

# KIGGINS-NISBET MINE COMPLEX

Mt. Hood National Forest  
Clackamas County, Oregon



## NON-TIME CRITICAL REMOVAL ACTION REPORT

March 5, 2009

Prepared For:  
U.S. Forest Service, Region 6  
10600 NE 51<sup>st</sup> Circle  
Vancouver, Washington 98682

**MSE**

Millennium Science & Engineering, Inc.

# NON-TIME CRITICAL REMOVAL ACTION REPORT

**Kiggins-Nisbet Mine Complex  
Mt. Hood National Forest, Oregon**

**March 2009**

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## 1.0 INTRODUCTION

- Millennium Science and Engineering, Inc. (MSE) was contracted by the United States Department of Agriculture, Forest Service (Forest Service) to complete a Non-time Critical Removal Action (RA) at the Kiggins-Nisbet Mine Complex in the Mt. Hood National Forest.
- This document describes the RA activities, project schedule and key personnel, and confirmation sampling.
- All RA activities have been successfully completed at this time.
  - Pre- and post- removal action photographs are provided in Appendix A.
  - Completed field forms are provided in Appendix B.
  - Confirmation sample results are provided in Appendix C.

## 1.1 Site Description

- The Kiggins-Nisbet Mine Complex (i.e. the Site) consists of three inactive mercury mines (Kiggins, Nisbet and Ames-Bancroft) located about 30 miles southeast of Estacada, Oregon.
- The three mines are located along the southwest bank of the Oak Grove Fork (OGF) of the Clackamas River <1 mile downstream of the Lake Harriet Dam, approximately 0.6 miles apart.
- Site features at the **Kiggins Mine** are shown in Figure 1 and included:
  - Three adits; however, only two were located during the Site Inspection (SI) completed by Cascade Earth Sciences (CES) in 2004.
    - Adit 1 has an existing bat gate that was in need of repair.
    - Adit 2 has collapsed about 10 feet into the portal.
    - The third adit is assumed to be collapsed or covered by a landslide.
  - An air vent consisting of a 24-inch corrugated metal pipe (CMP) extending downward into the hillside below Adit 1.
  - Waste rock and tailings.
  - Multiple ore beneficiation structures and foundations, including:
    - Furnace wooden structure,
    - Concrete pad and conveyor to another concrete pad and large metal hopper,
    - Ore cart rails, and
    - Brick retort and furnace.
- Site features at the **Ames-Bancroft Mine** are shown in Figure 2 and included:
  - Two waste rock piles, and
  - One collapsed adit.

## 1.2 Purpose and Objectives

- The purpose of the RA was to address human health and ecological hazards at the Site that were identified in the SI (CES 2004) and the Engineering Evaluation/Cost Analysis (EE/CA) prepared by CES in 2005.
  - Results of samples collected during the SI indicated concentrations of several metals above screening levels in all media and the SI concluded there was evidence of a release of hazardous substances to surface water at the Site
  - Streamlined risk evaluations indicated potential risk to both human and ecological receptors at the Site from exposure to high concentrations of metals, particularly arsenic and mercury, in the mine waste.
  - A single mercury hot spot consisting of about 20 bank cubic yards (bcy) of mercury-contaminated soil around a concrete pad under the large hopper pad was identified at the Kiggins Mine.

- Two arsenic hot spots consisting of two waste rock piles with a total combined estimated volume of about 40 bcy were identified at the Ames-Bancroft Mine.
- Risk-based cleanup concentrations were not developed for either mine.
- Objectives of the RA were to:
  - Eliminate potential exposure pathways to mine waste and soil containing high concentrations of arsenic and mercury,
  - Minimize offsite transport of contaminated soil to surface water, and
  - Remove arsenic- and mercury-contaminated soil and waste rock with concentrations above the hot spot concentrations identified in the EE/CA (CES 2005):
    - Arsenic hot spot concentration = 3,500 milligram per kilogram (mg/kg)
    - Mercury hot spot concentration = 30,248.5 mg/kg

### 1.3 Schedule and Key Personnel

- RA activities began on August 17, 2008, and continued for 10 days.
- The project team consisted of the following:
  - Mike Puett, P.E., MSE Project Manager/Project Engineer
  - Don Tibbets, E.I.T, MSE Field Engineer
  - Sam Orr, Orr Excavation Construction Manager
  - Various equipment operators and laborers from Orr Excavation
- Forest Service project personnel include:
  - Pete Jones, R.G, C.E.G, On-Scene Coordinator (OSC) and Contracting Officer Representative (COR)

### 2.0 REMOVAL ACTION ACTIVITIES

- RA activities were based on the EE/CA recommended alternative (CES 2005) and results of the pre-removal site reconnaissance by MSE in May 2008.
- Material quantities were gross estimates provided in the EE/CA (CES 2005).
- All cleanup activities have been completed and, with the exception of future monitoring, no further action is necessary.
- RA activities at the **Kiggins Mine** consisted of:
  - Accessing the Site from Forest Road (FR) 4630 which is about 1,000 feet north of the mine and across the OGF.
    - Equipment accessed the Site by fording the OGF about 100 feet upstream of the dilapidated bridge.
  - Excavating the mercury hot spot (~20 bcy) and transporting to the Columbia Ridge RCRA Subtitle C landfill in Arlington, Oregon for disposal.
    - The hot spot consisted of mercury-contaminated soil from around the concrete pad under the large hopper that exceeded the mercury hot spot concentration of 30,248.5 mg/kg.
  - Gathering, loading, and transporting drums, piping, condensers and other miscellaneous nuisance material (estimated to be <1 ton) to the Columbia Ridge RCRA Subtitle C landfill for disposal.
    - The hopper, furnace, conveyor, compressor and other miscellaneous structures and artifacts were not disturbed and remain in place.
  - Repairing a bat gate in Adit 1.
  - Collapsing the end of the exposed vent pipe and covering with rock from the immediate area.
  - Removing a culvert from the stream channel below Adit 1 and recontouring the channel and area to promote flow and prevent potential flooding of the vent pipe (24-inch CMP).

- Backfilling the retort with rock and soil excavated during the culvert removal and filling a hole in the retort wall with rock and mortar.
- Grading the disturbed areas to blend with surrounding topography and covering the excavated waste areas with 1 foot of rock and soil excavated during the culvert removal.
- Seeding the disturbed areas with a Forest Service supplied seed mix and applying fertilizer and straw mulch.
- Pulling the remnants of the dilapidated bridge that crossed the OGF onto the Kiggins Mine Site and out of view from the north side of the OGF.
- RA activities at the **Ames-Bancroft Mine** consisted of:
  - Accessing the Site from Oak Grove Fork Road (FR 57), which is about 200 feet south of the mine.
    - Constructing a small access road from the FR 57 to the Site.
  - Excavating the two arsenic hot spots (~100 bcy) and transporting to the Columbia Ridge RCRA C landfill for disposal.
    - The hot spots consisted of two waste rock piles (WR-2 & WR-3) that exceeded the arsenic hot spot concentration established in the EE/CA of 3,500 mg/kg.
  - Grading the access road and disturbed areas to blend with the surrounding topography, seeding with a Forest Service supplied seed mix, and applying fertilizer and straw mulch.

## 2.1 Mobilization and Site Preparation

- Mobilization of heavy equipment and personnel to the Site began on August 16, 2008.
- The following equipment was mobilized to the Site:
  - Dump truck without pup
  - JD 120 Excavator
  - Skid steer
  - Skip loader
  - Welder
  - Generator
- All equipment had been thoroughly pressure washed and cleaned before entering the Site to remove foreign dirt and weeds.
- Areas not to be disturbed during the RA, such as culturally sensitive areas, were clearly flagged in consultation with the On Scene Coordinator (OSC).
- During removal activities at the Kiggins Mine, equipment and materials were staged at the intersection of the site access road and FR 4630.
- During removal activities at the Ames-Bancroft Mine, equipment and materials were staged along FR 57 above the Site.
- Fuel storage consisted of mobile 200 gallon-tanks in the back of support trucks.
- Emergency spill kits were made available in case of spillage during equipment refueling.

## 2.2 Road Use and Maintenance, and Traffic Control

- Kiggins Mine was accessed by utilizing FR 4630 via FR 57 and OR-224.
- Ames-Bancroft Mine was accessed by utilizing FR 57.
- Flaggers were used on FR 57 to safely direct traffic around staging operations on August 26-27, 2008.

### 2.3 Clearing and Grubbing

- Clearing and grubbing at the Kiggins Mine consisted of clearing an access path to the culvert and air vent area.
- Clearing and grubbing at the Ames-Bancroft Mine consisted of clearing an access path from FR 57 to the two arsenic hot spots.
- All clearing and grubbing was performed under the direction of the MSE Field Engineer.
- Care was taken to avoid cedars and other large trees, and to minimize the area of disturbance.
- Grubbed material and slash was stockpiled at both mines for placement over the disturbed areas during revegetation.

