

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: Brooks Stanfield, EPA Region 10

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.

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 (yd³). 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 yd³ and waste rock was estimated at 400 yd³.

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/m³).

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 yd³ of soil were excavated from the mill furnace area, and this material was transported off-Site for disposal as hazardous waste. Approximately 240 yd³ 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 yd³ 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 unpaired 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 yd³ and 4,148 yd³, 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 yd³, and an estimated 6,000 yd³ 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/m³. 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 yd³ along with 9 yd³ 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 FPXRF 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 yd³.

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 yd³ roll-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 yd³ along with 96 yd³ 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/m³ and 5,000 ng/m³ 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/m³ 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 yd³. 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

Table 2: Ex-Situ (Xr) 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 $\mu\text{g}/\text{m}^3$, which was considerably less than the action level of 1,400 $\mu\text{g}/\text{m}^3$.

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

No information available at this time.

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 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 – 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.epaossc.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)