy the DataRam particulate monitors around the top of the repository, the staging area, and Residence 3 or 4. Dust suppression efforts were generally effective, even during the hottest days. For example, the time-weighted average (TWA) of particulates from 8/18 to 8/23 ranged from 3.5 to 57.3 $\mu g/m^3$, which was considerably less than the action level of 1400 $\mu g/m^3$.

Greener Cleanup Best Management Practices
START and ERRS collected and segregated plastic bottles and metals cans for recycling. Air-conditioning was used sparingly during the early mornings in the job trailers at the Site. A Fire Prevention and Suppression Plan established procedures for fire prevention and suppression of fires set indirectly as a result of the response action activities performed at the Site.

2.2.1.2 Next Steps
The following removal activities are expected to occur during the next week period (09/02/14 – 9/13/14): complete the excavation of mine-waste contaminated material from Area 1; demolish the trailers and excavate mine-waste contaminated material from the trailer pads and driveways; receive structural fill and wearing course material to reconstruct the road along Areas 2 and 4 leading to Residence 3; install culverts in Areas 2 and 4; continue placing mine-waste contaminated material into the repository and grading and shaping; and continue to monitor and measure Site conditions and to maintain Site BMPs.

2.2.2.1 Issues
ERRS PM Consider replacing a haul truck with a water truck, if available. Assess whether to extend excavation from Area 4 into the Bonanza Mine Road near the pump house. Continue to assess former mill area.

The extraordinary hot and dry conditions have required that additional personnel and equipment be assigned to ensure that BMPs for minimizing generation and transport of fugitive dust are effective and efficient and to ensure that adequate precautions regarding wild fire prevention and suppression are in-place. The effort has included mobilizing an additional 4,000-gallon water truck with driver, and the purchase of other field equipment such as shovels, pulaskis, and fire extinguishers.

2.3 Logistics Section

2.3 Logistics Section

An additional START member was mobilized to the site on 8/25 to provide support for FPXRF field screening and administrative tasking.

2.5.1 Safety Officer

All personnel remain at Level C PPE (with full-face respirator) pending results of previously submitted air samples and ongoing air monitoring. Updated Site Respiratory Protection Plan to incorporate EPA, ERRS, and START action levels.

2.4 Finance Section

2.4.1 Narrative

A project ceiling increase will likely be needed because the quantity of mine-waste material is increasingly greater than estimated and there are other lesser unanticipated expenses such as fire preparedness and suppression and replacement trailer-related electrical and septic requirements.

2.5 Other Command Staff

2.5.1 Safety Officer

Daily safety meetings are held. During each meeting, key personnel review the day's planned activities and any pertinent safety-related issues are highlighted. Personnel are also encouraged to present any particular concern or issues and any recommendation for improvement of project work and/or safety.

All personnel are at Level C PPE (with full-face respirator) while working in the hot zone to ensure protection against mercury vapors and mercury and arsenic particulates. Level C PPE may be downgraded in the future pending the results of ongoing air monitoring and sampling.

2.5.2 Liaison Officer

Outreach activities are being addressed by key project personnel on an as needed basis.

2.5.3 Information Officer

See 2.5.2. Additionally, a Community Invovement Coordinator (CIC) has been assigned to the project and is available to also assist with outreach activities on an as needed basis.

3. Participating Entities

3.1 Unified Command

While UC is not established, ODEQ is integrated into the project organization, as appropriate.

3.2 Cooperating Agencies

N/A

4. Personnel On Site

EPA – 1
START – 2

ERRS - 12
ODEQ Western Region – 2 representatives performed a site visit on 8/26.

5. Definition of Terms

N/A

6. Additional sources of information

6.1 Internet location of additional information/report

www.epaosc.org/BonanzaMineandMill

6.2 Reporting Schedule

POLREPs will be prepared about every two weeks to coincide with OSC rotation schedule.

7. Situational Reference Materials

(Reminder - Add certain background diocuments to the web site)

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Bonanza Mine and Mill - Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region X

Subject: **POLREP #3**
Bonanza Mine and Mill

Sutherlin, OR
Latitude: 43.3899870 Longitude: -123.1845630

To: Rick Albright, EPA Region 10 (POLREP List)
Anthony Barber, EPA Region 10 (POLREP List)
Lori Cohen, EPA Region 10 (POLREP List)
Chris Field, EPA Region 10 (POLREP List)
John Irrizary, HQ OEM (POLREP LIST)
Wally Moon, EPA Region 10 (POLREP List)
Calvin Terada, EPA Region 10 (POLREP List)

From: Earl Liverman, On-Scene Coordinator
Date: 9/19/2014
Reporting Period: 9/2/14 to 9/13/14

1. Introduction

1.1 Background

Site Number:	10NE	**Contract Number:**	START 14-06-0006
D.O. Number:	ERRS 0013/030309.0013	**Action Memo Date:**	6/4/2014
Response Authority:	CERCLA	**Response Type:**	Time-Critical
Response Lead:	EPA	**Incident Category:**	Removal Action
NPL Status:	Non NPL	**Operable Unit:**	
Mobilization Date:	8/4/2014	**Start Date:**	8/4/2014
Demob Date:	11/1/2014	**Completion Date:**	11/1/2014
CERCLIS ID:	ORN001001174	**RCRIS ID:**	
ERNS No.:		**State Notification:**	6/4/14
FPN#:		**Reimbursable Account #:**	

1.1.1 Incident Category

Abandoned historical mercury mine and mill.

1.1.2 Site Description

1.1.2.1 Location

The Bonanza Mine and Mill Site is located near the small community of Nonpareil, 6 miles east of Sutherlin, Douglas County, Oregon. The Site is located in the SW ¼ of Section 16 of Township 25 South, Range 4 West, Willamette Meridian (latitude N43° 23'46", longitude W123°10'54").

Except for one former building used as a residence, other mine and mill buildings are no longer present, leaving only the mill concrete foundations, calcine, and waste rock. The mine had 12 adits and more than three miles of subterranean tunnels and shafts. The mine adits have since been abandoned, and no open adits have been located during the 2014 removal action.

Five residences are located close to the mine, including two residences within 200 feet of the former mill. Besides roads and driveways leading to the residences, the land is undeveloped. The nearest off-Site residences are located about a half mile away, to the northeast, along Banks Creek Road.

The Bonanza Mine has an operation history extending from the mid-1860s through 1960. The main mercury-containing mineral is cinnabar, although metacinnabar and native mercury were also reported in the mine workings. Total recorded mercury production was 39,540 flasks (or 3,005,040 pounds).

1.1.2.2 Description of Threat

The data from numerous environmental investigations shows that environmental media are contaminated by elevated concentrations of mercury, arsenic, and other metals, and the source of metals is from historical mercury mining, processing, and disposal operations. Elevated metals concentrations are present in calcine, waste rock, and soil at the former mill site, the surrounding hillside, and valley floor.

1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results

Data regarding the nature and extent of the contaminants of concern found at the Site are summarized below.

1999 – Preliminary Assessment

Ecology and Environment, Inc. (E&E) completed a Preliminary Assessment (PA) of Red Rock Road (Road) for EPA in May 1999. The PA evaluated the potential for exposure to public health and the environment from potential metals contamination associated with the Road. The Road is a former railroad grade approximately 17 miles long that was constructed of calcine from the Bonanza Mine. The amount of material used in construction of the Road is estimated at 316,000 cubic yards (yd^3). As a result of the PA, further investigation was recommended.

2000 - Site Inspection

E&E completed a Site Inspection (SI) of Red Rock Road and surrounding watersheds for EPA in May 2000. As part of this SI, nine surface soil samples were collected from potential source areas at the Bonanza Mine Site, including the former mill, calcine, waste rock, and an abandoned adit. Mercury concentrations in these areas ranged from 74 to 12,000 milligram per kilogram (mg/kg), arsenic concentrations ranged from 71.3 to 246 mg/kg, and lead concentrations ranged from 6.5 to 1,240 mg/kg. The total on-Site volume of calcine was estimated at 2,080 yd^3 and waste rock was estimated at 400 yd^3.

2000 – Removal Assessment

In September 2000, Hart Crowser, Inc. (HC) performed a Removal Assessment (RA) at the former mill site for ODEQ to gather additional data to delineate the extent of metals contamination at the Site. As part of this RA, 31 surface and near-surface soil samples were collected from the former mill site and surrounding hillside. Mercury concentrations ranged from 67.7 to 12,000 mg/kg, arsenic concentrations ranged from 20.3 to 314 mg/kg, and lead concentrations were generally below 70 mg/kg. Calcine, waste rock, and roadway soils also had elevated mercury and arsenic concentrations ranging up to 179 mg/kg and 246 mg/kg, respectively.

One sample each of the former mill soil and calcine were analyzed for mercury speciation. Methyl mercury was detected at 0.03765 mg/kg in soil and 0.00246 mg/kg in calcine. Sequential extraction on soil and

calcine indicated that most of the mercury was sulfide-bound, primarily in the form of cinnabar or metacinnabar. Volatile mercury was detected at 2,100 and 2,360 microgram per cubic meter (µg/m^3).

Water samples were collected from the on-Site well and water storage tank. Arsenic was detected at 0.0536 milligram per liter (mg/L) in a sample collected from the on-Site well and this concentration exceeds the Federal Maximum Contaminant Level (MCL) of 0.005 mg/L for drinking water. Reportedly, well water is used only for agricultural purposes and not for drinking water. Based on the findings of the removal assessment, the first of two removal actions described in Section 2.1.2 (Response Actions to Date) was performed by ODEQ in 2000 in certain areas to achieve prompt human health risk reduction. Water samples have been collected from the spring water storage tank and have consistently had no detections of mercury and arsenic using standard drinking water analytical methods.

2003 – Site Visit

HC returned to the Site on behalf of ODEQ in 2003 to assess whether ecological receptors and/or exposure pathways were present or potentially present at or in the Bonanza Mine Site and along Foster Creek. Impacts to the Site and surrounding properties attributable to contaminated environmental media were not observed during the Site visit. Physical impacts from historical mining operations included the waste rock pile, mine access roads, and mine excavation. Based on the results of the Oregon Natural Heritage Information Center data search and information from the Oregon Department of Fish and Wildlife, HC concluded that there is a possibility that rare, threatened, and endangered species may be present at or near the Site.

2005 – Post-Removal Assessment Report

HC compiled and assessed available information for the Bonanza Mine in 2005 to assist in preparation of a forthcoming Remedial Investigation (RI) Work Plan. This report also developed a preliminary conceptual site model (CSM) for both human and ecological receptors at the Site and identified tasks to be performed during the RI to address data gaps. Volatile mercury was measured in soil from the former mill and calcine. No other environmental media samples were collected as part of this activity. The RI Work Plan has not yet been prepared.

2013 – Soil Assessment

In December 2013, ODEQ screened 118 soil samples using a field portable X-Ray fluorescence spectrometer (FPXRF) to gather additional data to identify those areas where soil concentrations are below a site-specific background concentration for arsenic and a residential risk-based concentration for mercury. Nine discrete soil samples were also collected and sent off-Site for laboratory analysis. The results of this assessment indicated that arsenic and mercury contamination is more widespread in the northern portion of the property than previously anticipated. The results also showed that arsenic and mercury contamination extends into the southern portion of the Site near two existing residences.

2. Current Activities

2.1 Operations Section

2.1.1 Narrative

2.1.2 Response Actions to Date

2.1.2.a The following removal actions have been undertaken by the Oregon Department of Environmental Quality (ODEQ) in the past:

2000 – Removal Action

Based on the findings of the 2000 HC RA, HC performed a removal action at the former mill site for ODEQ from 14 through 29 September 2000. The objective of this action was to provide prompt risk reduction by excavating soil exceeding 230 mg/kg mercury in the mill area, and for arsenic and lead the cleanup goals were 50 mg/kg and 400 mg/kg, respectively. Eight yd^3 of soil were excavated from the mill furnace area, and this material was transported off-Site for disposal as hazardous waste. Approximately 240 yd^3 of mercury-contaminated soil was excavated from the mill area and placed in a lined and covered temporary storage cell near the base of the waste rock pile. This material was removed from the Site in April 2004 and transported off-Site for disposal. Larger debris such as concrete, firebrick, and a metal furnace were

placed in a subsurface vault located at the former mill site. Disturbed areas were restored, as closely as possible, to the original site conditions.