### 2.4 Storm Water Diversion/Erosion Control

- Storm water diversion and erosion control best management practices (BMP) were implemented at both mines before commencing removal activities and included:
  - Small earthen berms or shallow ditches to divert storm water runoff around key areas.
  - Straw wattles on exposed slopes to reduce flow velocities.
- All BMPs were installed under the direction of the MSE Field Engineer and in accordance with the manufacturer's guidance and specifications.

### 2.5 Mine Waste Excavation

- The Oregon Department of Environmental Quality (ODEQ) requires treatment of hot spots to the extent feasible and defines them as areas that present an unacceptable risk and where the contamination is highly concentrated, highly mobile, or cannot be reliably contained (ODEQ 1998).
  - Arsenic and mercury hot spot concentrations were developed by CES in the EE/CA in accordance with ODEQ guidance and using human health risk equations and site-specific exposure factors (CES 2005).
    - Arsenic hot spot concentration = 3,500 mg/kg
    - Mercury hot spot concentration = 30,248.5 mg/kg
  - The hot spot concentrations correspond to 100 times the acceptable risk level (i.e. excess cancer risk [ECR] = 1 E-04) for individual carcinogens and 10 times the acceptable risk level (i.e. hazard index [HI] = 10) for individual non-carcinogens. By comparison, EPA's Industrial Soil Preliminary Remediation Goals (PRG) are typically much lower because they are based on the acceptable risk level (i.e. ECR = 1 E-06, HI = 1) and 250 days per year of exposure. However, PRGs are simply general cleanup goals and are not enforceable.
- The areal extent and depth of waste excavation was determined based on visual assessment and field screening with an INNOV-X X-Ray Fluorescence (XRF) meter.
  - In-situ measurements were taken with the XRF and the results compared to the hot spot concentrations to determine the areal extent of waste material to be removed.
  - Periodic measurements with the XRF were also taken during excavation to determine the depth of excavation.
  - XRF screening results are presented in Appendix B and summarized in Tables 1 and 2.
- At the Kiggins Mine, approximately 20 bcy of mercury-contaminated soil was excavated from around the concrete pad under the large hopper.
- At the Ames-Bancroft Mine, approximately 100 bcy of arsenic-contaminated mine waste was excavated from waste rock piles WR-2 and WR-3.
  - The volume of arsenic-contaminated mine waste above the hot spot concentration was significantly greater than estimated (40 bcy) in the EE/CA (CES 2005).

- The material was loaded into Haz-Mat trucks and transported to the Columbia Ridge RCRA Subtitle C landfill in Arlington, Oregon for disposal.
  - Care was taken to avoid waste spillage, and overfilling of the trucks.

## **2.6 Vent Closure and Culvert Removal**

- The vent pipe (24-inch CMP) at the Kiggins Mine was closed by pinching off the exposed opening and covering with large rocks gathered from the immediate area.
- A culvert below Adit 1 and near the vent pipe at the Kiggins Mine was removed and disposed of at the Columbia Ridge RCRA Subtitle C landfill.
- The area was graded to mimic a natural channel and care was taken to ensure sufficient elevation difference between the channel bottom and vent pipe to prevent water from entering the vent pipe during high flows.

## **2.7 Retort Filling**

- The retort at the Kiggins Mine was backfilled with approximately 10 bcy of soil and rock that had been stockpiled during the culvert removal.
  - The concrete cover was removed from the retort to provide access, broken into pieces, and dumped into the retort.
  - The stockpiled soil and rock was dumped directly into the retort and care was taken to avoid bridging.
  - The material was compacted by tamping where possible, and the final surface was mounded slightly to allow for settling and prevent ponding of storm water.
- A hole (approximately 1 by 2 feet) in the retort wall near the stream was filled in with a mixture of rock and mortar.

## **2.8 Bat Gate Repair**

- The bat gate in Adit 1 at the Kiggins Mine was repaired by welding inverted angle iron onto the existing cross bars.
- New security bolts were added in a manner to prevent them from being vandalized or removed by a hand saw.
- Security nuts were to be supplied and installed by the local Forest Service Ranger District.

## **2.9 Debris Removal**

- Miscellaneous debris consisting of empty 55-gallon drums, condenser tubes, and retort piping was loaded into trucks and transported to the Columbia Ridge RCRA Subtitle C landfill for disposal.
  - The total volume of debris is estimated to be <1 ton.
- All structures, concrete foundations, equipment remnants, and other items of potential cultural or historic significance were left in place.
- Remains of the dilapidated wooden bridge at the Kiggins Mine were moved onto the Site and placed in an area out of view from across the OGF.

## **2.10 Reclamation and Revegetation**

- All disturbed areas at both mines were recontoured to blend with the surrounding contour and revegetated.

- Revegetation efforts consisted of seeding with a Forest Service-approved seed mix and applying fertilizer and straw mulch.
- Stockpiled slash and grubbed material was placed over the re-seeded areas. Larger pieces were placed parallel to the slope to slow overland flow during rain events.

### 3.0 CONFIRMATION SAMPLING

- Confirmation soil samples were collected from the waste excavation areas at both mines to verify that the arsenic and mercury-contaminated mine wastes and soil were removed from the Site.

#### 3.1 XRF Screening

- Before collecting confirmation samples, an XRF was used to screen metals concentrations in soil from the excavated waste areas.
- Because soil moisture content and other factors can significantly influence in-situ XRF measurements, final XRF confirmation measurements consisted of bench testing.
  - Discrete grab samples were collected from the bottom and sides of excavated waste areas.
  - The samples were prepared and tested in accordance with the manufacturer's instructions and specifications for bench testing.
  - When screening results indicated metals concentrations at or above the hot spot concentrations, additional material was excavated and the XRF screening process repeated.
  - Once screening results indicated metals concentrations were significantly below the hot spot concentrations, confirmation soil samples were collected.
  - The XRF screening results are provided in Appendix B and summarized in Tables 1 and 2.

#### 3.2 Confirmation Samples

- Confirmation samples consisted of discrete soil samples collected from undisturbed areas of the bottom and sides of the excavated waste areas.
  - The samples were collected using disposable plastic spoons.
  - The samples were placed in laboratory-supplied, 8-ounce glass jars with teflon-lined lids, and stored in a cooler with ice.
  - Two samples were collected from Kiggins Mine and four from the Ames-Bancroft Mine.
- Sample containers were sealed at the time of collection and an adhesive label placed over the lid and threads to ensure that the sample container was not tampered with prior to delivery to the laboratory.
- The sample number, date and time of sample collection, sampler's initials, and requested analysis were recorded on the label using an indelible ink ball-point pen.
- All samples were assigned a unique sample number that indicated the mine name, specific area at the mine, sample number, and sample depth below surface.
- For example: AB-WR2-01-4.5
  - Where:
    - AB = Ames-Bancroft Mine
    - WR2 = Waste rock pile WR-2
    - 01 = Sample 1
    - 4.5 = Sample collected from a depth of 4.5 feet below the ground surface
- The sample containers were placed in a cooler suitable for shipping to the analytical laboratory.
  - Plastic bags filled with ice and sealed were placed in the cooler to maintain the samples at 4 °C until delivery to the laboratory.
  - Care was exercised to prevent direct contact between the samples and ice.

- Chain-of-Custody forms were used to document and track sample possession.
  - One copy of the Chain-of-Custody was retained, and the original was sealed in a plastic bag and placed in the cooler with the samples.
  - When transferring possession of the samples, the Chain-of-Custody was signed and dated by the sample custodian.
  - The cooler was sealed with tape and custody seals placed across the cooler opening and initialed.
- The samples were shipped via Federal Express to SVL Analytical Laboratory in Kellog, Idaho. The Federal Express airbills will be retained as part of the permanent Chain-of-Custody documentation.
- The confirmation samples were analyzed for RCRA 8 metals.
- The analytical results are provided in Appendix C and summarized in Table 3.
  - Confirmation samples from the Kiggins Mine contained total mercury ranging from 213 mg/kg to 533 mg/kg, well below the hot spot concentration of 30,248.5 mg/kg.
  - Confirmation samples from Ames-Bancroft Mine contained total arsenic analysis ranging from 125 mg/kg to 379 mg/kg, well below the hot spot concentration of 3,500 mg/kg.

#### **4.0 DEVIATIONS FROM THE REMOVAL ACTION WORK PLAN**

- The additional volume of arsenic-contaminated mine waste discovered at the Ames-Bancroft Mine necessitated a Change Order.
  - The original volume was estimated in the EE/CA to be 40 bcy (CES 2005).
  - The actual volume of material was ~100 bcy.
  - The excess material was removed and transported to the Columbia Ridge RCRA C landfill in Arlington, Oregon for disposal.