Confirmation soil samples were collected after the removal action. A few samples exceeded the mercury cleanup goal (up to 6,400 mg/kg); however, these sample areas are beneath two to six feet of clean material. Characterization samples collected from the surrounding hillside, calcine, waste rock pile, roads, driveways, and cell base had mercury concentrations ranging from 1.53 to 220 mg/kg. Four samples with greater than 230 mg/kg mercury were from the mine adit (306 mg/kg), the temporary repository (500 mg/kg), an area south of the former mill (930 mg/kg), and a small area where free mercury was observed (5,100 mg/kg).

2014 – Removal Action

NRC Environmental, with technical support and documentation from APEX, performed a second removal action at the Site for ODEQ in February 2014. The objective of this action was to achieve prompt human health risk reduction by removing and capping soil in certain inhabited areas of the Site that were impacted by elevated concentrations of mercury and arsenic. At the time this removal action was performed, the contaminants of concern were mercury and arsenic, and the cleanup goals were 23 mg/kg and 17 mg/kg, respectively.

Prior to implementation of the removal action, FPXRF screening was performed at 118 points scattered across the Site. Arsenic ranged from non-detect to 471 parts per million (ppm), and mercury concentrations ranged from non-detect to 1,200 ppm. Using this information, six areas were identified that had arsenic or mercury concentrations above the cleanup goals. During conduct of the removal action (12 through 21 February 2014) and follow-up site visit (12 March 2014), 39 additional data points were collected from across the Site with the purpose of better understanding the metals distribution across the Site. Arsenic concentrations in these points ranged from non-detect to 81 ppm, and mercury concentrations ranged from non-detect to 459 ppm. The results indicated that the mine-waste contamination from the mill site area is more widespread than previously anticipated, including contamination encountered near two existing home sites.

The largest areas of contaminated soil encompass about 16 acres, including the original mill site and calcine pile. ODEQ determined that these areas could not be excavated at this time due to resource constraints. Temporary fencing and gates were installed to restrict access to certain areas and the existing blackberry vegetation restricting access to Area 4 was left undisturbed. Approximately 60 yd^3 of contaminated soil and firebrick were excavated from the smaller areas, and this material was placed in a temporary cell near the base of the waste rock pile where it remains. Disturbed areas were restored, as closely as possible, to the original site conditions.

2.1.2.b. The following removal actions have been undertaken by EPA as part of this ongoing removal action for the current reporting period:

Excavation and Reconstruction

The unpaved road along Areas 2 and 4 was excavated to a depth of 24 to 36 inches bgs. The bottom of the excavation was screened using an FPXRF prior to the placement of Oregon Department of Transportation (ODOT)-specification gravel material to reconstruct the road. The original culvert between Areas 2 and 4 leading to Residence 4 was removed and replaced with a new culvert; a second culvert located on the north side of Area 2 leading to Residence 3 was also replaced with a new culvert. A drainage channel for the intermittent tributary was excavated in Areas 2 and 4 and lined with 4- to 8-inch diameter gabion rock. The volume of mine-waste contaminated soil excavated from Areas 2 and 4 was 9,792 yd^3 and 4,148 yd^3, respectively.

On September 10, ERRS began to excavate the eastern section of Area 1 (the western section was excavated in late August). The excavation in Area 1 continued in a northern direction toward the slash pile. START supported the excavation with the FPXRF to identify specific locations for additional excavation. As of September 13, the volume of excavated soil from Area 1 was 4,048 yd^3, and an estimated 6,000 yd^3 remains to be excavated from this area.

On September 9, ERRS performed additional excavation at the mill area based on elevated readings from the Lumex mercury vapor analyzer, which ranged from 3,000 to 24,000 ng/m^3. On September 11, START identified material, which by appearance looked to be free or elemental mercury, on the ground surface in

the mill area near two previously excavated locations in this area. ERRS deployed the mercury recovery vacuum to remove this material, and then excavated additional contaminated soil. Four soil samples were collected from the bottom of the excavation on September 12 for ex-situ FPXRF analysis. The concentration of mercury ranged from 0 to 14 mg/kg and arsenic from 16 to 30 mg/kg. The total volume of soil removed from the mill area was 5,168 yd^3 along with 9 yd^3 of concrete debris. No additional excavation is planned for at that location.

The road leading from the mill area toward Residence 1 was excavated to a depth of 12 to 24 inches bgs. The FPRXF was used to screen the excavation floor of the road at 15 locations; the average concentration of mercury was 60 mg/kg and arsenic was 51 mg/kg. The total volume of excavated soil from the mill area to Residence 1 was 1,104 yd^3.

Residential Abatement, Demolition and Excavation

An asbestos abatement subcontractor mobilized to the Site to perform an abatement of Residences 1 and 2. Upon removal of the asbestos-containing material, both residences were demolished and loaded into seven 30 yd^3roll-off containers for disposal at Roseburg Municipal landfill as non-hazardous waste.

Residence 1 was conceptually subdivided into three sections for planning purposes. The north section, approximately 6,000 square feet, was excavated to 12 inches bgs. The middle section, approximately 8,000 square feet, was excavated to 24 inches bgs. The south section, approximately 6,000 square feet, was excavated to 12 inches bgs. The depth of excavation was guided by FPXRF data. The total volume of excavated soil from Residence 1 was 1,968 yd^3 along with 96 yd^3 of concrete debris.

Notable features of Residence 1 include two concrete septic tanks; an older tank located in the middle section was empty while a newer tank in the south section was full. A septic subcontractor arrived on Site to pump out the full tank, approximately 1,000 gallons, before both tanks were crushed and hauled to the repository with an excavator. A four inch vertical hole was identified in the middle section along with a second hole that appeared to be partially collapsed; the Lumex mercury vapor analyzer identified concentrations of 2,000 ng/m^3 and 5,000 ng/m^3 from the holes, respectively. ERRS was directed to fill the holes with bentonite to disable the pathway of mercury vapor. The ambient concentration of mercury vapor at the time was 1,000 ng/m^3 which was likely due to additional excavation in the Mill Site located directly below Residence 1; during the warm and sunny part of the day the rising air currents from the Repository and Mill Site were believed responsible for the increased concentration of mercury vapors in and around Residence 1.

A footpath leading from Residence 1 to Residence 2 was screened with the FPXRF at six locations. Elevated concentrations of mercury in soil were identified along the footpath up 1,230 mg/kg, and the footpath was rendered inaccessible to the extent practicable.

Residence 2 was identified as two operational areas based on the Site layout; the level home site was approximately 6,000 square feet while the sloping hillside, to include the access road, was an additional 10,000 square feet. Based on FPXRF data, the home site and sloping hillside were excavated to 12 inches bgs and 36 inches bgs, respectively. The total volume of excavated soil from Residence 2 was 2,304 yd^3. Notable features of Residence 2 included burn pits, fire brick, and garbage pits that were excavated and placed in the repository. A concrete septic tank at Residence 2 was identified during the excavation. A septic subcontractor pumped out the tank, approximately 1,000 gallons, before the tank was crushed and transported to the repository.

Sampling and Laboratory Results

On August 26, a total of 8 soil samples were submitted to an off-Site laboratory for analysis of arsenic and mercury via EPA Methods 6020 and 7471, respectively. These samples were collected from the mill area, Area 2, and the anticipated borrow source. Prior to submission to the laboratory, the samples were also screened with the FPXRF. The results from both the laboratory and the ex-situ XRF data are included in the following draft table along with a correlation calculation for arsenic and mercury.

Draft Table 1: Comparison of Ex-Situ FPXRF and Laboratory Data for Mercury and Arsenic

Sample Number	Sample Description	Depth	Mercury		Arsenic	
			Ex-Situ	Lab	Ex-Situ	Lab

Concentrations are in mg/kg						
14080201	Southern Mill Site	8 feet	397	350	38	44.6
14080202	Northern Mill Site	8 feet	27	23.7	31	35.4
14080203	Area 2	1 foot	9079	5510	689	814
14080204	Quarry (topsoil)	NA	0	0.033	3	5.08
14080204-D	Quarry (topsoil)	NA	0	0.036	5	5.02
14080205	Quarry (washed sand)	NA	0	0.023	4	3.66
14080206	Quarry (0.75 inch minus)	NA	0	0.002	3	0.59
14080207	Quarry (2.5 inch minus)	NA	0	0.003	8	0.93
		Correlation	1.000		1.000	

START conducted confirmation soil sampling from the bottom of the excavations at Residence 1 and Residence 2. The sampling strategy targeted all three sections at Residence 1 and the home site location at Residence 2. A five point composite soil sample was collected from the bottom of each sample location and homogenized. The FPXRF was used to perform ex-situ screening of the sample prior to submission to an off-Site laboratory on September 11 with 1 week turnaround time. The FPXRF data for mercury and arsenic is included in the following draft table.

Draft Table 2: Ex-Situ FPXRF Data for Composite Soil Samples from Residence 1 and Residence 2

Location	Sublocation	Depth	Mercury	Arsenic
			Ex-Situ	Ex-Situ
Concentrations are in mg/kg				
Residence 1	North Section	12 inches	89	144
Residence 1	Middle Section	24 inches	167	110
Residence 1	South Section	12 inches	162	66
Residence 2	Homesite	12 inches	79	51

Repository

The repository was expanded toward the south to overlay pre-existing calcine piles and to accommodate the greater volume of mine-waste contaminated materials. A survey of the repository on September 3 provided an updated area of 106,000 square feet with a nearly perfect 3:1 slope. During the reporting period, ERRS continued to perform compaction of the repository using a vibratory compactor, bulldozers and haul trucks.

Best Management Practices

Continued to monitor and measure Site conditions and maintain Site BMPs. Continued to deploy the DataRam particulate monitors around the top of the repository, the staging area, and Residence 3 or 4. Dust suppression efforts were generally effective, even during the hottest days. For example, the time-weighted average (TWA) of particulates from 9/2 to 9/13 ranged from 5.9 to 45.5 µg/m^3, which was considerably less than the action level of 1,400 µg/m^3.

Greener Cleanup Best Management Practices

START and ERRS collected and segregated plastic bottles and metals cans for recycling. Air-conditioning was used sparingly during the early mornings in the job trailers at the Site. A Fire Prevention and

Suppression Plan established procedures for fire prevention and suppression of fires set indirectly as a result of the response action activities performed at the Site.

2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)

EPA has initiated a PRP search for this Site, and EPA will continue to collect and analyze additional information about mining companies involved with operations at the Site and/or owners of the Site.

2.1.4 Progress Metrics (as of 9/13/14)

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
Commingled mercury waste	Soil and other debris removed using hand tools	(3) 55-gallon drums	-	Macro-encapsulation	RCRA Subtitle C Facility (TBD)
Commingled mercury waste	Soil and other debris removed using Hg recovery vacuum	(1) 5-gallon pail	-	Retirement (sulfide treatment)	TBD

A total of 28,724 yd^3 of mine-waste material has been excavated and consolidated at the repository by the end of the current reporting period. The excavation extended to a maximum depth of about 14 feet below ground surface in certain areas due to the presence of recoverable mercury (i.e., about the size of a BB and larger) in the mill area. The overall area was over-excavated because it was the location of the former mill, the presence of recoverable free mercury, and the exceptionally high LUMEX mercury monitor readings.

2.2 Planning Section

2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities

2.2.1.2 Next Steps

The following removal activities are expected to occur during the next reporting period (09/15/14 – 9/27/14): complete the excavation of mine-waste contaminated material from Area 1; continue to receive structural fill and wearing course material to reconstruct the road leading to Residence 1 and Residence 2 past the Mill Site; receive structural fill and wearing course material to overlay the repository; install culverts in Area 1; continue placing mine-waste contaminated material into the repository and grading and shaping; and continue to monitor and measure Site conditions and to maintain Site BMPs.

2.2.2.1 Issues

Consider options for backfilling mill area. Coordinate procurement of replacement trailers at Residence 1 and Residence 2. Prepare a decontamination strategy for demobilizing heavy equipment from the Site.

2.3 Logistics Section

2.3 Logistics Section

A START engineer will be on Site during the week of September 15 – 19.

2.5.1 Safety Officer

Remain vigilant for bees and other stinging insects; during the weekend of September 13, two large swarms of bees were identified within the work zones on Site.

2.4 Finance Section

2.4.1 Narrative

A project ceiling increase will likely be needed because the quantity of mine-waste material is increasingly

greater than estimated and there are other lesser unanticipated expenses such as fire preparedness and suppression and replacement trailer-related electrical and septic requirements.

2.5 Other Command Staff

2.5.1 Safety Officer

Daily safety meetings are held. During each meeting, key personnel review the day's planned activities and any pertinent safety-related issues are highlighted. Personnel are also encouraged to present any particular concern or issues and any recommendation for improvement of project work and/or safety.

All personnel are at Level C PPE (with full-face respirator) while working in the hot zone to ensure protection against mercury vapors and mercury and arsenic particulates. Level C PPE may be downgraded in the future pending the results of ongoing air monitoring and sampling.

2.5.2 Liaison Officer

Outreach activities are being addressed by key project personnel on an as needed basis.

2.5.3 Information Officer

See 2.5.2. Additionally, a Community Invovement Coordinator (CIC) has been assigned to the project and is available to also assist with outreach activities on an as needed basis.

3. Participating Entities

3.1 Unified Command

While UC is not established, ODEQ is integrated into the project organization, as appropriate.

3.2 Cooperating Agencies

N/A

4. Personnel On Site

EPA – 1
START – 1
ERRS – 12
Roseburg City Manager, Fire Chief, Deputy Fire Chief performed a Site visit on 9/3.
Seattle-based EPA staff on 9/3.
ODEQ Western Region – 2 representatives performed a Site visit on 9/4.

5. Definition of Terms

N/A

6. Additional sources of information

6.1 Internet location of additional information/report

www.epaosc.org/BonanzaMineandMill

6.2 Reporting Schedule

POLREPs will be prepared about every two weeks to coincide with OSC rotation schedule.

7. Situational Reference Materials

(Reminder - Add certain background diocuments to the web site)

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Bonanza Mine and Mill - Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region X

Subject: **POLREP #4**
Bonanza Mine and Mill

Sutherlin, OR
Latitude: 43.3899870 Longitude: -123.1845630

To: Rick Albright, EPA Region 10 (POLREP List)
Anthony Barber, EPA Region 10 (POLREP List)
Lori Cohen, EPA Region 10 (POLREP List)
Chris Field, EPA Region 10 (POLREP List)
John Irrizary, HQ OEM (POLREP LIST)
Wally Moon, EPA Region 10 (POLREP List)
Calvin Terada, EPA Region 10 (POLREP List)

From: Richard Franklin, On-Scene Coordinator
Date: 10/8/2014
Reporting Period: 9/15/14 – 9/27/14

1. Introduction

1.1 Background

Site Number:	10NE	**Contract Number:**	START 14-06-0006
D.O. Number:	ERRS 0013/030309.0013	**Action Memo Date:**	6/4/2014
Response Authority:	CERCLA	**Response Type:**	Time-Critical
Response Lead:	EPA	**Incident Category:**	Removal Action
NPL Status:	Non NPL	**Operable Unit:**	
Mobilization Date:	8/4/2014	**Start Date:**	8/4/2014
Demob Date:	11/1/2014	**Completion Date:**	11/1/2014
CERCLIS ID:	ORN001001174	**RCRIS ID:**	
ERNS No.:		**State Notification:**	6/4/14
FPN#:		**Reimbursable Account #:**	

1.1.1 Incident Category

Abandoned historical mercury mine and mill.

1.1.2 Site Description

1.1.2.1 Location

The Bonanza Mine and Mill Site is located near the small community of Nonpareil, 6 miles east of Sutherlin, Douglas County, Oregon. The Site is located in the SW ¼ of Section 16 of Township 25 South, Range 4 West, Willamette Meridian (latitude N43° 23'46", longitude W123°10'54").

Except for one former building used as a residence, other mine and mill buildings are no longer present, leaving only the mill concrete foundations, calcine, and waste rock. The mine had 12 adits and more than three miles of subterranean tunnels and shafts. The mine adits have since been abandoned, and no open adits have been located during the 2014 removal action.

Five residences are located close to the mine, including two residences within 200 feet of the former mill. Besides roads and driveways leading to the residences, the land is undeveloped. The nearest off-Site residences are located about a half mile away, to the northeast, along Banks Creek Road.

The Bonanza Mine has an operation history extending from the mid-1860s through 1960. The main mercury-containing mineral is cinnabar, although metacinnabar and native mercury were also reported in the mine workings. Total recorded mercury production was 39,540 flasks (or 3,005,040 pounds).

1.1.2.2 Description of Threat

The data from numerous environmental investigations shows that environmental media are contaminated by elevated concentrations of mercury, arsenic, and other metals, and the source of metals is from historical mercury mining, processing, and disposal operations. Elevated metals concentrations are present in calcine, waste rock, and soil at the former mill site, the surrounding hillside, and valley floor.

1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results

Data regarding the nature and extent of the contaminants of concern found at the Site are summarized below.

1999 – Preliminary Assessment

Ecology and Environment, Inc. (E&E) completed a Preliminary Assessment (PA) of Red Rock Road (Road) for EPA in May 1999. The PA evaluated the potential for exposure to public health and the environment from potential metals contamination associated with the Road. The Road is a former railroad grade approximately 17 miles long that was constructed of calcine from the Bonanza Mine. The amount of material used in construction of the Road is estimated at 316,000 cubic yards (yd^3). As a result of the PA, further investigation was recommended.

2000 - Site Inspection

E&E completed a Site Inspection (SI) of Red Rock Road and surrounding watersheds for EPA in May 2000. As part of this SI, nine surface soil samples were collected from potential source areas at the Bonanza Mine Site, including the former mill, calcine, waste rock, and an abandoned adit. Mercury concentrations in these areas ranged from 74 to 12,000 milligram per kilogram (mg/kg), arsenic concentrations ranged from 71.3 to 246 mg/kg, and lead concentrations ranged from 6.5 to 1,240 mg/kg. The total on-Site volume of calcine was estimated at 2,080 yd^3 and waste rock was estimated at 400 yd^3.

2000 – Removal Assessment

In September 2000, Hart Crowser, Inc. (HC) performed a Removal Assessment (RA) at the former mill site for ODEQ to gather additional data to delineate the extent of metals contamination at the Site. As part of this RA, 31 surface and near-surface soil samples were collected from the former mill site and surrounding hillside. Mercury concentrations ranged from 67.7 to 12,000 mg/kg, arsenic concentrations ranged from 20.3 to 314 mg/kg, and lead concentrations were generally below 70 mg/kg. Calcine, waste rock, and roadway soils also had elevated mercury and arsenic concentrations ranging up to 179 mg/kg and 246 mg/kg, respectively.

One sample each of the former mill soil and calcine were analyzed for mercury speciation. Methyl mercury was detected at 0.03765 mg/kg in soil and 0.00246 mg/kg in calcine. Sequential extraction on soil and

calcine indicated that most of the mercury was sulfide-bound, primarily in the form of cinnabar or metacinnabar. Volatile mercury was detected at 2,100 and 2,360 microgram per cubic meter (µg/m^3).

Water samples were collected from the on-Site well and water storage tank. Arsenic was detected at 0.0536 milligram per liter (mg/L) in a sample collected from the on-Site well and this concentration exceeds the Federal Maximum Contaminant Level (MCL) of 0.005 mg/L for drinking water. Reportedly, well water is used only for agricultural purposes and not for drinking water. Based on the findings of the removal assessment, the first of two removal actions described in Section 2.1.2 (Response Actions to Date) was performed by ODEQ in 2000 in certain areas to achieve prompt human health risk reduction. Water samples have been collected from the spring water storage tank and have consistently had no detections of mercury and arsenic using standard drinking water analytical methods.

2003 – Site Visit

HC returned to the Site on behalf of ODEQ in 2003 to assess whether ecological receptors and/or exposure pathways were present or potentially present at or in the Bonanza Mine Site and along Foster Creek. Impacts to the Site and surrounding properties attributable to contaminated environmental media were not observed during the Site visit. Physical impacts from historical mining operations included the waste rock pile, mine access roads, and mine excavation. Based on the results of the Oregon Natural Heritage Information Center data search and information from the Oregon Department of Fish and Wildlife, HC concluded that there is a possibility that rare, threatened, and endangered species may be present at or near the Site.

2005 – Post-Removal Assessment Report

HC compiled and assessed available information for the Bonanza Mine in 2005 to assist in preparation of a forthcoming Remedial Investigation (RI) Work Plan. This report also developed a preliminary conceptual site model (CSM) for both human and ecological receptors at the Site and identified tasks to be performed during the RI to address data gaps. Volatile mercury was measured in soil from the former mill and calcine. No other environmental media samples were collected as part of this activity. The RI Work Plan has not yet been prepared.

2013 – Soil Assessment

In December 2013, ODEQ screened 118 soil samples using a field portable X-Ray fluorescence spectrometer (FPXRF) to gather additional data to identify those areas where soil concentrations are below a site-specific background concentration for arsenic and a residential risk-based concentration for mercury. Nine discrete soil samples were also collected and sent off-Site for laboratory analysis. The results of this assessment indicated that arsenic and mercury contamination is more widespread in the northern portion of the property than previously anticipated. The results also showed that arsenic and mercury contamination extends into the southern portion of the Site near two existing residences.

2. Current Activities

2.1 Operations Section

2.1.1 Narrative

2.1.2 Response Actions to Date

2.1.2.a The following removal actions have been undertaken by the Oregon Department of Environmental Quality (ODEQ) in the past:

2000 – Removal Action

Based on the findings of the 2000 HC RA, HC performed a removal action at the former mill site for ODEQ from 14 through 29 September 2000. The objective of this action was to provide prompt risk reduction by excavating soil exceeding 230 mg/kg mercury in the mill area, and for arsenic and lead the cleanup goals were 50 mg/kg and 400 mg/kg, respectively. Eight yd^3 of soil were excavated from the mill furnace area, and this material was transported off-Site for disposal as hazardous waste. Approximately 240 yd^3 of mercury-contaminated soil was excavated from the mill area and placed in a lined and covered temporary storage cell near the base of the waste rock pile. This material was removed from the Site in April 2004 and transported off-Site for disposal. Larger debris such as concrete, firebrick, and a metal furnace were

placed in a subsurface vault located at the former mill site. Disturbed areas were restored, as closely as possible, to the original site conditions.

Confirmation soil samples were collected after the removal action. A few samples exceeded the mercury cleanup goal (up to 6,400 mg/kg); however, these sample areas are beneath two to six feet of clean material. Characterization samples collected from the surrounding hillside, calcine, waste rock pile, roads, driveways, and cell base had mercury concentrations ranging from 1.53 to 220 mg/kg. Four samples with greater than 230 mg/kg mercury were from the mine adit (306 mg/kg), the temporary repository (500 mg/kg), an area south of the former mill (930 mg/kg), and a small area where free mercury was observed (5,100 mg/kg).

2014 – Removal Action

NRC Environmental, with technical support and documentation from APEX, performed a second removal action at the Site for ODEQ in February 2014. The objective of this action was to achieve prompt human health risk reduction by removing and capping soil in certain inhabited areas of the Site that were impacted by elevated concentrations of mercury and arsenic. At the time this removal action was performed, the contaminants of concern were mercury and arsenic, and the cleanup goals were 23 mg/kg and 17 mg/kg, respectively.

Prior to implementation of the removal action, FPXRF screening was performed at 118 points scattered across the Site. Arsenic ranged from non-detect to 471 parts per million (ppm), and mercury concentrations ranged from non-detect to 1,200 ppm. Using this information, six areas were identified that had arsenic or mercury concentrations above the cleanup goals. During conduct of the removal action (12 through 21 February 2014) and follow-up site visit (12 March 2014), 39 additional data points were collected from across the Site with the purpose of better understanding the metals distribution across the Site. Arsenic concentrations in these points ranged from non-detect to 81 ppm, and mercury concentrations ranged from non-detect to 459 ppm. The results indicated that the mine-waste contamination from the mill site area is more widespread than previously anticipated, including contamination encountered near two existing home sites.

The largest areas of contaminated soil encompass about 16 acres, including the original mill site and calcine pile. ODEQ determined that these areas could not be excavated at this time due to resource constraints. Temporary fencing and gates were installed to restrict access to certain areas and the existing blackberry vegetation restricting access to Area 4 was left undisturbed. Approximately 60 yd^3 of contaminated soil and firebrick were excavated from the smaller areas, and this material was placed in a temporary cell near the base of the waste rock pile where it remains. Disturbed areas were restored, as closely as possible, to the original site conditions.

2.1.2.b. The following removal actions have been undertaken by EPA as part of this ongoing removal action for the current reporting period:

Excavation and Reconstruction

The road leading from the Mill Site to Area 2 was excavated to a depth of 18 inches bgs on September 16. Upon completion of the excavation, a section of road between the Mill Site and Residence 2 was screened with the FPXRF at 9 locations; the average concentrations for mercury and arsenic were 173 mg/kg and 154 mg/kg, respectively. ERRS deployed 400 linear feet of geotextile fabric along this section to provide a physical barrier on the most contaminated section of road. START used the FPXRF to screen 22 additional locations along the road, and the average mercury and arsenic concentrations were 40 mg/kg and 73 mg/kg, respectively. ERRS then placed 1.5 inch diameter rock along the road to suppress dust and prepare for potential precipitation.