#### **5.0 REMOVAL ACTION SUMMARY AND COSTS**

- All RA activities were completed at the Site.
  - ~20 bcy of mercury-contaminated soil was excavated from the Kiggins Mine and transported to the Columbia Ridge RCRA Subtitle C landfill in Arlington, Oregon for disposal.
  - <1 ton of drums, piping, condensers and miscellaneous debris was removed from the Kiggins Mine and transported to the Columbia Ridge RCRA Subtitle C landfill in Arlington, Oregon for disposal.
  - A bat gate in Adit 1 at the Kiggins Mine was repaired.
  - A culvert was removed from the Kiggins Mine and the stream channel was realigned to prevent flooding of the vent pipe. The exposed vent pipe was collapsed and covered with rock.
  - A retort at the Kiggins Mine was backfilled with rock and soil from the culvert removal and an opening in the side wall of the retort was sealed with rock and mortar.
  - ~100 bcy of arsenic-contaminated soil was excavated from the Ames-Bancroft Mine and transported to the Columbia Ridge RCRA Subtitle C landfill in Arlington, Oregon for disposal.
    - The disturbed areas were graded, seeded, and covered with straw mulch and slash.
- The original contract amount for the RA was \$172,332.
  - The Change Order increased the contract amount by \$13,062.
  - The total cost for the RA was \$185,394.
- No further action is needed at the Site except for post-removal monitoring.

## **6.0 POST-REMOVAL ACTION MONITORING**

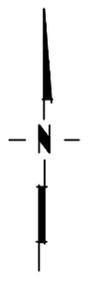
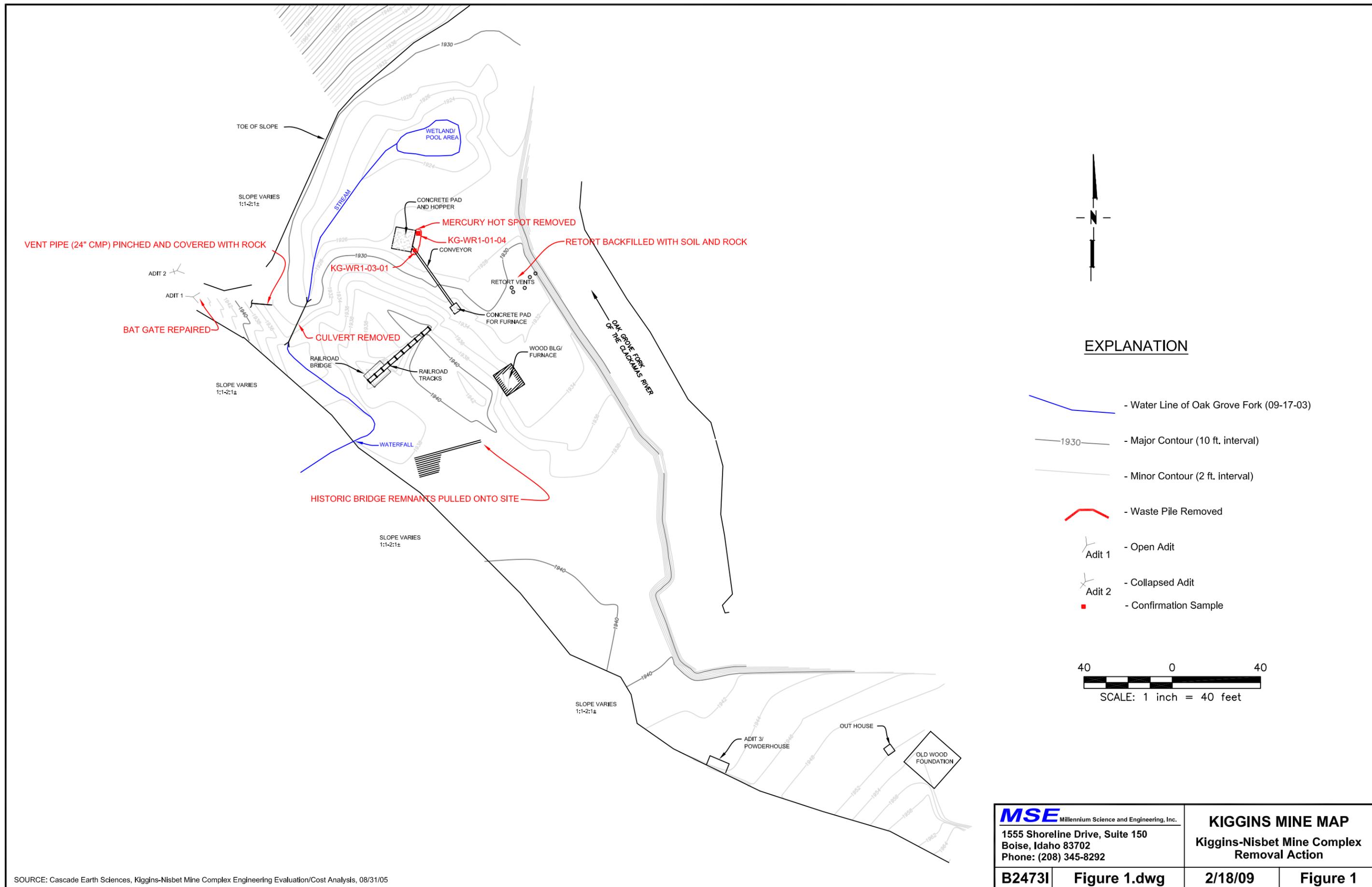
- MSE will complete 3 years of annual post-removal monitoring of the aquatic habitat at the Site. The proposed samples and analyses are summarized in Table 4.
  - The first monitoring event will be conducted in Summer 2009, and the final monitoring event will be conducted in Summer 2011.
  - The monitoring will be limited to the aquatic habitat and will be based on the SI using a refined set of sampling locations and analytical parameters.
  - Annual monitoring reports summarizing the analytical results and comparing to previous monitoring results will be prepared and submitted to the Forest Service by the end of each calendar year.
- Surface water, pore water, sediment, and benthic samples will be collected from the aquatic habitat at the site for comparison with pre-removal monitoring results. The proposed sampling approach and methodology are based on the SI using a refined set of sampling locations and analytical parameters.

## **7.0 REFERENCES**

Cascade Earth Sciences (CES). 2004. Site Inspection Report – Final, Kiggins and Nisbet Mines, Mt. Hood National Forest, Oregon. Prepared for U.S. Forest Service. March.

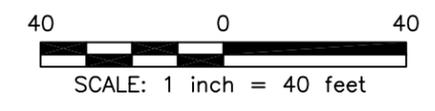
CES. 2005. Engineering Evaluation/Cost Analysis, Kiggins-Nisbet Mine Complex, Mt. Hood National Forest, Clackamas County, Oregon. Prepared for U.S. Forest Service. November.

## FIGURES



**EXPLANATION**

-  - Water Line of Oak Grove Fork (09-17-03)
-  - Major Contour (10 ft. interval)
-  - Minor Contour (2 ft. interval)
-  - Waste Pile Removed
-  - Open Adit
-  - Collapsed Adit
-  - Confirmation Sample