Residence 6 is the former location of a burned structure immediately downhill from Residence 2. During the initial phase of the removal action, Residence 6 was the temporary staging area for personal belongings stored in a Conex box along with 3 travel trailers. By September 19, the Conex box and trailers were relocated to Residence 1 to allow for excavation at Residence 6. On September 20, most of Residence 6 was excavated to a depth of 12 to 24 inches which totaled nearly 825 yd^3 of soil, fire bricks and red cobbles. START performed FPXRF screening at approximately 25 locations on the bottom of the excavation, most of which were less than 80 mg/kg for mercury. However, an oval-shaped section of red cobbles approximately the size of a softball was uncovered in the middle of Residence 6. This section, with dimensions of 30 feet by 70 feet, was screened with the FPXRF which identified concentrations of mercury

ranging from 52 – 277 mg/kg. On September 23, START used the Lumex to screen for mercury vapors among the red cobbles, and detected concentrations up to 18,000 ng/m^3 near the ground surface (for reference, the NIOSH REL is 50,000 ng/m^3). The OSC directed ERRS to excavate approximately 5 truckloads (175 yd^3) of the red cobbles and reassess with the Lumex, which identified mercury vapor concentrations of 10,000 ng/m^3. The void space between the red cobbles appeared to be a pathway for mercury vapors, and the depth of the red cobbles was unknown. On the following day ERRS spread 30 bags of 3/8 inch bentonite chips among the red rock to seal the void space until it could be backfilled during the following reporting period.

Excavation in Area 1 continued from September 15 - 26. The depth of excavation ranged from 12 inches bgs along the eastern slope to 60 inches bgs near the toe of the repository. During this period, START performed 10 separate FPXRF screening events at 315 locations in Area 1 to guide the excavation of mine-waste contaminated soil. The average concentration of mercury and arsenic was 171 mg/kg and 25 mg/kg, respectively. The highest concentration of mercury and arsenic was 6,057 mg/kg and 435 mg/kg, respectively. The total volume of mine-waste contaminated soil excavated in Area 1 was 12,400 yd^3.

The excavation of mine-waste contaminated soil throughout the Site was completed by the end of the current reporting period.

ERRS imported over 4,650 yd^3 of gabion rock, 2.5 inch diameter rock, 1 inch diameter rock, and topsoil from Umpqua Quarry as well as nearly 1,500 yd^3 of 1.5 inch diameter rock from Nonpareil Quarry by the end of the reporting period.

Culverts and Erosion Control Measures

On September 18, the weather was overcast and the Site received light rain. Previously the weather on Site was hot and dry. On September 23, ERRS deployed straw bales in drainage channels and placed plastic tarps over piles of clean fill in preparation for a heavy rainstorm predicted the following day. On September 24, ERRS worked a half day shift to limit the generation of mud in the work zones and reduce sedimentation in the drainage channels during the rainstorm. The erosion control measures withstood the downpour without compromise. Specifically, the prior construction of the drainage ditches and the compaction of the repository handled the extraordinary rain event. A record-breaking 1.37 inches of precipitation was received in nearby Roseburg, breaking a record set in 1986 when a mere 0.40 inches fell. Later, on September 26, ERRS began to lay straw and seed to promote revegetation along the eastern sections of Areas 2 and 4.

On September 25, ERRS installed two culverts leading to Area 2; a 12-inch culvert to drain the road leading from the Mill Site and an 18-inch culvert to drain the south section of Area 1. On the following day, a 24-inch culvert was installed from Area 4 across Bonanza Mine Road.

Vehicle Decontamination and Screening

On September 20, START prepared a draft protocol to guide the decontamination and confirmation screening of heavy equipment on Site. The purpose of the protocol was to ensure that bulldozers, haul trucks, excavators, and other equipment used on Site were adequately decontaminated for general use in Level D PPE. The protocol was prepared in response to the decontamination of a 40-ton haul truck which identified persistent concentrations of mercury vapors greater than 1,000 ng/m^3 in the vehicle cab despite multiple iterations of cleaning and screening. The protocol was approved on September 22 by OSC Franklin and OSC Liverman, and the scope was expanded to include Club Cars, Gators, and any other wheeled or tracked vehicles potentially exposed to mine-waste contaminated soil. Later that day the protocol was successfully implemented, and the majority of equipment was sufficiently decontaminated during the first iteration. During the reporting period, a total of three haul trucks, three water trucks, two bulldozers, an excavator, and a vibratory compactor were all decontaminated and screened. In accordance with the protocol, all cabin filters were replaced with the exception of one water truck (inaccessible filter) and the excavator (filter on order).

Additionally, START used the Lumex to screen various work spaces, break areas, and work trucks on September 22. The work spaces were less than 45 ng/m^3, and the work trucks were less than 250 ng/m^3.

Homesite Placement and Utilities

On September 19, David Bussen from Douglas County Planning arrived on Site to assess potential leach field locations. The ideal placement would be in undisturbed soil with level drain pathways and less than 45 degree slope. A possible location was identified north of Residence 1, but it was likely outside the property

boundary. Mr. Bussen returned on September 23 to investigate soil conditions from three test pits. A location near Residence 5 and adjacent to an existing leach field was identified as an ideal candidate. START performed FPXRF screening of soil from this location to confirm that the ground was not contaminated with mercury or arsenic (the concentration of mercury was below instrument detection limits, and the concentration of arsenic was less than 35 mg/kg). Regardless of the final location of the homesites, the leach field will likely be placed near the test pit at Residence 5.

On September 18, ERRS began to install a permanent water line leading from the pump house south of Bonanza Mine Road though Area 4 and into Area 2. ERRS also began to install a trench on the west side of Area 4 for a future communication line.

Screening, Sampling and Laboratory Results

The distribution and concentration of mercury vapors appears to be affected by multiple variables, including temperature, humidity, wind speed, wind direction, Site activities, and proximity to the repository, among other factors. The hillside surrounding the excavated areas, along with the footprints of Residences 1, 2 and 6, may also be a source of mercury vapors.

On September 23, START performed two iterations of Lumex screening for mercury vapors at eleven targeted locations. The first iteration took place at 0800 hours and the second iteration around noon. Near Residences 1, 2, 3 and 6, the ambient concentration of mercury vapor in the early morning was moderately elevated (250 to 1,100 ng/m^3) and tended to decrease by noon (25 – 300 ng/m^3). During previous screening events, the mercury vapor concentrations increased to their highest concentrations in the mid- to late-afternoon, likely as a result of increased air temperature and wind velocity. The repository and/or Mill Site continue to be a likely source of mercury vapors, with concentrations ranging from 2,000 ng/m^3 to 3,000 ng/m^3on September 23. Concentrations greater than 5,000 ng/m^3 have been routinely encountered around the uphill side of the repository during the afternoon hours.

Per request of OSC Liverman, START prepared a draft summary of field screening data from the beginning of Site operations through September 23.

- FPXRF Screening Data
    - Approximately 1,025 FPXRF screenings were performed on Site.
    - The highest concentration of mercury was 9,079 mg/kg, with an average concentration of 263 mg/kg.
    - The highest concentration of arsenic was 1,037 mg/kg, with an average concentration of 66 mg/kg.
- Lumex Screening Data
    - The highest 1-second reading for mercury vapor was 90,000 ng/m^3.
    - The highest 10-second reading for mercury vapor was 54,000 ng/m^3.

On September 19, START received laboratory results for chain-of-custody 10NE-12 which included four soil samples. During the previous reporting period, START conducted confirmation soil sampling from the bottom of the excavations at Residence 1 and Residence 2. The sampling strategy targeted all three sections at Residence 1 and the homesite location at Residence 2; a five point composite soil sample was collected from the bottom of each sample location and homogenized. The FPXRF was used to perform ex-situ screening of the sample prior to submission to an off-Site laboratory on September 11 with 1 week turnaround time. The results from both the laboratory and the ex-situ FPXRF data are included in the following table along with a correlation calculation for arsenic and mercury.

Draft Table 3: Comparison of Ex-Situ FPXRF and Laboratory Data from Residence 1 and Residence 2

Sample Number	Sample Description	Depth	Mercury		Arsenic	
			Ex-Situ	Lab	Ex-Situ	Lab
Concentrations are in mg/kg						

14080208	Residence 1, South	12 inches	162	266	66	63.4
14080209	Residence 1, Middle	24 inches	167	349	110	118
14080210	Residence 1, North	12 inches	89	87.3	144	137
14080211	Residence 2, Homesite	12 inches	79	73.8	51	52.2
		Correlation	0.977		0.989	

Based on laboratory data in Table 3, ERRS placed approximately 3 inches of rock at Residence 1 to provide a physical barrier above the bottom of the excavation.

Repository
During the reporting period, ERRS continued to perform compaction of the repository using a vibratory compactor, bulldozers and haul trucks. The repository was expanded toward the south to overlay pre-existing calcine piles and to accommodate the greater volume of mine-waste contaminated materials. An updated survey of the repository on September 23 provided a revised area of 176,000 square feet.

The ERRS removal manager recommended a combination anchor trench and drainage ditch along the eastern toe of the repository; the opposing hillside was too close to the toe to accommodate both features independent of one another. OSC Franklin and the START project manager discussed the situation with the START engineer, who approved the design modification on September 19. During the current reporting period, ERRS installed the anchor trench surrounding the north, west, and south sides of the repository to a minimum of 3 feet deep by 6 feet wide. The remaining section along the eastern side will be installed to a minimum of 4 feet deep by 6 feet wide to accommodate the drainage channel.

Best Management Practices
Continued to monitor and measure Site conditions and maintain Site BMPs. Continued to deploy the DataRam particulate monitors around the top of the repository, the staging area, and Residence 3. Dust suppression efforts were generally effective, even during the hottest days. For example, the time-weighted average (TWA) of particulates from 9/15 to 9/27 ranged from 0.5 µg/m^3 to 44.4 µg/m^3, which was considerably less than the action level of 1,400 µg/m^3.

Neighboring Properties
Lone Rock Timber Management Company owns a significant portion of property surrounding the Site. On September 19, OSC Franklin contacted Lone Rock via telephone and was granted verbal access to the property in order to take photos of the Site. Lone Rock also informed OSC Franklin that they intend to begin construction of a logging road to begin harvesting timber, and that EPA should anticipate a limited increase in truck traffic along Bonanza Mine Road during the early morning and later afternoon.

Greener Cleanup Best Management Practices
START and ERRS collected and segregated plastic bottles and metals cans for recycling. Air-conditioning was used sparingly during the early mornings in the job trailers at the Site. A Fire Prevention and Suppression Plan established procedures for fire prevention and suppression of fires set indirectly as a result of the response action activities performed at the Site.

Off-Site Support Activities
During the reporting period, OSC Heister devoted considerable time to searching for two replacement trailers throughout the Willamette Valley while OSC Liverman prepared a draft action memorandum amendment and maintenance, monitoring, and repair (MM&R) plan. OSC Liverman also coordinated with ODEQ and Douglas County staffs along with SHPO, USFWS, and tribal staffs regarding final project documents.

2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)

EPA has initiated a PRP search for this Site, and EPA will continue to collect and analyze additional information about mining companies involved with operations at the Site and/or owners of the Site.

2.1.4 Progress Metrics (as of 9/13/14)

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
Commingled mercury waste	Soil and other debris removed using hand tools	(2) 55-gallon drums	-	Macro-encapsulation	RCRA Subtitle C Facility (TBD)
Commingled mercury waste	Soil and other debris removed using Hg recovery vacuum	(1) 5-gallon pail	-	Retirement (sulfide treatment)	TBD

2.2 Planning Section

2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities

2.2.1.2 Next Steps

The following removal activities are expected to occur during the next reporting period (09/28/14 – 10/11/14): decontaminate the remaining excavator; begin to install water line to Residence 5; place backfill in Mill Site; place backfill in Residence 6; haul unscreened topsoil to the repository; spread and compact unscreened topsoil on the repository; prepare to receive the repository liner; continue ditch lines in Area 1 and Area 2; coordinate a survey of the Site boundary; research potential manufactured homes; select new homesite locations; coordinate with utility providers regarding new homesite locations; continue to monitor and measure Site conditions; continue to monitor and maintain Site BMPs; continue to communicate Site activities with representative from the state, the property owner, and the general public.

2.2.2.1 Issues

A Douglas County Sheriff's Deputy informed EPA that hunting season will begin on October 4.