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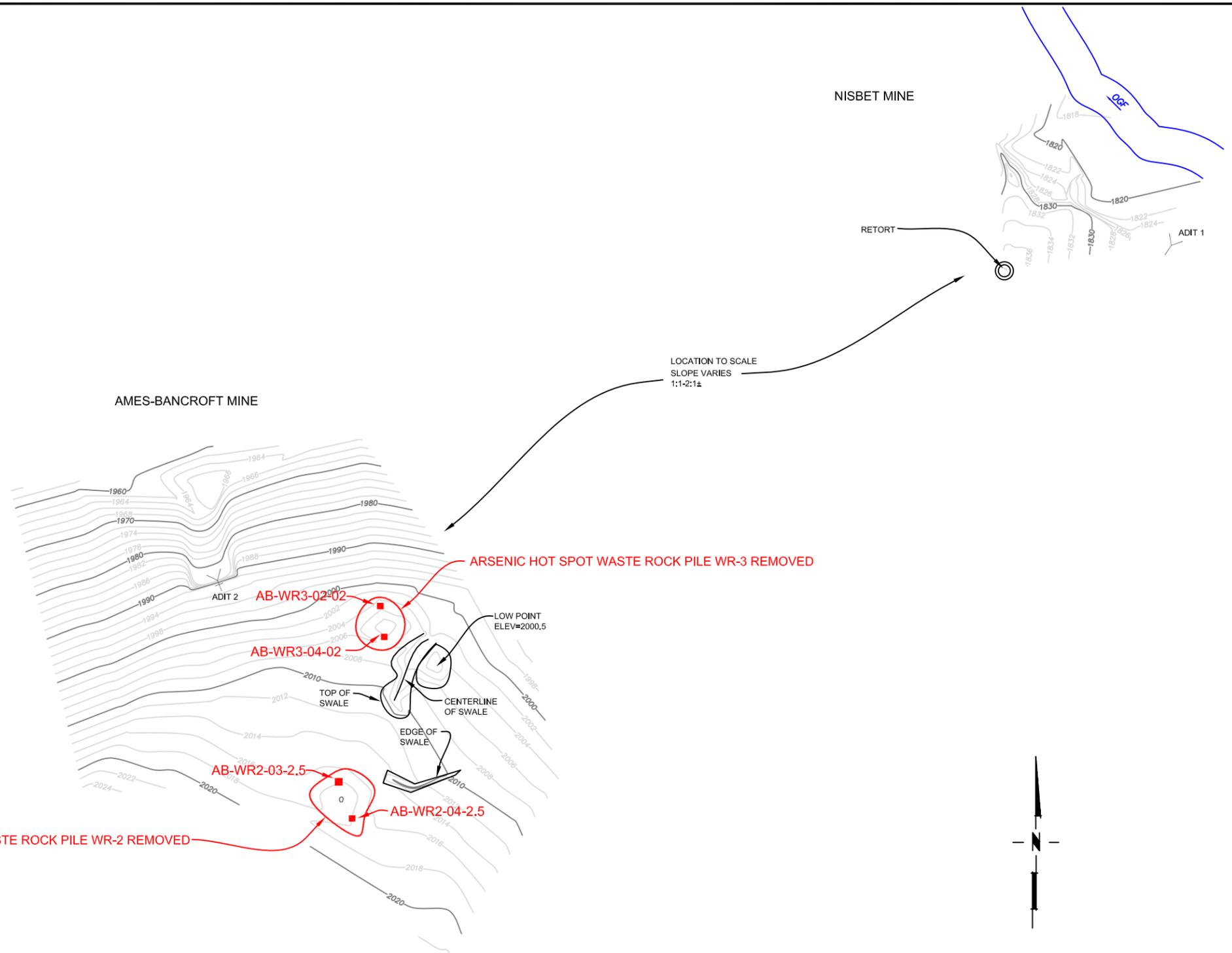
**KIGGINS MINE MAP**  
 Kiggins-Nisbet Mine Complex  
 Removal Action

<b>B2473I</b>	<b>Figure 1.dwg</b>	<b>2/18/09</b>	<b>Figure 1</b>
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SOURCE: Cascade Earth Sciences, Kiggins-Nisbet Mine Complex Engineering Evaluation/Cost Analysis, 08/31/05

**EXPLANATION**

-  - Water Line of Oak Grove Fork (09-17-03)
-  - Major Contour (10 ft. interval)
-  - Minor Contour (2 ft. interval)
-  - Waste Pile
-  - Open Adit
-  - Collapsed Adit
-  - Confirmation Sample



ARSENIC HOT SPOT WASTE ROCK PILE WR-2 REMOVED

ARSENIC HOT SPOT WASTE ROCK PILE WR-3 REMOVED

AB-WR3-02-02

AB-WR3-04-02

AB-WR2-03-2.5

AB-WR2-04-2.5

AMES-BANCROFT MINE

NISBET MINE

RETORT

ADIT 1

LOCATION TO SCALE  
SLOPE VARIES  
1:1-2:1

ADIT 2

LOW POINT  
ELEV=2000.5

TOP OF SWALE

CENTERLINE OF SWALE

EDGE OF SWALE

Oak Grove Road

SOURCE: Cascade Earth Sciences, Kiggins-Nisbet Mine Complex Engineering Evaluation/Cost Analysis, 08/31/05

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**B2473I** **Figure 2.dwg**

**AMES-BANCROFT MINE MAP**  
Kiggins-Nisbet Mine Complex  
Removal Action  
**2/18/09** **Figure 2**

## **TABLES**

**TABLE 1**  
**Kiggins-Nisbet Mine Complex Removal Action**  
**Kiggins Mine XRF Field Screening Results Summary**

Mine	Area	Location	Date	XRF Screening Result (mg/kg)	
				Arsenic	Mercury
Kiggins	<b>Pre-removal Screening:</b>				
	Area around hopper foundation	KG-WR1-01-GS	8/20/2008	146	31248
		KG-WR1-02-GS	8/20/2008	185	29921
		KG-WR1-03-GS	8/20/2008	177	33062
		KG-WR1-04-GS	8/20/2008	118	31862
		KG-WR1-05-GS	8/20/2008	211	19326
		KG-WR1-06-GS	8/20/2008	254	18380
		KG-WR1-07-GS	8/20/2008	364	25203
		KG-WR1-08-GS	8/20/2008	482	454
	<b>Post-removal Screening:</b>				
	Area around hopper foundation	KG-WR1-04-GS	8/20/2008	268	304
		KG-WR1-05-GS	8/20/2008	111	126
		KG-WR1-06-GS	8/20/2008	196	134
		KG-WR1-07-GS	8/20/2008	106	143
KG-WR1-08-GS		8/20/2008	163	218	
KG-WR1-09-GS		8/20/2008	89	113	
KG-WR1-10-GS		8/20/2008	152	204	
<b>Human Health Screening Criteria</b>					
Oregon Industrial Maximum Allowable Soil Concentration Cleanup Levels (ODEQ 2000)			3	600	
EPA Region IX Industrial Soil PRGs (EPA 2004)			1.6	310	
<b>Ecological Screening Criteria</b>					
Oregon Level II Screening Level Values for Plants, Invertebrates, and Wildlife (Lowest value, ODEQ 2001)			NS	0.1	
EPA Ecological Soil Screening Levels (Eco-SSLs, EPA 2005)			18	NS	

Notes:

- Screening criteria exceeded
- mg/kg = Milligram per kilogram
- EPA = U.S. Environmental Protection Agency
- NS = No screening criteria
- ODEQ = Oregon Department of Environmental Quality
- PRG = Preliminary remediation goal
- XRF = X-ray Fluorescence

**TABLE 2**  
**Kiggins-Nisbet Mine Complex Removal Action**  
**Ames-Bancroft Mine XRF Field Screening Results Summary**

Mine	Area	Location	Date	XRF Screening Result (mg/kg)	
				Arsenic	Mercury
Ames-Bancroft	<b>Pre-removal Screening:</b>				
	WR-2	AB-WR2-01-GS	8/21/2008	3401	232
		AB-WR2-02-GS	8/21/2008	3441	289
		AB-WR2-03-GS	8/21/2008	2966	236
		AB-WR2-04-GS	8/21/2008	3727	393
	WR-3	AB-WR3-01-GS	8/21/2008	3164	373
		AB-WR3-02-GS	8/21/2008	2617	218
		AB-WR3-03-GS	8/21/2008	3275	1538
	<b>Post-removal Screening:</b>				
	WR-2	AB-WR2-01-GS	8/21/2008	1600	210
		AB-WR2-02-GS	8/21/2008	387	185
		AB-WR2-03-GS	8/21/2008	568	301
		AB-WR2-04-GS	8/21/2008	352	48
	WR-3	AB-WR3-01-GS	8/21/2008	862	162
AB-WR3-02-GS		8/21/2008	527	205	
AB-WR3-03-GS		8/21/2008	193	213	
<b>Human Health Screening Criteria</b>					
Oregon Industrial Maximum Allowable Soil Concentration Cleanup Levels (ODEQ 2000)				3	600
EPA Region IX Industrial Soil PRGs (EPA 2004)				1.6	310
<b>Ecological Screening Criteria</b>					
Oregon Level II Screening Level Values for Plants, Invertebrates, and Wildlife (Lowest value, ODEQ 2001)				NS	0.1
EPA Ecological Soil Screening Levels (Eco-SSLs, EPA 2005)				18	NS

Notes:

Screening criteria exceeded

mg/kg = Milligram per kilogram

EPA = U.S. Environmental Protection Agency

NS = No screening criteria

ODEQ = Oregon Department of Environmental Quality

PRG = Preliminary remediation goal

XRF = X-ray Fluorescence

**TABLE 3**  
**Kiggins-Nisbet Mine Complex Removal Action**  
**Confirmation Sample Analytical Results Summary**

Mine	Area	Sample ID	Date Collected	Solids (%)	Analytical Result (mg/kg)							
					Ag	As	Ba	Cd	Cr	Hg	Pb	Se
Kiggins	Area around hopper foundation	KG-WR1-01-04	8/20/2008	79.2	<0.50	431	161	<0.20	15.2	533	11.4	2.0
		KG-WR1-03-01	8/20/2008	76.0	<0.50	190	75.6	<0.20	17.0	213	11.3	2.0
Ames-Bancroft	Waste Rock Pile WR-2	AB-WR2-03-2.5	8/20/2008	79.8	0.25	360	144	0.10	28.9	22.8	4.1	2.0
		AB-WR2-04-2.5	8/20/2008	83.1	0.66	379	173	<0.20	30.4	167	7.05	2.0
	Waste Rock Pile WR-3	AB-WR3-04-02	8/21/2008	79.5	<0.50	125	185	<0.20	32.1	5.38	5.8	2.0
		AB-WR3-02-02	8/21/2008	80.4	<0.50	366	166	<0.20	33	88.5	4	2.0
<b>Human Health Screening Criteria</b>												
Oregon Industrial Maximum Allowable Soil Concentration Cleanup Levels (ODEQ 2000)					10000	3	140000	1000	1500	600	2000	NS
EPA Region IX Industrial Soil PRGs (EPA 2004)					5100	1.6	1900	450	450	310	800	5100
<b>Ecological Screening Criteria</b>												
Oregon Level II Screening Level Values for Plants, Invertebrates and Wildlife (lowest)					2	NS	85	4	NS	0.1	16	1
EPA Ecological Soil Screening Levels (Eco-SSLs, EPA 2005)					NS	18	330	0.36	NS	NS	11	NS

Notes:

- Screening criteria exceeded
- mg/kg = Milligram per kilogram
- EPA = U.S. Environmental Protection Agency
- NS = No screening criteria
- ODEQ = Oregon Department of Environmental Quality

**TABLE 4**  
**Kiggins-Nisbet Mine Complex Removal Action**  
**Post-removal Monitoring Summary**

Mine	Location	Medium	Number of Samples	Analyses
Kiggins	OGF Upstream of Site (OGF-SW-5)	Surface Water	1	Total & dissolved metals: Al, As, Fe, Hg, Mn, Zn; Hardness; pH; TDS; TSS
		Pore Water	1	Field: pH, temp, DO, EC, ORP/Eh
		Sediment	1	Metals: As, Cd, Cr, Cu, Mn, Ni
		Benthic Organisms	2	Taxonomy, generally to genus/species
	OGF Downstream of Site (OGF-SW-7)	Surface Water	1	Total & dissolved metals: Al, As, Fe, Hg, Mn, Zn; Hardness; pH; TDS; TSS
		Pore Water	1	Field: pH, temp, DO, EC, ORP/Eh
		Sediment	1	Metals: As, Cd, Cr, Cu, Mn, Ni
		Benthic Organisms	2	Taxonomy, generally to genus/species
Site	Water QA/QC	1 blank, 1 MS/MSD pair	Total & dissolved metals: Al, As, Fe, Hg, Mn, Zn	

Notes:

MS/MSD = Matrix spike/matrix spike duplicate

OGF = Oak Grove Fork

QA/QC = Quality assurance/quality control

**APPENDIX A**  
**Pre- and Post-Removal Action Photographs**



**Photo 1. Oak Grove Fork (OGF) at Kiggins Mine prior to crossing**



**Photo 2. OGF at Kiggins Mine prior to crossing**



**Photo 3. OGF crossing at Kiggins Mine post reclamation**



**Photo 4. Bat gate at Kiggins Mine prior to repair**



**Photo 5. Repaired bat gate at Kiggins Mine**



**Photo 6. Vent pipe (24-inch CMP) at Kiggins Mine prior to closure**



**Photo 7. Closed vent pipe (24-inch CMP) at Kiggins Mine**



**Photo 8. Mercury hot spot around hopper foundation at Kiggins Mine**



**Photo 9. Post hot spot removal around hopper foundation at Kiggins Mine**



**Photo 10. Hole in retort furnace wall at Kiggins Mine**



**Photo 11. Repaired hole in retort furnace wall at Kiggins Mine**



**Photo 12. Remains of dilapidated bridge at Kiggins Mine pulled onto site**



**Photo 13. Erosion control along Kiggins Mine access road**



**Photo 14. Reclaimed access near powder house at Kiggins Mine**



**Photo 15. Preparing access road to Ames-Bancroft Mine**



**Photo 16. Reclaimed access road to Ames-Bancroft Mine**



**Photo 17. Ames-Bancroft Mine waste rock pile WR-2 pre-removal**



**Photo 18. Removing waste rock pile WR-2 at Ames-Bancroft Mine**



**Photo 19. Waste rock pile WR-2 at Ames-Bancroft Mine post reclamation**



**Photo 20. Removing waste rock pile WR-3 at Ames-Bancroft Mine**



**Photo 21. Waste rock piles WR-2 and WR-3 at Ames-Bancroft Mine post reclamation**



**Photo 22. Re-establishing natural slope to conceal Ames-Bancroft Mine access**



**Photo 23. Reclaiming Ames-Bancroft Mine access**



**Photo 24. Ames-Bancroft Mine access post reclamation**



**Photo 25. Staging area along Oak Grove Fork Road (FR 57)**



**Photo 26. Loading waste for transport**

**APPENDIX B**  
**Field Forms**

## **MSE** XRF Screening Record

Project: Kiggins-Nisbet Mine Complex Removal Action

Date: 8/20/08

XRF Instrument: Innov X

Settings: Rain/Cloudy

Operator: Don Tibbets

### XRF SCREENING RESULTS

Location	Analyte	Result (mg/kg)
KG-WR1-01-GS	Hg	31,248
	As	146
KG-WR1-02-GS	Hg	29,921
	As	185
KG-WR1-03-GS	Hg	33,062
	As	177
KG-WR1-04-GS	Hg	31,862
	As	118
KG-WR1-05-GS	Hg	19,326
	As	211
KG-WR1-06-GS	Hg	18,380
	As	254
KG-WR1-07-GS	Hg	25,203
	As	364
KG-WR1-08-GS	Hg	454
	As	482
KG-WR1-09-GS	Hg	31,962
	As	250
KG-WR1-10-GS	Hg	18,035
	As	118

### DESCRIPTION/COMMENTS

--

## **MSE** XRF Screening Record

Project: Kiggins-Nisbet Mine Complex Removal Action

Date: 8/20/08

XRF Instrument: Innov X

Settings: Rain/Cloudy

Operator: Don Tibbets

### XRF SCREENING RESULTS

Location	Analyte	Result (mg/kg)
KG-WR1-01-4	Hg	185
	As	152
KG-WR1-02-3	Hg	317
	As	302
KG-WR1-03-01	Hg	334
	As	118
KG-WR1-04-01	Hg	304
	As	268
KG-WR1-05-01	Hg	126
	As	111
KG-WR1-06-01	Hg	134
	As	196
KG-WR1-07-01	Hg	143
	As	106
KG-WR1-08-01	Hg	218
	As	163
KG-WR1-09-01	Hg	113
	As	89
KG-WR1-10-01	Hg	204
	As	152

### DESCRIPTION/COMMENTS

--

## **MSE XRF Screening Record**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Date:	8/21/08
XRF Instrument:	Innov X
Settings:	Sunny/Wet
Operator:	Don Tibbets

### XRF SCREENING RESULTS

Location	Analyte	Result (mg/kg)
AB-WR2-01-GS	Hg	232
	As	3,401
AB-WR2-02-GS	Hg	289
	As	3,441
AB-WR2-03-GS	Hg	236
	As	2,966
AB-WR2-04-GS	Hg	393
	As	3,727
AB-WR3-01-GS	Hg	373
	As	3,164
AB-WR3-02-GS	Hg	218
	As	2,617
AB-WR3-03-GS	Hg	1,538
	As	3,275

### DESCRIPTION/COMMENTS

--

## **MSE** XRF Screening Record

Project: Kiggins-Nisbet Mine Complex Removal Action

Date: 8/22/08

XRF Instrument: Innov X

Settings: Sunny/Wet

Operator: Don Tibbets

### XRF SCREENING RESULTS

Location	Analyte	Result (mg/kg)
AB-WR2-01-01	As	1,600
	Hg	210
AB-WR2-02-02	As	387
	Hg	185
AB-WR2-03-2-5	As	568
	Hg	301
AB-WR2-04-2-5	As	352
	Hg	48
AB-WR3-01-02	As	862
	Hg	162
AB-WR3-02-02	As	527
	Hg	205
AB-WR3-03-02	As	193
	Hg	213
AB-WR3-04-02	As	641

### DESCRIPTION/COMMENTS

--

# MSE Confirmation Sample Collection Record

<b>SAMPLE ID:</b> KG-WR1-01-04	
Project:	Kiggins-Nisbet Mine Complex Removal Action <span style="float: right;">Project No: B2473</span>
Sample Location:	Clackamas County, OR - Mt. Hood National Forest <span style="float: right;">Photo: NA</span>
Description:	Field samples
Date:	8/20/08
Field Personnel:	Don Tibbets
Conditions:	warm <span style="float: right;">Weather: Rain/cloudy</span>