EPA provided ongoing coordination with residents continuing to reside on-Site. On September 24, the EPA, START and ERRS met with Mr. Don Smith, the property landowner, to discuss the possibility of siting the replacement manufactured homes near the EPA command post to reduce the potential for exposure to mercury vapors around the mine site.

2.3 Logistics Section

2.3 Logistics Section

A START engineer was on Site during the week of September 15 – 19. During this time, the engineer verified design and adequacy of erosion control measures, verified design and expansion of the repository to accommodate placement of considerably larger amounts of mine-waste contaminated material, and assisted with delineation of contaminated locations using the FPXRF.

2.5.1 Safety Officer

No respirators were worn on September 24 due to intense rain. Since that date, only personnel working on the repository are wearing respirators. START has been conducting periodic Lumex screening to confirm that mercury vapors are below action levels.

2.4 Finance Section

2.4.1 Narrative

A project ceiling increase will likely be needed because the quantity of mine-waste material is increasingly greater than estimated and there are other lesser unanticipated expenses such as fire preparedness and

suppression and replacement trailer-related electrical and septic requirements.

2.5 Other Command Staff

2.5.1 Safety Officer

Daily safety meetings are held. During each meeting, key personnel review the day's planned activities and any pertinent safety-related issues are highlighted. Personnel are also encouraged to present any particular concern or issues and any recommendation for improvement of project work and/or safety.

During the reporting period, site personnel were downgraded from Level C PPE (with full-face respirator) to Level D PPE based on the results of ongoing air monitoring and sampling.

2.5.2 Liaison Officer

Outreach activities are being addressed by key project personnel on an as needed basis.

2.5.3 Information Officer

See 2.5.2. Additionally, a Community Invovement Coordinator (CIC) has been assigned to the project and is available to also assist with outreach activities on an as needed basis.

3. Participating Entities

3.1 Unified Command

While UC is not established, ODEQ is integrated into the project organization, as appropriate.

3.2 Cooperating Agencies

N/A

4. Personnel On Site

EPA – 1
START – 2
ERRS – 13
ODEQ Western Region – 1 representative performed a Site visit on 9/16.
Douglas County HazMat Team – 5 members performed a Site visit on 9/17.

5. Definition of Terms

N/A

6. Additional sources of information

6.1 Internet location of additional information/report

www.epaosc.org/BonanzaMineandMill

6.2 Reporting Schedule

POLREPs will be prepared about every two weeks to coincide with OSC rotation schedule.

7. Situational Reference Materials

(Reminder - Add certain background documents to the web site)

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Bonanza Mine and Mill - Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region X

Subject:	**POLREP #5** **Bonanza Mine and Mill** **Sutherlin, OR** **Latitude: 43.3899870 Longitude: -123.1845630**
To:	Rick Albright, EPA Region 10 (POLREP List) Anthony Barber, EPA Region 10 (POLREP List) Lori Cohen, EPA Region 10 (POLREP List) Chris Field, EPA Region 10 (POLREP List) John Irrizary, HQ OEM (POLREP LIST) Wally Moon, EPA Region 10 (POLREP List) Calvin Terada, EPA Region 10 (POLREP List)
From:	Dan Heister, On-Scene Coordinator
Date:	10/21/2014
Reporting Period:	9/28/14 – 10/11/14

1. Introduction

1.1 Background

Site Number:	10NE	**Contract Number:**	START 14-06-0006
D.O. Number:	ERRS 0013/030309.0013	**Action Memo Date:**	6/4/2014
Response Authority:	CERCLA	**Response Type:**	Time-Critical
Response Lead:	EPA	**Incident Category:**	Removal Action
NPL Status:	Non NPL	**Operable Unit:**	
Mobilization Date:	8/4/2014	**Start Date:**	8/4/2014
Demob Date:	11/22/2014	**Completion Date:**	11/22/2014
CERCLIS ID:	ORN001001174	**RCRIS ID:**	
ERNS No.:		**State Notification:**	6/4/14
FPN#:		**Reimbursable Account #:**	

1.1.1 Incident Category

Abandoned historical mercury mine and mill.

1.1.2 Site Description

1.1.2.1 Location

The Bonanza Mine and Mill Site is located near the small community of Nonpareil, 6 miles east of Sutherlin, Douglas County, Oregon. The Site is located in the SW ¼ of Section 16 of Township 25 South, Range 4 West, Willamette Meridian (latitude N43° 23'46", longitude W123°10'54").

Except for one former building used as a residence, other mine and mill buildings are no longer present, leaving only the mill concrete foundations, calcine, and waste rock. The mine had 12 adits and more than three miles of subterranean tunnels and shafts. The mine adits have since been abandoned, and no open adits have been located during the 2014 removal action.

Five residences are located close to the mine, including two residences within 200 feet of the former mill. Besides roads and driveways leading to the residences, the land is undeveloped. The nearest off-Site residences are located about a half mile away, to the northeast, along Banks Creek Road.

The Bonanza Mine has an operation history extending from the mid-1860s through 1960. The main mercury-containing mineral is cinnabar, although metacinnabar and native mercury were also reported in the mine workings. Total recorded mercury production was 39,540 flasks (or 3,005,040 pounds).

1.1.2.2 Description of Threat

The data from numerous environmental investigations shows that environmental media are contaminated by elevated concentrations of mercury, arsenic, and other metals, and the source of metals is from historical mercury mining, processing, and disposal operations. Elevated metals concentrations are present in calcine, waste rock, and soil at the former mill site, the surrounding hillside, and valley floor.

1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results

Data regarding the nature and extent of the contaminants of concern found at the Site are summarized below.

1999 – Preliminary Assessment

Ecology and Environment, Inc. (E&E) completed a Preliminary Assessment (PA) of Red Rock Road (Road) for EPA in May 1999. The PA evaluated the potential for exposure to public health and the environment from potential metals contamination associated with the Road. The Road is a former railroad grade approximately 17 miles long that was constructed of calcine from the Bonanza Mine. The amount of material used in construction of the Road is estimated at 316,000 cubic yards (yd^3). As a result of the PA, further investigation was recommended.

2000 - Site Inspection

E&E completed a Site Inspection (SI) of Red Rock Road and surrounding watersheds for EPA in May 2000. As part of this SI, nine surface soil samples were collected from potential source areas at the Bonanza Mine Site, including the former mill, calcine, waste rock, and an abandoned adit. Mercury concentrations in these areas ranged from 74 to 12,000 milligram per kilogram (mg/kg), arsenic concentrations ranged from 71.3 to 246 mg/kg, and lead concentrations ranged from 6.5 to 1,240 mg/kg. The total on-Site volume of calcine was estimated at 2,080 yd^3 and waste rock was estimated at 400 yd^3.

2000 – Removal Assessment

In September 2000, Hart Crowser, Inc. (HC) performed a Removal Assessment (RA) at the former mill site for ODEQ to gather additional data to delineate the extent of metals contamination at the Site. As part of this RA, 31 surface and near-surface soil samples were collected from the former mill site and surrounding hillside. Mercury concentrations ranged from 67.7 to 12,000 mg/kg, arsenic concentrations ranged from 20.3 to 314 mg/kg, and lead concentrations were generally below 70 mg/kg. Calcine, waste rock, and roadway soils also had elevated mercury and arsenic concentrations ranging up to 179 mg/kg and 246 mg/kg, respectively.

One sample each of the former mill soil and calcine were analyzed for mercury speciation. Methyl mercury was detected at 0.03765 mg/kg in soil and 0.00246 mg/kg in calcine. Sequential extraction on soil and calcine indicated that most of the mercury was sulfide-bound, primarily in the form of cinnabar or metacinnabar. Volatile mercury was detected at 2,100 and 2,360 microgram per cubic meter ($\mu g/m^3$).

Water samples were collected from the on-Site well and water storage tank. Arsenic was detected at 0.0536 milligram per liter (mg/L) in a sample collected from the on-Site well and this concentration

exceeds the Federal Maximum Contaminant Level (MCL) of 0.005 mg/L for drinking water. Reportedly, well water is used only for agricultural purposes and not for drinking water. Based on the findings of the removal assessment, the first of two removal actions described in Section 2.1.2 (Response Actions to Date) was performed by ODEQ in 2000 in certain areas to achieve prompt human health risk reduction. Water samples have been collected from the spring water storage tank and have consistently had no detections of mercury and arsenic using standard drinking water analytical methods.

2003 – Site Visit

HC returned to the Site on behalf of ODEQ in 2003 to assess whether ecological receptors and/or exposure pathways were present or potentially present at or in the Bonanza Mine Site and along Foster Creek. Impacts to the Site and surrounding properties attributable to contaminated environmental media were not observed during the Site visit. Physical impacts from historical mining operations included the waste rock pile, mine access roads, and mine excavation. Based on the results of the Oregon Natural Heritage Information Center data search and information from the Oregon Department of Fish and Wildlife, HC concluded that there is a possibility that rare, threatened, and endangered species may be present at or near the Site.

2005 – Post-Removal Assessment Report

HC compiled and assessed available information for the Bonanza Mine in 2005 to assist in preparation of a forthcoming Remedial Investigation (RI) Work Plan. This report also developed a preliminary conceptual site model (CSM) for both human and ecological receptors at the Site and identified tasks to be performed during the RI to address data gaps. Volatile mercury was measured in soil from the former mill and calcine. No other environmental media samples were collected as part of this activity. The RI Work Plan has not yet been prepared.

2013 – Soil Assessment

In December 2013, ODEQ screened 118 soil samples using a field portable X-Ray fluorescence spectrometer (FPXRF) to gather additional data to identify those areas where soil concentrations are below a site-specific background concentration for arsenic and a residential risk-based concentration for mercury. Nine discrete soil samples were also collected and sent off-Site for laboratory analysis. The results of this assessment indicated that arsenic and mercury contamination is more widespread in the northern portion of the property than previously anticipated. The results also showed that arsenic and mercury contamination extends into the southern portion of the Site near two existing residences.

2. Current Activities

2.1 Operations Section

2.1.1 Narrative

2.1.2 Response Actions to Date

2.1.2.a The following removal actions have been undertaken by the Oregon Department of Environmental Quality (ODEQ) in the past:

2000 – Removal Action

Based on the findings of the 2000 HC RA, HC performed a removal action at the former mill site for ODEQ from 14 through 29 September 2000. The objective of this action was to provide prompt risk reduction by excavating soil exceeding 230 mg/kg mercury in the mill area, and for arsenic and lead the cleanup goals were 50 mg/kg and 400 mg/kg, respectively. Eight yd^3 of soil were excavated from the mill furnace area, and this material was transported off-Site for disposal as hazardous waste. Approximately 240 yd^3 of mercury-contaminated soil was excavated from the mill area and placed in a lined and covered temporary storage cell near the base of the waste rock pile. This material was removed from the Site in April 2004 and transported off-Site for disposal. Larger debris such as concrete, firebrick, and a metal furnace were placed in a subsurface vault located at the former mill site. Disturbed areas were restored, as closely as possible, to the original site conditions.

Confirmation soil samples were collected after the removal action. A few samples exceeded the mercury cleanup goal (up to 6,400 mg/kg); however, these sample areas are beneath two to six feet of clean material. Characterization samples collected from the surrounding hillside, calcine, waste rock pile, roads, driveways, and cell base had mercury concentrations ranging from 1.53 to 220 mg/kg. Four samples with greater than 230 mg/kg mercury were from the mine adit (306 mg/kg), the temporary repository (500 mg/kg), an area south of the former mill (930 mg/kg), and a small area where free mercury was observed (5,100 mg/kg).

2014 – Removal Action

NRC Environmental, with technical support and documentation from APEX, performed a second removal action at the Site for ODEQ in February 2014. The objective of this action was to achieve prompt human health risk reduction by removing and capping soil in certain inhabited areas of the Site that were impacted by elevated concentrations of mercury and arsenic. At the time this removal action was performed, the contaminants of concern were mercury and arsenic, and the cleanup goals were 23 mg/kg and 17 mg/kg, respectively.

Prior to implementation of the removal action, FPXRF screening was performed at 118 points scattered across the Site. Arsenic ranged from non-detect to 471 parts per million (ppm), and mercury concentrations ranged from non-detect to 1,200 ppm. Using this information, six areas were identified that had arsenic or mercury concentrations above the cleanup goals. During conduct of the removal action (12 through 21 February 2014) and follow-up site visit (12 March 2014), 39 additional data points were collected from across the Site with the purpose of better understanding the metals distribution across the Site. Arsenic concentrations in these points ranged from non-detect to 81 ppm, and mercury concentrations ranged from non-detect to 459 ppm. The results indicated that the mine-waste contamination from the mill site area is more widespread than previously anticipated, including contamination encountered near two existing home sites.

The largest areas of contaminated soil encompass about 16 acres, including the original mill site and calcine pile. ODEQ determined that these areas could not be excavated at this time due to resource constraints. Temporary fencing and gates were installed to restrict access to certain areas and the existing blackberry vegetation restricting access to Area 4 was left undisturbed. Approximately 60 yd^3 of contaminated soil and firebrick were excavated from the smaller areas, and this material was placed in a temporary cell near the base of the waste rock pile where it remains. Disturbed areas were restored, as closely as possible, to the original site conditions.

2.1.2.b. The following removal actions have been undertaken by EPA as part of this ongoing removal action for the current reporting period:

Excavation and Reconstruction
ERRS continued to excavate drainage channels in Area 1 and Area 2 along with the anchor trench around the toe of the repository.

ERRS placed 40 bags of powdered bentonite at Residence 6 to fill void space between large cobbles that were previously identified as pathways for mercury vapors. The void space was backfilled using clay excavated from the anchor trench in Area 1. A layer of 6 inch sub-base was then placed throughout Residence 6 to level the area on October 11.

On October 8, ERRS placed topsoil around the trees at Residence 1. Soil from the anchor trench in Area 1 was used to level the south section, and shale rock from Residence 2 was used to level the north section. An additional layer of 2.5 inch minus rock imported from Umpqua Quarry was then placed throughout Residence 1.

During previous reporting periods, approximately 5,200 yd^3 of mine-waste contaminated material was excavated at the mill site. During the current reporting period, the mill site was backfilled with 4,600 yd^3 of soil excavated from Residence 2 and smaller quantities of jaw rock and excavated soil in Area 1 and Area 2. The mill site was then covered with a thin layer of topsoil and seeded.

Erosion Control Measures
ERRS placed weed-free seed and straw along the eastern section of Area 1 to promote revegetation of

the hillside. The drainage ditches in Area 1, Area 2, and Area 4 were lined with gabion rock for erosion control.

Vehicle and Equipment Decontamination and Screening
On October 2, the 336 CAT excavator was decontaminated and screened with the Lumex mercury vapor analyzer in accordance with the protocol developed during the previous reporting period. Both cab filter and the engine filter were replaced. This was the last piece of heavy equipment that required decontamination. Later that day, the ERRS mercury vacuum was decontaminated and screened with the Lumex. In general, the vacuum was less than 100 ng/m^3 with the exception of a few components that were consistently greater than 5,000 ng/m^3; these components were discarded in the repository and will be replaced upon demobilization from the Site.

Homesite Placement and Utilities
ERRS continued to install water line and phone conduit to Residence 4 and Residence 5. CenturyLink placed communication cable from the southwest corner of Area 4 to near Residence 4. The mini-excavator began to install a utility trench leading up the road near Area 2 toward Residence 1.

On September 29, OSC Liverman contacted START to request a survey of the property boundary to assist with the positioning of the replacement manufactured homes and identify potential borrow sources of clean fill. START arranged for a surveyor to identify all corners of the property and flag approximate 100 foot intervals along the northern and southern boundaries. The survey was scheduled for October 11 – 14 during the following reporting period.

On October 8, ODEQ was informed of EPA's decision to place the manufactured homes at Residence 1 and Residence 6. The decision was based on an analysis of Site circumstances, including but not limited to the location of the former mill, the volume of mine-waste contaminated material excavated from and replaced with clean backfill at both locations (and elsewhere on Site), ambient construction-related screening data using field instruments such as the Lumex mercury vapor analyzer, and homeowner preference. OSC Heister discussed this decision in greater detail on the following day when ODEQ Bryn Thoms and two representatives from the Oregon Health Authority visited the Site.

Screening, Sampling and Laboratory Results
As mentioned during previous PolReps, the distribution and concentration of mercury vapors on Site appears to be affected by multiple variables including temperature, humidity, wind speed, wind direction, Site activities, and proximity to the repository, among other factors. The hillside surrounding the excavated areas, along with the footprints of Residences 1, 2 and 6 were also considered potential sources of mercury vapors. In early October, START and OSC Heister decided to assess the influence of the repository by performing Lumex mercury vapor screening both before and after the repository was completely covered with a 6 inch layer of clean compacted topsoil.

The results in draft Table 4 were collected when the repository was only partially (25%) covered with compacted topsoil. All concentrations were less than the ATSDR standard for the normal occupancy recommendation in residential settings (1,000 ng/m^3), although the concentrations at some of the locations were within 20% of the standard.

Draft Table 4: Repository only partially covered on 10/4.

Location	Date	Time	Mercury Vapor (ng/m3)
Residence 1A	4-Oct-14	Morning	620
	4-Oct-14	Noon	112
	4-Oct-14	Afternoon	28
Residence 1B	4-Oct-14	Morning	91
	4-Oct-14	Noon	54
	4-Oct-14	Afternoon	13
Residence 1C	4-Oct-14	Morning	11

	4-Oct-14	Noon	23
	4-Oct-14	Afternoon	31
Residence 2A	4-Oct-14	Morning	267
	4-Oct-14	Noon	210
	4-Oct-14	Afternoon	164
Residence 2B	4-Oct-14	Morning	277
	4-Oct-14	Noon	241
	4-Oct-14	Afternoon	338
Residence 6A	4-Oct-14	Morning	54
	4-Oct-14	Noon	208
	4-Oct-14	Afternoon	27
Residence 6B	4-Oct-14	Morning	41
	4-Oct-14	Noon	122
	4-Oct-14	Afternoon	72
Mill Site	4-Oct-14	Morning	673
	4-Oct-14	Noon	106
	4-Oct-14	Afternoon	838

The results in draft Table 5 were collected after the repository was completed covered with 6 inches of compacted topsoil. All concentrations were well below the ATSDR standard for the normal occupancy recommendation in residential settings (1,000 ng/m^3), notably the mill site which had elevated concentrations greater than 24,000 ng/m^3 during previous reporting periods. Based on the results from this limited screening event, it appears that the repository was likely a significant source of mercury vapors during the 2014 removal action.

Draft Table 5: Repository covered with 6 inches of soil by 10/7.

Location	Date	Time	Mercury Vapor (ng/m3)
Residence 1A	7-Oct-14	Afternoon	13
	8-Oct-14	Morning	339
	8-Oct-14	Mid-Morning	23
	8-Oct-14	Noon	15
	8-Oct-14	Afternoon	10
	9-Oct-14	Morning	30
Residence 1B	7-Oct-14	Afternoon	3
	8-Oct-14	Morning	432
	8-Oct-14	Mid-Morning	18

	8-Oct-14	Noon	60
	8-Oct-14	Afternoon	20
	9-Oct-14	Morning	98
Residence 1C	7-Oct-14	Afternoon	8
	8-Oct-14	Morning	160
	8-Oct-14	Mid-Morning	25
	8-Oct-14	Noon	13
	8-Oct-14	Afternoon	11
	9-Oct-14	Morning	88
Residence 6A	7-Oct-14	Afternoon	5
	8-Oct-14	Morning	81
	8-Oct-14	Mid-Morning	41
	8-Oct-14	Noon	28
	8-Oct-14	Afternoon	20
	9-Oct-14	Morning	112
Residence 6B	7-Oct-14	Afternoon	60
	8-Oct-14	Morning	83
	8-Oct-14	Mid-Morning	46
	8-Oct-14	Noon	10
	8-Oct-14	Afternoon	27
	9-Oct-14	Morning	189
Mill Site	7-Oct-14	Afternoon	120
	8-Oct-14	Morning	247
	8-Oct-14	Mid-Morning	NA
	8-Oct-14	Noon	NA
	8-Oct-14	Afternoon	NA
	9-Oct-14	Morning	167

Repository

During the current reporting period, ERRS continued to perform compaction of the repository using a vibratory compactor, bulldozers and haul trucks. The repository was expanded toward the south to overlay pre-existing calcine piles and to accommodate the greater volume of mine-waste contaminated material. The compaction of the mine-waste contaminated material at the repository was completed on September 29. ERRS began to place unscreened topsoil on the repository on October 3. The topsoil was

compacted to a depth of approximately 6 inches using the bulldozer and by October 7 the entire repository had been covered with topsoil. On October 10, ERRS removed windrows, sharp sticks and rocks from the compacted topsoil and smoothed the edges of the repository using the mini-excavator in preparation for deploying the liners during the following reporting period.

Twelve rolls of 40-millimeter (mil) low-density polyethylene (LDPE) were delivered on October 7 and staged in Area 1; each roll is 16,300 ft^2. This liner will be in direct contact with the compacted topsoil. A second liner composed of 200-mil geotextile composite will be delivered during the next reporting period. Ultimately, the geotextile composite will be placed above the LDPE liner and underneath a soil cap to create a pathway for infiltrated groundwater.

Best Management Practices
Continued to monitor and measure Site conditions and maintain Site BMPs. Continued to deploy the DataRam particulate monitors around the top of the repository, the staging area, and Residence 3. Dust suppression efforts were effective, especially as the daily temperatures decreased and relative humidity increased.

Off-Site Support Activities
During the reporting period, OSC Heister devoted considerable time to searching for two replacement trailers throughout the Willamette Valley while OSC Liverman prepared a draft action memorandum amendment and maintenance, monitoring, and repair (MM&R) plan. OSC Liverman also coordinated with ODEQ and Douglas County staffs along with SHPO, USFWS, and tribal staffs regarding final project documents.

2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)
EPA has initiated a PRP search for this Site, and EPA will continue to collect and analyze additional information about mining companies involved with operations at the Site and/or owners of the Site.

2.1.4 Progress Metrics (as of 10/11/14)

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
Commingled mercury waste	Soil and other debris removed using hand tools	(2) 55-gallon drums	-	Macro-encapsulation	RCRA Subtitle C Facility (TBD)
Commingled mercury waste	Soil and other debris removed using Hg recovery vacuum	(1) 5-gallon pail	-	Retirement (sulfide treatment)	TBD

2.2 Planning Section

2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities

2.2.1.2 Next Steps
The following removal activities are expected to occur during the next reporting period (10/12/14 – 10/25/14): obtain weed-free straw; add 1 inch rock at Residence 1; continue to develop Residence 6; continue to excavated utility trenches; survey the property boundary; receive results from the second liner test and recalculate acceptable soil cap thickness for the repository; perform additional screening with the Lumex mercury vapor analyzer; receive 200-mil geotextile liner; deploy both liners on the repository; backfill the anchor trenches and begin covering the liners with soil; identify on-Site borrow sources for soil cap; demolish and reconstruct pumphouse; coordinate the inspection and purchase of the replacement manufactured homes; coordinate with utility providers regarding homesite locations; continue to monitor and measure Site conditions; continue to monitor and maintain Site BMPs; continue to communicate Site activities with representative from the state, the property owner, and the general public.

2.2.2.1 Issues
A Douglas County Sheriff's Deputy informed EPA that hunting season began on October 4.

During the previous reporting period, EPA met with Mr. Don Smith, the property landowner, to discuss the possibility of siting the replacement manufactured homes near the EPA command post. During the current reporting period, OSC Heister informed Mr. Smith that the homes would be placed at Residence 1 and Residence 6. Mr. Smith expressed his satisfaction with this decision.

2.3 Logistics Section

2.3 Logistics Section
The ERRS response manager proposed a reduced soil cap on the repository of 12 inches (the original design included a 24 inch cap). On October 7, a START engineer was consulted on the proposal, and he requested the results of two liner tests to reassess the cap thickness. Although the data from one of the tests was received on October 9, the results from the second test were not received by the end of the current reporting period.

2.5.1 Safety Officer
Operation of the vibratory compactor near the anchor trench should be performed with caution to reduce potential collapse of the sidewall. Poison oak has been identified throughout the Site, and both ERRS and START members have had limited exposures to the irritating effects of the plant.

2.4 Finance Section

2.4.1 Narrative
A project ceiling increase will likely be needed because the quantity of mine-waste material is increasingly greater than estimated and there are other lesser unanticipated expenses such as fire preparedness and suppression and replacement trailer-related electrical and septic requirements.

2.5 Other Command Staff

2.5.1 Safety Officer
Daily safety meetings are held. During each meeting, key personnel review the day's planned activities and any pertinent safety-related issues are highlighted. Personnel are also encouraged to present any particular concern or issues and any recommendation for improvement of project work and/or safety.

During the reporting period, site personnel were in Level D PPE based on the results of ongoing air monitoring and/or sampling.

2.5.2 Liaison Officer
Outreach activities are being addressed by key project personnel on an as needed basis.

2.5.3 Information Officer
See 2.5.2. Additionally, a Community Involvement Coordinator (CIC) has been assigned to the project and is available to also assist with outreach activities on an as needed basis.