## METHOD

Grab: X	Depth: 4'		
Composite:	Boring ID	Depth	Comments

## SAMPLE COLLECTION

Equipment:	Trowel X	Hand Auger	Other:
Sample Collection Time:	1425 MST		

Sample Identification	Size				Analysis								Matrix			Other
	500-mL Bottle	12-oz glass jar	8-oz glass jar	Brass Sleeve	RCRA 8 Metals	Arsenic	Mercury	Paste pH	ABA	Pesticides	VOCs	SVOCs	Soil	Water	Other	
KG-WR1-01-04			1		X								X			

## DESCRIPTION/COMMENTS

# MSE Confirmation Sample Collection Record

<b>SAMPLE ID:</b> KG-WR1-03-01	
Project:	Kiggins-Nisbet Mine Complex Removal Action <span style="float: right;">Project No: B2473</span>
Sample Location:	Clackamas County, OR - Mt. Hood National Forest <span style="float: right;">Photo: NA</span>
Description:	Field samples
Date:	8/20/08
Field Personnel:	Don Tibbets
Conditions:	warm <span style="float: right;">Weather: Rain/cloudy</span>

## METHOD

Grab: X	Depth: 1'		
Composite:	Boring ID	Depth	Comments

## SAMPLE COLLECTION

Equipment:	Trowel X	Hand Auger	Other:
Sample Collection Time:	1440 MST		

Sample Identification	Size				Analysis								Matrix			Other
	500-mL Bottle	12-oz glass jar	8-oz glass jar	Brass Sleeve	RCRA 8 Metals	Arsenic	Mercury	Paste pH	ABA	Pesticides	VOCs	SVOCs	Soil	Water	Other	
KG-WR1-03-01			1		X								X			

## DESCRIPTION/COMMENTS

# MSE Confirmation Sample Collection Record

<b>SAMPLE ID:</b> AB-WR3-04-02	
Project:	Kiggins-Nisbet Mine Complex Removal Action <span style="float: right;">Project No: B2473</span>
Sample Location:	Clackamas County, OR - Mt. Hood National Forest <span style="float: right;">Photo: NA</span>
Description:	Field samples
Date:	8/21/08
Field Personnel:	Don Tibbets
Conditions:	warm <span style="float: right;">Weather: Sunny/Wet</span>

## METHOD

Grab: X	Depth: 2'		
Composite:	Boring ID	Depth	Comments

## SAMPLE COLLECTION

Equipment:	Trowel X	Hand Auger	Other:
Sample Collection Time:	1215 MST		

Sample Identification	Size				Analysis								Matrix		Other	
	500-mL Bottle	12-oz glass jar	8-oz glass jar	Brass Sleeve	RCRA 8 Metals	Arsenic	Mercury	Paste pH	ABA	Pesticides	VOCs	SVOCs	Soil	Other -		
AB-WR3-04-02			1		X								X			

## DESCRIPTION/COMMENTS

# MSE Confirmation Sample Collection Record

<b>SAMPLE ID:</b> AB-WR3-02-02	
Project:	Kiggins-Nisbet Mine Complex Removal Action <span style="float: right;">Project No: B2473</span>
Sample Location:	Clackamas County, OR - Mt. Hood National Forest <span style="float: right;">Photo: NA</span>
Description:	Field samples
Date:	8/21/08
Field Personnel:	Don Tibbets
Conditions:	warm <span style="float: right;">Weather: Sunny/Wet</span>

## METHOD

Grab: X	Depth: 2'		
Composite:	Boring ID	Depth	Comments

## SAMPLE COLLECTION

Equipment:	Trowel X	Hand Auger	Other:
Sample Collection Time:	1253 MST		

Sample Identification	Size				Analysis								Matrix		Other	
	500-mL Bottle	12-oz glass jar	8-oz glass jar	Brass Sleeve	RCRA 8 Metals	Arsenic	Mercury	Paste pH	ABA	Pesticides	VOCs	SVOCs	Soil	Other -		
AB-WR3-02-02			1		X								X			

## DESCRIPTION/COMMENTS

# MSE Confirmation Sample Collection Record

<b>SAMPLE ID:</b> AB-WR2-03-2.5	
Project:	Kiggins-Nisbet Mine Complex Removal Action <span style="float: right;">Project No: B2473</span>
Sample Location:	Clackamas County, OR - Mt. Hood National Forest <span style="float: right;">Photo: NA</span>
Description:	Field samples
Date:	8/20/08
Field Personnel:	Don Tibbets
Conditions:	warm <span style="float: right;">Weather: Rain/Cloudy</span>

## METHOD

Grab: X	Depth: 2.5'		
Composite:	Boring ID	Depth	Comments

## SAMPLE COLLECTION

Equipment:	Trowel X	Hand Auger	Other:
Sample Collection Time:	1030 MST		

Sample Identification	Size				Analysis								Matrix		Other	
	500-mL Bottle	12-oz glass jar	8-oz glass jar	Brass Sleeve	RCRA 8 Metals	Arsenic	Mercury	Paste pH	ABA	Pesticides	VOCs	SVOCs	Soil	Other -		
AB-WR2-03-2.5			1		X								X			

## DESCRIPTION/COMMENTS

# MSE Confirmation Sample Collection Record

<b>SAMPLE ID:</b> AB-WR2-04-2.5	
Project:	Kiggins-Nisbet Mine Complex Removal Action <span style="float: right;">Project No: B2473</span>
Sample Location:	Clackamas County, OR - Mt. Hood National Forest <span style="float: right;">Photo: NA</span>
Description:	Field samples
Date:	8/20/08
Field Personnel:	Don Tibbets
Conditions:	warm <span style="float: right;">Weather: Rain/Cloudy</span>

## METHOD

Grab: X	Depth: 2.5'		
<b>Composite:</b>	Boring ID	Depth	Comments

## SAMPLE COLLECTION

Equipment:	Trowel X	Hand Auger	Other:
Sample Collection Time:	1045 MST		

Sample Identification	Size				Analysis								Matrix		Other	
	500-mL Bottle	12-oz glass jar	8-oz glass jar	Brass Sleeve	RCRA 8 Metals	Arsenic	Mercury	Paste pH	ABA	Pesticides	VOCs	SVOCs	Soil	Other -		
AB-WR2-04-2.5			1		X								X			

## DESCRIPTION/COMMENTS

# **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/29/2008

## FIELD CONDITIONS

Weather:		Temp:
Precipitation:	Rain	Wind:

## VISITORS TO THE SITE

Name:	Company:	Purpose of Visit:

## FIELD WORK SUMMARY

07:00 Crew started.  
Crew mobilized from site.  
Job complete.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/28/2008

### FIELD CONDITIONS

Weather:		Temp:
Precipitation:	Rain	Wind:

### VISITORS TO THE SITE

Name:	Company:	Purpose of Visit:

### FIELD WORK SUMMARY

07:00 Crew started.  
Loaded two trucks with pups with additional material to haul to Arlington.  
Spent the rest of the day loading equipment and preparing to mobilize.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/27/2008

### FIELD CONDITIONS

Weather:		Temp:
Precipitation:	Rain	Wind:

### VISITORS TO THE SITE

Name	Company:	Purpose of Visit:

### FIELD WORK SUMMARY

07:00 Crew started.  
Loaded 2 trucks with pups to haul waste to Arlington.  
Crew loaded all equipment that was no longer necessary.  
Spoke with Pete Jones and received verbal approval to proceed with hauling remainder of waste to Arlington.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/26/2008

### FIELD CONDITIONS

Weather:		Temp:
Precipitation: No		Wind:

### VISITORS TO THE SITE

Name:	Company:	Purpose of Visit:

### FIELD WORK SUMMARY

07:00 Crew started.

Spoke with Pete Jones and he instructed me to only haul the material we were previously approved for to Arlington until he could speak with the Contracting Officer.

Crew spent the remainder of the day reclaiming road and loading equipment that was no longer necessary.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/25/2008

### FIELD CONDITIONS

Weather:		Temp:
Precipitation:	No	Wind:

### VISITORS TO THE SITE

Name:	Company:	Purpose of Visit:

### FIELD WORK SUMMARY

07:00 Crew started.

Crew spent the day servicing equipment and loading equipment that was no longer needed to complete the job. Attempted to contact Pete Jones but was unable to as he was in route to another mine site.

Crew began reclaiming roads and seeding where possible.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/24/2008

### **FIELD CONDITIONS**

Weather:		Temp:
Precipitation:	No	Wind:

### **VISITORS TO THE SITE**

Name:	Company:	Purpose of Visit:

### **FIELD WORK SUMMARY**

07:00 Crew started.

Crew removed more of the waste material, once we reached the anticipated volume ~40 cy.

I instructed the crew to stop all actions and to shut down temporarily.

Attempted to call Pete Jones to inform him of additional quantities and was unable to reach him.

After speaking with Mike Puett (MSE PM), we agreed that due to a storm moving in and the slope at which the road was cut in at, we had to either remove the excess waste or go on stand by for several days.