3. Participating Entities

3.1 Unified Command
While UC is not established, ODEQ is integrated into the project organization, as appropriate.

3.2 Cooperating Agencies
N/A

4. Personnel On Site

EPA – 1
START – 1
ERRS – 13
ODEQ Western Region – 1 representative performed a Site visit on 10/9.

OHA – 2 representatives performed a Site visit on 10/9.

5. Definition of Terms

N/A

6. Additional sources of information

6.1 Internet location of additional information/report

www.epaosc.org/BonanzaMineandMill

6.2 Reporting Schedule

POLREPs will be prepared about every two weeks to coincide with OSC rotation schedule.

7. Situational Reference Materials

No information available at this time.

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Bonanza Mine and Mill - Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region X

Subject:	**POLREP #6** **Bonanza Mine and Mill** **Sutherlin, OR** **Latitude: 43.3899870 Longitude: -123.1845630**
To:	Rick Albright, EPA Region 10 (POLREP List) Anthony Barber, EPA Region 10 (POLREP List) Lori Cohen, EPA Region 10 (POLREP List) Chris Field, EPA Region 10 (POLREP List) John Irrizary, HQ OEM (POLREP LIST) Wally Moon, EPA Region 10 (POLREP List) Calvin Terada, EPA Region 10 (POLREP List)
From:	Earl Liverman & Richard Franklin, On-Scene Coordinators
Date:	11/14/2014
Reporting Period:	10/12/14 - 11/9/14

1. Introduction

1.1 Background

Site Number:	10NE	**Contract Number:**	START 14-06-0006
D.O. Number:	ERRS 0013/030309.0013	**Action Memo Date:**	6/4/2014
Response Authority:	CERCLA	**Response Type:**	Time-Critical
Response Lead:	EPA	**Incident Category:**	Removal Action
NPL Status:	Non NPL	**Operable Unit:**	
Mobilization Date:	8/4/2014	**Start Date:**	8/4/2014
Demob Date:	11/22/2014	**Completion Date:**	11/22/2014
CERCLIS ID:	ORN001001174	**RCRIS ID:**	
ERNS No.:		**State Notification:**	6/4/14
FPN#:		**Reimbursable Account #:**	

1.1.1 Incident Category

Abandoned historical mercury mine and mill.

1.1.2 Site Description

1.1.2.1 Location

The Bonanza Mine and Mill Site is located 6 miles east of Sutherlin, Douglas County, Oregon.

1.1.2.2 Description of Threat

Elevated concentrations of mercury, arsenic, and other metals from historical mercury mining operations.

For additional information and details, please see PolReps 1 through 5.

1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results
Data regarding the nature and extent of the contaminants of concern found at the Site include elevated levels or mercury, arsenic, and other metals in soils, mill tailings, road surfaces, and other media. For additional information and details please refer to PolReps 1 through 5.

2. Current Activities

2.1 Operations Section

2.1.1 Narrative

2.1.2 Response Actions to Date

2.1.2.a Removal actions were undertaken by the Oregon Department of Environmental Quality (ODEQ) in 2000 and 2014. For additional information and details please see PolReps 1 through 5.

2.1.2.b. The following removal actions have been undertaken by EPA as part of this ongoing removal action for the first phase of the current reporting period: **October 12 - 25, 2014.**

The primary activities during this period included the following tasks:

- Accept delivery of nearly 5 acres of 40-millow-density polyethylene (LDPE) geomembrane liner and 200-mil geonet liner to cover repository.
- Receive results from an off-site geotechnical laboratory regarding sheer tests for the liner material and recalculate acceptable soil cap thickness for the repository.
- Survey the site boundary to assist with the placement of two manufactured homes and identify potential borrow sources of clean fill to cover the on-site repository.
- Utilize a borrow source of up to 20,000 cubic yards of clean fill adjacent to the EPA command post to cover the on-site repository.
- Excavate utility trenches leading to Residence 1 and Residence 6 homesites.
- Perform additional screening with the Lumex mercury vapor analyzer at Residence 1, Residence 6, and the mill site to continue to assess ambient mercury vapors on site.
- Deploy both the geomembrane liner and 200-mil geonet liner on the repository.
- Begin to place the soil cap on the repository.
- Demolish and reconstruct the pumphouse south of Area 4.
- Coordinate the inspection and purchase of the replacement manufactured home at the Residence 6 homesite.
- Continue to search for a suitable replacement manufactured home at the Residence 1 homesite.

From October 13 to 16, the START subcontract surveyor, Centerline Concepts, performed a survey of the site boundary. The purpose of the survey was to assist with potential placement locations for the two manufactured homes and identify potential on-site borrow sources for the repository soil cap.

On October 13, the START PM and ERRS RM used the Lumex mercury vapor instrument to screen ambient mercury vapors at Residence 1, Residence 2, Residence 6, and the mill site; all locations were less than 100 ng/m^3 which was markedly less than the NIOSH REL of 50,000 ng/m^3 and the ATSDR level for normal occupancy of 1,000 ng/m^3.

Rain showers and wet site conditions resulted in intermittent delays during the operation period. The final deployment of the DataRam particulate monitors occurred on October 13 because the repository was fully covered with clean soil and the airborne threat of arsenic and mercury particulates was mitigated. In addition, the DataRams cannot be deployed during rain showers.

ERRS continued to add subgrade and wearing course material to Residence 1 and Residence 6 to prepare for the replacement manufactured homes. The haul road leading from Area 2 to the mill site was reinforced to accommodate haul trucks carrying borrow source material to the top of the repository.

On October 15, EPA received results from an off-site geotechnical laboratory regarding sheer tests for the liner material. A START engineer then assessed a proposal to potentially decrease the soil cap thickness of the repository from 24 inches to 12 inches based on the availability of on-site borrow

material. Although the revised repository specifications allowed for the shallow soil cap, the eventual soil cap thickness did not change from the original design.

On October 16, the first section of geomembrane liner was placed on the repository. By the end of the day, approximately 75% of this liner was deployed including fusion of the seams using a propriety heat gun. The following day, the geonet liner was deployed on top of the geomembrane (it rained overnight, and the remaining section of geomembrane liner could not be deployed because the seams needed to be dry in order to be fused). ERRS began to excavate soil from the borrow source on October 18 to place in the upper anchor trenches to secure the liners and by mid-day October 19, both liners had been completely deployed. ERRS continued to place borrow material on the repository for the next three weeks until it was completely covered with 24 inches of soil.

The pumphouse located south of Area 4 was in disrepair and infested with rodents. EPA directed ERRS to demolish the pumphouse and replace it with a new weather-resistant pumphouse, which occurred on October 17.

The local power company and communications provider visited the site on October 17 to assess reconnection of services for Residence 1 and Residence 6. The power company confirmed that the current power poles were sufficient, and the transformers did not need to be moved or replaced. However, an additional service pole would still need to be from the power pole by an ERRS subcontractor during a future reporting period to connect Residence 6 to the power pole. On October 23, a representative from the communications provider arrived on site to install phone line from Area 2 to Residence 6.

On October 25, the ERRS RM completed the purchase of a 2 bedroom, 2 bathroom replacement manufactured home for the Residence 6 homesite. It was delivered to the site during the following reporting period. The search for the final replacement manufactured home continued.

2.1.2.c. The following removal actions have been undertaken by EPA as part of this ongoing removal action for the second phase of the current reporting period: **October 27 - November 9, 2014.**

The primary activities during this period included the following tasks:

- Completion of the repository soil cover.
- Installation of the upper repository run-on control ditch, the repository side perimeter ditches, and other armored drainage channels on the site.
- Construction of the repository toe drain and toe surface drainage channel.
- Placement of a manufactured home at Residence 6.
- Installation of the shared septic system drain field, and placement of septic tanks at Residence 6 and Residence 1.
- Grading, reclamation, and surface restoration of disturbed areas.
- Maintenance of the site roadways during construction activities.

Rain showers and wet site conditions resulted in intermittent delays during operation period. Task scheduling was assessed daily based on current conditions and weather forecasts in consideration of site safety, and to avoid damage to the site from working in unsuitable conditions. ERRS hauled cover soil from the on-site borrow source west of the command post, and placed the soil on the repository. The soil was transported to the repository using two articulated haul trucks, dumped onto the previously placed cover soil, and pushed over the geomembrane/geonet liner system with a low-ground pressure dozer in an approximately 30 to 36-inch lift. Cover soil was placed on the liner system starting from the bottom of the repository slope in approximately 50-foot wide section, and then placed progressively upward over the liner until covering to the top of the slope. As each section was completed, the fill operation was shifted to the adjacent sections to the northwest, again placing cover soil starting from the bottom of the slope and working upward. The sections of cover soil were compacted using a smooth-drum roller compactor, in a single, full-thickness lift.

On November 1, 2014, tension and three seam separations were noted in the geonet liner sections in northeastern portion of the repository. No damage or stretched areas of the underlying geomembrane material was observed during inspection of the separated seams. Separated seams were covered with non-woven geotextile to prevent direct contact of cover soil and geomembrane, and to prevent sediment migration into the geonet. Cracks were noted in the surface of the compacted cover soil in the northeastern portion of the repository. The cracks were oriented in a North-South direction, 45-degrees

from the up-down slope direction. The cracks were more prevalent in the upper two thirds of the slope, but also occurred near the lower portion of the slope. ERRS elected to fill in the toe drain trench with soil as a preventative measure to buttress slope soils. The toe trench was covered over with borrow soil, and compacted using the roller compactor.

Additional work on the repository cover soil was postponed for several days due to rainy weather and unfavorable soil conditions. The repository soil cover was completed on November 5, 2015. Due to project time and budget constraints, and limited availability of suitable import top soil, the 6-inch top soil was omitted and additional borrow soil was included to serve as the final surface cover. During a later work phase, prior to placing slash, seed, and straw, and a fertilizer soil amendment will be added to improve vegetation growing conditions. A START subcontract surveyor, Centerline Concepts, conducted a repository surface topographical survey on November 7, 2014. The surveyor also located and marked the soil-backfilled repository toe drain trench.

The upper repository run-on control ditch and the southern side drainage channel, were constructed by shaping the drainage features in the fill soil, and armoring the bottom and sides with 4 to 8-inch rock. The northeastern 30-foot segment of the run-on control ditch will be completed later, to allow for construction equipment access during slash placement.

A replacement manufactured home for Residence 6 was transported to the site on October 31, 2014. The home was moved to its final location by the moving contractor using a remote controlled tractor. Positioning the unit into the Residence 6 driveway required ERRS to add road material at the intersection to allow trailer clearance. On November 3, 2014 an ERRS subcontractor installed the vapor barrier, support blocks, and hurricane straps. Additional installation tasks for Residence 6 manufactured home were conducted between November 3 through November 9, 2014. ERRS installed front and rear steps, roof gutters and downspouts, and made roof repairs. The electrical subcontractor installed a power service pole and meter at Residences 1 and 6. START conducted a mercury air monitoring survey in each room of the Residence 6 manufactured home using the Lumex mercury vapor analyzer. No elevated mercury readings were seen. Remaining tasks for Residence 6 include power, telephone, and water utility connections, and installation of the trailer skirting. A replacement manufactured home for Residence 1 was identified by EPA. The purchase closing is expected to occur on November 12, and transportation to the Site on November 20, 2014.

ERRS' septic system subcontractor, Randy Arts Excavating, prepared and installed the drain field and leach lines northeast of Bonanza Mine Road, south of Area 4. The excavation and backfilling was done during times of dry weather during the operational period, and was completed on November 8, 2014. A septic tank was installed at Residence 6 on November 6, 2014, and at Residence 1 on November 8, 2014. Each tank was filled with water the day of installation.

After removing the soil needed for the repository cover, ERRS began reclaiming the soil borrow source west of the command post. Slopes were blended to the surrounding topography, and the drainage swale toward the northeast was reestablished. The excavator operator dispersed slash over the bare slopes. On November 7, 2014 and a hand crew placed seed and straw in this area and around the periphery of the command post.

Other work accomplished during this operation period included maintain the roadways by removing mud and placing rock as required to accommodate construction traffic and to reduce sediment run off. Bare areas, including the Former Mill Site, road shoulders, and banks were seeded and covered with straw.

On November 10, 2014 the repository was track-walked and back-bladed with a LGP bulldozer to remove surficial erosion rills and texture the surface. A 16:16:1 fertilizer pellet blend was applied to the soil surface, and a turf grass seed mix was broadcast over the repository. The slash that was preserved and stockpiled from the initial repository area preparation was distributed over the repository surface using the mini-excavator.