The cost to remove the additional waste was much less than going to standby, therefore we proceeded to remove the excess waste and stockpile it.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/23/2008

### FIELD CONDITIONS

Weather:		Temp:
Precipitation: Rain		Wind:

### VISITORS TO THE SITE

Name	Company:	Purpose of Visit:

### FIELD WORK SUMMARY

07:00 Crew started.

2 crew members hauled barrels and pipes to landfill.

Met Gwynn Collier at the Ripplebrook guard station to pick up the seed and mulch.

Crew returned from landfill and started revegetating the Kiggins Mine site.

Spread the stockpiled slash and applied seed with fertilizer and a layer of straw mulch.

Reclaimed all access roads, trails, and creek crossings.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/22/2008

### FIELD CONDITIONS

Weather:		Temp:
Precipitation:	Rain	Wind:

### VISITORS TO THE SITE

Name:	Company:	Purpose of Visit:

### FIELD WORK SUMMARY

07:00 Crew started

Crew spent day repairing bat gate and continuing to collect barrels and pipes to be removed from site.

Crew rehabbed streambank where culvert had been removed.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT Orr Exc.
USFS Personnel:	
Date:	8/21/2008

### FIELD CONDITIONS

Weather:		Temp:
Precipitation:	Rain	Wind:

### VISITORS TO THE SITE

Name:	Company:	Purpose of Visit:

### FIELD WORK SUMMARY

07:00 Crew started.

Excavated soil from the front and sides of the hopper to a depth of 4 feet.

XRF shots were taken during excavation, once results from XRF were considerably below clean up levels, a confirmation sample was collected.

Crew removed all barrels and metal pipes from the Kiggins Mine site.

Removed culvert and loaded contaminated soil into dump truck.

Old bridge was removed and pulled onto site.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action	
Project Number:	B2473	
Location:	Clackamas County, Oregon - Mt. Hood National Forest	
Field Personnel:	DT Orr Exc.	
USFS Personnel:	PJ	
Date:	8/20/2008	

### **FIELD CONDITIONS**

Weather:	Sunny	Temp:
Precipitation:	No	Wind:

### **VISITORS TO THE SITE**

Name:	Company:	Purpose of Visit:
Pete Jones	USFS	Meeting

### **FIELD WORK SUMMARY**

07:00 Safety meeting with entire crew.

08:00 Crew forged the OGF and built access road to site.

10:00 Pete Jones came on site to go over job. Sam, Pete and myself went to Ames-Bancroft to determine site access.

14:30 Pete Jones left site.

Crew spent remainder of day installing erosion controls.

## **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT
USFS Personnel:	
Date:	8/19/2008

### FIELD CONDITIONS

Weather:		Temp:
Precipitation:      Rain		Wind:

### VISITORS TO THE SITE

Name:	Company:	Purpose of Visit:

### FIELD WORK SUMMARY

Went into Estacada to USFS office to pick up fire permit, arrange for grass seed, and apply for industrial camp permit. Orr Excavating arrived on site at 15:00, crew spent the rest of the day setting up camp and unloading equipment.

# **MSE Daily Field Summary**

Project:	Kiggins-Nisbet Mine Complex Removal Action
Project Number:	B2473
Location:	Clackamas County, Oregon - Mt. Hood National Forest
Field Personnel:	DT
USFS Personnel:	
Date:	8/18/2008

## FIELD CONDITIONS

Weather:		Temp:
Precipitation:	Rain	Wind:

## VISITORS TO THE SITE

Name:	Company:	Purpose of Visit:

## FIELD WORK SUMMARY

Set up campsite.  
Located Ames-Bancroft Mine site.

**APPENDIX C**  
**Confirmation Sample Results**



MSE - Boise  
1605 N. 13th Street  
Boise, ID 83702

Work Order: **W810081**  
Reported: 25-Sep-08 09:21

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Sampled By	Date Received
AB-WR2-03-2-5	W810081-01	Soil	20-Aug-08 10:30	DT	10-Sep-2008
AB-WR2-04-2-5	W810081-02	Soil	20-Aug-08 10:45	DT	10-Sep-2008
KG-WR1-01-04	W810081-03	Soil	20-Aug-08 14:25	DT	10-Sep-2008
KG-WR1-03-01	W810081-04	Soil	20-Aug-08 14:40	DT	10-Sep-2008
AB-WR3-04-02	W810081-05	Soil	21-Aug-08 12:15	DT	10-Sep-2008
AB-WR3-02-02	W810081-06	Soil	21-Aug-08 12:15	DT	10-Sep-2008

Solid samples are analyzed on an as-received, wet-weight basis, unless otherwise requested.  
Sample preparation is defined by the client as per their Data Quality Objectives.  
The complete report includes pages for each sample, a full QC report, and a notes section.

(Q6) SVL received the following containers outside of published EPA guidelines for preservation temperatures (0-6°C).  
The guidelines do not pertain to nitric-preserved metals.

**Default Cooler (Received Temperature: 8.2°C)**

Labnumber	Container	Client ID	Labnumber	Container	Client ID
W810081-01 A	Bag, Ziploc	AB-WR2-03-2-5	W810081-02 A	Bag, Ziploc	AB-WR2-04-2-5

**New Cooler (Received Temperature: 12.0°C)**

Labnumber	Container	Client ID	Labnumber	Container	Client ID
W810081-03 A	Bag, Ziploc	KG-WR1-01-04	W810081-04 A	Bag, Ziploc	KG-WR1-03-01
W810081-05 A	Bag, Ziploc	AB-WR3-04-02	W810081-06 A	Bag, Ziploc	AB-WR3-02-02



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

MSE - Boise  
1605 N. 13th Street  
Boise, ID 83702

Work Order: **W810081**  
Reported: 25-Sep-08 09:21

Client Sample ID: **AB-WR2-03-2-5**  
SVL Sample ID: **W810081-01 (Soil)**

Sampled: 20-Aug-08 10:30  
Received: 10-Sep-08  
Sampled By: DT

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analys	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Arsenic	360	mg/kg	2.5	0.7		W837262	DG	09/22/08 03:43	
EPA 6010B	Barium	144	mg/kg	0.20	0.04		W837262	DG	09/22/08 03:43	
EPA 6010B	Cadmium	< 0.20	mg/kg	0.20	0.05		W837262	DG	09/22/08 01:28	
EPA 6010B	Chromium	28.9	mg/kg	0.60	0.11		W837262	DG	09/22/08 01:28	
EPA 6010B	Lead	4.14	mg/kg	0.75	0.25		W837262	DG	09/22/08 03:43	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	1.1		W837262	DG	09/22/08 01:28	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.10		W837262	DG	09/22/08 01:28	
<b>Mercury by SW846 Methods</b>										
EPA 7471A	Mercury	22.8	mg/kg	3.30	0.970	100	W839005	JAA	09/23/08 09:54	D2,H1
<b>Percent Solids</b>										
Percent Solids	% Solids	79.8	%				W837303	HB	09/12/08 10:48	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

**John Kern**  
Laboratory Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

MSE - Boise  
1605 N. 13th Street  
Boise, ID 83702

Work Order: **W810081**  
Reported: 25-Sep-08 09:21

Client Sample ID: **AB-WR2-04-2-5**  
SVL Sample ID: **W810081-02 (Soil)**

Sampled: 20-Aug-08 10:45  
Received: 10-Sep-08  
Sampled By: DT

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analys	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Arsenic	379	mg/kg	2.5	0.7		W837262	DG	09/22/08 03:49	
EPA 6010B	Barium	173	mg/kg	0.20	0.04		W837262	DG	09/22/08 03:48	
EPA 6010B	Cadmium	< 0.20	mg/kg	0.20	0.05		W837262	DG	09/22/08 01:33	
EPA 6010B	Chromium	30.4	mg/kg	0.60	0.11		W837262	DG	09/22/08 01:33	
EPA 6010B	Lead	7.05	mg/kg	0.75	0.25		W837262	DG	09/22/08 03:49	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	1.1		W837262	DG	09/22/08 01:34	
EPA 6010B	Silver	0.66	mg/kg	0.50	0.10		W837262	DG	09/22/08 01:33	
<b>Mercury by SW846 Methods</b>										
EPA 7471A	Mercury	167	mg/kg	33.0	9.70	1000	W839005	JAA	09/23/08 09:59	D2,H1
<b>Percent Solids</b>										
Percent Solids	% Solids	83.1	%				W837303	HB	09/12/08 10:48	

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**John Kern**  
Laboratory Director



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Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