2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)
EPA has initiated a PRP search for this Site.

2.1.4 Progress Metrics (as of 11/10/14)

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
			-	Macro-encapsulation	

Commingled mercury waste	Soil and other debris removed using hand tools	(2) 55-gallon drums			RCRA Subtitle C Facility (TBD)
Commingled mercury waste	Soil and other debris removed using Hg recovery vacuum	(1) 5-gallon pail	-	Retirement (sulfide treatment)	TBD
Mercury soil waste	Soil and other debris	(2) 55-gallon drums	007851712 FLE		Bethlehem Apparatus Co.
Mercury wood debris	Soil, wood, and other debris	(2) 55-gallon drums	007851711 FLE		Clean Harbors Grassy Mountain

2.2 Planning Section

2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities

2.2.1.2 Next Steps

The following removal activities are expected to occur during the next reporting period (11/11/14 – 12/6/14): Complete the repository soil cover seeding, straw, and slash placement. Install the southern portion of the repository toe drain trench.Install the septic effluent lines between residences and drain field.Complete the purchase of Residence 1 mobile home and transport and place at the home site. Connect water, power, phone, and septic drain utilities to Residence 1 and 6 mobile homes. Final grading and finishing of site roadways. Complete drainage channels in Area 1. Continue to communicate Site activities with representative from the state, the property owner, and the general public. Complete a draft of the Maintenance, Monitoring, and Repair document.

2.2.2.1 Issues

2.3 Logistics Section

2.3 Logistics Section

2.5.1 Safety Officer

Heavy rains have added additional hazards to the removal work, including wet road and soil surfaces and increased risk of vehicle and equipment accidents, and added risk of trench collapse. Construction crew has discussed hazards during daily safety meetings, and have rescheduled some site activities to occur during more favorable conditions.

2.4 Finance Section

2.5 Other Command Staff

2.5.1 Safety Officer

Daily safety meetings are held. During each meeting, key personnel review the day's planned activities and any pertinent safety-related issues are highlighted. Personnel are also encouraged to present any particular concern or issues and any recommendation for improvement of project work and/or safety.

During the reporting period, site personnel were in Level D PPE based on the results of previous air monitoring and/or sampling.

2.5.2 Liaison Officer
Outreach activities are being addressed by key project personnel on an as needed basis.

2.5.3 Information Officer
See 2.5.2. Additionally, a Community Involvement Coordinator (CIC) has been assigned to the project and is available to also assist with outreach activities on an as needed basis.

3. Participating Entities

3.1 Unified Command
While UC is not established, ODEQ is integrated into the project organization, as appropriate.

3.2 Cooperating Agencies
N/A

4. Personnel On Site

EPA – 1
START – 1
ERRS – 11

5. Definition of Terms

N/A

6. Additional sources of information

6.1 Internet location of additional information/report
www.epaosc.org/BonanzaMineandMill

6.2 Reporting Schedule
POLREPs will be prepared about every two to four weeks.

7. Situational Reference Materials

No information available at this time.

U.S. ENVIRONMENTAL PROTECTION AGENCY
POLLUTION/SITUATION REPORT
Bonanza Mine and Mill - Removal Polrep
Final Removal Polrep

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region X

Subject:	**POLREP #7** **Final PolRep** **Bonanza Mine and Mill** **Sutherlin, OR** **Latitude: 43.3899870 Longitude: -123.1845630**
To:	Rick Albright, EPA Region 10 (POLREP List) Anthony Barber, EPA Region 10 (POLREP List) Lori Cohen, EPA Region 10 (POLREP List) Chris Field, EPA Region 10 (POLREP List) John Irrizary, HQ OEM (POLREP LIST) Wally Moon, EPA Region 10 (POLREP List) Calvin Terada, EPA Region 10 (POLREP List)
From:	Earl Liverman, On-Scene Coordinator
Date:	2/3/2015
Reporting Period:	November 10 to December 6, 2014

1. Introduction

1.1 Background

Site Number:	10NE	**Contract Number:**	START 14-06-0006
D.O. Number:	ERRS 0013/030309.0013	**Action Memo Date:**	6/4/2014
Response Authority:	CERCLA	**Response Type:**	Time-Critical
Response Lead:	EPA	**Incident Category:**	Removal Action
NPL Status:	Non NPL	**Operable Unit:**	
Mobilization Date:	8/4/2014	**Start Date:**	8/4/2014
Demob Date:	12/6/2014	**Completion Date:**	12/6/2014
CERCLIS ID:	ORN001001174	**RCRIS ID:**	
ERNS No.:		**State Notification:**	6/4/14
FPN#:		**Reimbursable Account #:**	

1.1.1 Incident Category

Abandoned historical mercury mine and mill.

1.1.2 Site Description

1.1.2.1 Location

The Bonanza Mine and Mill Site is located 6 miles east of Sutherlin, Douglas County, Oregon.

1.1.2.2 Description of Threat
Elevated concentrations of mercury, arsenic, and other metals from historical mercury mining operations. For additional information and details, please see PolReps 1 through 6.

1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results
Data regarding the nature and extent of the contaminants of concern found at the Site include elevated levels or mercury, arsenic, and other metals in soils, mill tailings, road surfaces, and other media. For additional information and details please refer to PolReps 1 through 6.

2. Current Activities

2.1 Operations Section

2.1.1 Narrative

2.1.2 Response Actions to Date

2.1.2.a Removal actions were undertaken by the Oregon Department of Environmental Quality (ODEQ) in 2000 and 2014. For additional information and details please see PolReps 1 through 6.

2.1.2.b. The following removal actions have been undertaken by EPA as part of this ongoing removal action for the current reporting period: **November 10 - December 6, 2014**

The primary activities during this period included the following tasks:

- Completion of the repository soil cover to include final seed, straw, and slash placement.
- Installation of the southern portion of the repository toe drain trench.
- Installation of the septic effluent lines between the residences and the drain field.
- Completion of drainage channels in Area 1.
- Finalization of the purchase of manufactured home located in Klamath Falls.
- Transportation and placement of Klamath Falls manufactured home at Residence 1.
- Connection of water, power, and phone utilities to both residences.
- Completion of Maintenance, Monitoring, and Repair (MM&R) plan.
- Demobilization of work trailers and other equipment from the site.
- Demobilization of EPA, START and ERRS personnel from the site.
- Perform final grading, reclamation, and surface restoration of disturbed areas.

Rain showers and wet site conditions resulted in intermittent delays during the current operational period. Task scheduling was assessed daily based on current conditions and weather forecasts in consideration of site safety, and to avoid damage to the site from working in unsuitable conditions. The work crews were not on site during the week of November 23 – 30 in recognition of the Thanksgiving holiday.

ERRS used the bulldozer to trackwalk the repository slope to create texture prior to application of pellet fertilizer and turfgrass seed mix. Slash was placed on the repository cover for erosion control using the mini-excavator. The excavator placed logs perpendicular to the slope and dispersed stumps, light slash, and brushweed in-between the logs.

The southern toe of the repository was reshaped and connected to the anchor trench. A START engineer was on site to observe and document the installation of a French drain along a select section of the southern toe. The engineer also met with the EPA OSC and ERRS RM to discuss and optimize drainage features on the north side of the repository near the Mill Site, former Residence 2, and Residence 6.

On November 12, OSC Franklin met with Mr. Smith to review restoration efforts on the borrow source area located behind the work trailers. The property owner expressed satisfaction with the restoration which included grading, seeding, and placement of slash and straw.

The septic system was completed during the operational period. The mini-excavator was used to dig a trench in the road for the PVC effluent line to connect the drain field to septic tanks located at both residences. The drain field near the property owner’s residence was covered with straw and slash.

Prior to the current operational period, EPA and ERRS negotiated the purchase of a manufactured home located in Klamath Falls. On November 15, one START member and one ERRS member traveled to Klamath Falls to screen the home for mercury vapors using the Lumex mercury vapor analyzer. The results of the survey identified indoor air concentrations of mercury vapor similar to outdoor (background) concentrations, approximately 15 ng/m^3. For reference, the indoor air concentration of mercury vapor for residential settings as recommended by the ATSDR is 10,000 ng/m^3.

On November 18, the manufactured home from Eugene arrived on site and was placed at Residence 6. This home includes 2 bedrooms, 1 bathroom, a living room, kitchen and other amenities. The property owner, Mr. Smith, was accompanied by OSC Liverman, ERRS and START on a tour of the home.

On November 19, a four-person ERRS crew traveled to Klamath Falls to prepare the second manufactured home for transport to the site. This home has 3 bedrooms, 2 bathrooms, a living room, kitchen and other amenities. On November 21st the home arrived on site and was placed at Residence 1.

The electric utilities were connected during the operational period. At Residence 6, the power company connected the transformer to the service pole and the electrician placed conduit from the service pole to the home. At Residence 1, the power company connected the transformer to the power pole. Upon siting and placement of both residences, electrical connections were finalized to the homes and approved by county inspectors. Telephone and septic utilities were also connected to the residences. During this time, ERRS installed new smoke detectors and carbon monoxide detectors, and ensured that neither residence contained mercury thermostats. Because many original household items were contaminated and/or could not be reclaimed, each manufactured home was furnished with basic furniture items such as a kitchen table and chairs, couch, and bed frames with mattresses that were purchased locally from a used furniture store in nearby Sutherlin.

December 20, OSC Liverman and OSC Heister met with Mr. Smith to review the transfer agreement for the manufactured homes. ERRS and START were also present for the meeting. ODEQ Thoms arrived on site to join the discussion regarding requirements of the MM&R plan. This plan was prepared by EPA to clearly identify the property owner's responsibility of maintaining, monitoring, and repairing site features under ODEQ oversight. The MM&R plan includes tasks such as monitoring vegetation, ditches, culverts, repository cover, and gravel backfill along with a list potential warning signs such as heavy precipitation that may disturb the site. The MM&R plan also described reporting requirements, best management practices, exposure reduction measures, and precautions for digging or subsurface work. ODEQ Thoms also described planned deed restrictions with Mr. Smith, and expressed concern regarding open adit(s) related to the Bonanza Mine workings on adjacent property.

ERRS coordinated demobilization of site assets during the current operational period. The EPA work trailer was moved off site on November 14, and the second work trailer was moved on November 20. The 30 ton haul truck was decontaminated and demobilized on November 15. OSC Franklin confirmed with Lone Rock Timber, the adjacent property owner, to leave in place the gravel parking area prepared for the work trailers. ERRS deployed seven signs at various locations throughout the site to warn residents, visitors, and other personnel of remaining hazards on the property.

Prior to demobilization of personnel from the site, ERRS installed three check dams downstream of the pond, deployed straw wattles around Area 1, and placed rock along the road in Areas 1 and 2 for erosion control. By December 6, all EPA assets and contractor personnel had demobilized from the site.

2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)
EPA has initiated a PRP search for this Site.

2.1.4 Progress Metrics (as of 12/6/14)

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
Mercury, soil waste	Soil and other debris	One 55-gallon drum (150 lbs)	007851712FLE	Retirement via sulfide treatment	Bethlehem Apparatus Co.,

					Hellentown, PA
Mercury, wood debris	Soil, wood, and other debris	Two 55-gallon drums (1000 lbs)	007851711FLE	Macro-encapsulation	Clean Harbors Grassy Mountain, Grantsville, UT

2.2 Planning Section

2.2.1 Anticipated Activities

2.2.1.1 Planned Response Activities
No planned response activities anticipated.

2.2.1.2 Next Steps
No additional steps anticipated.

2.2.2.1 Issues
N/A

2.3 Logistics Section

2.3 Logistics Section
N/A

2.5.1 Safety Officer
N/A

2.4 Finance Section

No information available at this time.

2.5 Other Command Staff

2.5.1 Safety Officer
Daily safety meetings were held at the beginning of each day. During the reporting period, site personnel were in Level D PPE based on the results of previous air monitoring and/or sampling.

2.5.2 Liaison Officer
Outreach activities were addressed by key project personnel on an as needed basis.

2.5.3 Information Officer
See 2.5.2. Additionally, a Community Involvement Coordinator (CIC) was assigned to the project and available to assist with outreach activities on an as needed basis.

3. Participating Entities

3.1 Unified Command
While UC was not established, ODEQ was integrated into the project organization, as appropriate.

3.2 Cooperating Agencies
N/A

4. Personnel On Site

EPA – 1
START – 1
ERRS – 11

5. Definition of Terms

N/A

6. Additional sources of information

6.1 Internet location of additional information/report

www.epaosc.org/BonanzaMineandMill

6.2 Reporting Schedule

No additional PolReps anticipated.

7. Situational Reference Materials

No information available at this time.