MSE - Boise  
1605 N. 13th Street  
Boise, ID 83702

Work Order: **W810081**  
Reported: 25-Sep-08 09:21

Client Sample ID: **KG-WR1-01-04**  
SVL Sample ID: **W810081-03 (Soil)**

Sampled: 20-Aug-08 14:25  
Received: 10-Sep-08  
Sampled By: DT

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analys	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Arsenic	431	mg/kg	2.5	0.7		W837262	DG	09/22/08 04:06	
EPA 6010B	Barium	161	mg/kg	0.20	0.04		W837262	DG	09/22/08 04:06	
EPA 6010B	Cadmium	< 0.20	mg/kg	0.20	0.05		W837262	DG	09/22/08 01:39	
EPA 6010B	Chromium	15.2	mg/kg	0.60	0.11		W837262	DG	09/22/08 01:39	
EPA 6010B	Lead	11.4	mg/kg	0.75	0.25		W837262	DG	09/22/08 04:06	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	1.1		W837262	DG	09/22/08 01:39	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.10		W837262	DG	09/22/08 01:39	
<b>Mercury by SW846 Methods</b>										
EPA 7471A	Mercury	533	mg/kg	33.0	9.70	1000	W839005	JAA	09/23/08 10:00	D2,H1
<b>Percent Solids</b>										
Percent Solids	% Solids	79.2	%				W837303	HB	09/12/08 10:48	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

**John Kern**  
Laboratory Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

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Fax (208) 783-0891

MSE - Boise  
1605 N. 13th Street  
Boise, ID 83702

Work Order: **W810081**  
Reported: 25-Sep-08 09:21

Client Sample ID: **KG-WR1-03-01**  
SVL Sample ID: **W810081-04 (Soil)**

Sampled: 20-Aug-08 14:40  
Received: 10-Sep-08  
Sampled By: DT

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analys	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Arsenic	190	mg/kg	2.5	0.7		W837262	DG	09/22/08 04:12	
EPA 6010B	Barium	75.6	mg/kg	0.20	0.04		W837262	DG	09/22/08 04:11	
EPA 6010B	Cadmium	< 0.20	mg/kg	0.20	0.05		W837262	DG	09/22/08 02:02	
EPA 6010B	Chromium	17.0	mg/kg	0.60	0.11		W837262	DG	09/22/08 02:03	
EPA 6010B	Lead	11.3	mg/kg	0.75	0.25		W837262	DG	09/22/08 04:12	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	1.1		W837262	DG	09/22/08 02:03	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.10		W837262	DG	09/22/08 02:02	
<b>Mercury by SW846 Methods</b>										
EPA 7471A	Mercury	213	mg/kg	33.0	9.70	1000	W839005	JAA	09/23/08 10:02	D2,H1
<b>Percent Solids</b>										
Percent Solids	% Solids	76.0	%				W837303	HB	09/12/08 10:48	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

**John Kern**  
Laboratory Director



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Kellogg ID 83837-0929

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MSE - Boise  
1605 N. 13th Street  
Boise, ID 83702

Work Order: **W810081**  
Reported: 25-Sep-08 09:21

Client Sample ID: **AB-WR3-04-02**  
SVL Sample ID: **W810081-05 (Soil)**

Sampled: 21-Aug-08 12:15  
Received: 10-Sep-08  
Sampled By: DT

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analys	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Arsenic	125	mg/kg	2.5	0.7		W837262	DG	09/22/08 04:18	
EPA 6010B	Barium	185	mg/kg	0.20	0.04		W837262	DG	09/22/08 04:17	
EPA 6010B	Cadmium	< 0.20	mg/kg	0.20	0.05		W837262	DG	09/22/08 02:14	
EPA 6010B	Chromium	32.1	mg/kg	0.60	0.11		W837262	DG	09/22/08 02:14	
EPA 6010B	Lead	5.75	mg/kg	0.75	0.25		W837262	DG	09/22/08 04:18	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	1.1		W837262	DG	09/22/08 02:14	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.10		W837262	DG	09/22/08 02:14	
<b>Mercury by SW846 Methods</b>										
EPA 7471A	Mercury	5.38	mg/kg	0.330	0.097	10	W839005	JAA	09/23/08 10:07	D2,H1
<b>Percent Solids</b>										
Percent Solids	% Solids	79.5	%				W837303	HB	09/12/08 10:48	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

**John Kern**  
Laboratory Director



One Government Gulch - PO Box 929

Kellogg ID 83837-0929

(208) 784-1258

Fax (208) 783-0891

MSE - Boise  
1605 N. 13th Street  
Boise, ID 83702

Work Order: **W810081**  
Reported: 25-Sep-08 09:21

Client Sample ID: **AB-WR3-02-02**  
SVL Sample ID: **W810081-06 (Soil)**

Sampled: 21-Aug-08 12:15  
Received: 10-Sep-08  
Sampled By: DT

Sample Report Page 1 of 1

Method	Analyte	Result	Units	RL	MDL	Dilution	Batch	Analys	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Arsenic	366	mg/kg	2.5	0.7		W837262	DG	09/22/08 04:23	
EPA 6010B	Barium	166	mg/kg	0.20	0.04		W837262	DG	09/22/08 04:23	
EPA 6010B	Cadmium	< 0.20	mg/kg	0.20	0.05		W837262	DG	09/22/08 02:52	
EPA 6010B	Chromium	33.0	mg/kg	0.60	0.11		W837262	DG	09/22/08 02:52	
EPA 6010B	Lead	4.69	mg/kg	0.75	0.25		W837262	DG	09/22/08 04:23	
EPA 6010B	Selenium	< 4.0	mg/kg	4.0	1.1		W837262	DG	09/22/08 02:52	
EPA 6010B	Silver	< 0.50	mg/kg	0.50	0.10		W837262	DG	09/22/08 02:52	
<b>Mercury by SW846 Methods</b>										
EPA 7471A	Mercury	88.5	mg/kg	3.30	0.970	100	W839005	JAA	09/23/08 10:10	D2,H1
<b>Percent Solids</b>										
Percent Solids	% Solids	80.4	%				W837303	HB	09/12/08 10:48	

This data has been reviewed for accuracy and has been authorized for release by the Laboratory Director or designee.

**John Kern**  
Laboratory Director



MSE - Boise  
 1605 N. 13th Street  
 Boise, ID 83702

Work Order: **W810081**  
 Reported: 25-Sep-08 09:21

**Quality Control - BLANK Data**

Method	Analyte	Units	Result	MDL	MRL	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>								
EPA 6010B	Arsenic	mg/kg	<2.5	0.7	2.5	W837262	22-Sep-08	
EPA 6010B	Barium	mg/kg	<0.20	0.04	0.20	W837262	22-Sep-08	
EPA 6010B	Cadmium	mg/kg	<0.20	0.05	0.20	W837262	22-Sep-08	
EPA 6010B	Chromium	mg/kg	<0.60	0.11	0.60	W837262	22-Sep-08	
EPA 6010B	Lead	mg/kg	<0.75	0.25	0.75	W837262	22-Sep-08	
EPA 6010B	Selenium	mg/kg	<4.0	1.1	4.0	W837262	22-Sep-08	
EPA 6010B	Silver	mg/kg	<0.50	0.10	0.50	W837262	22-Sep-08	

**Mercury by SW846 Methods**

EPA 7471A	Mercury	mg/kg	<0.033	0.010	0.033	W839005	23-Sep-08	
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**Quality Control - LABORATORY CONTROL SAMPLE Data**

Method	Analyte	Units	LCS Result	LCS True	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>									
EPA 6010B	Arsenic	mg/kg	90.5	100	90.5	80 - 120	W837262	22-Sep-08	
EPA 6010B	Barium	mg/kg	95.0	100	95.0	80 - 120	W837262	22-Sep-08	
EPA 6010B	Cadmium	mg/kg	90.5	100	90.5	80 - 120	W837262	22-Sep-08	
EPA 6010B	Chromium	mg/kg	97.4	100	97.4	80 - 120	W837262	22-Sep-08	
EPA 6010B	Lead	mg/kg	88.3	100	88.3	80 - 120	W837262	22-Sep-08	
EPA 6010B	Selenium	mg/kg	80.7	100	80.7	80 - 120	W837262	22-Sep-08	
EPA 6010B	Silver	mg/kg	4.83	5.00	96.5	80 - 120	W837262	22-Sep-08	

**Mercury by SW846 Methods**

EPA 7471A	Mercury	mg/kg	0.875	0.833	105	90.4 - 120	W839005	23-Sep-08	
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**Quality Control - MATRIX SPIKE Data**

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Arsenic	mg/kg	451	363	100	87.7	75 - 125	W837262	22-Sep-08	
EPA 6010B	Barium	mg/kg	113	20.3	100	92.3	75 - 125	W837262	22-Sep-08	
EPA 6010B	Cadmium	mg/kg	84.9	<0.20	100	84.9	75 - 125	W837262	22-Sep-08	
EPA 6010B	Chromium	mg/kg	97.3	0.70	100	96.6	75 - 125	W837262	22-Sep-08	
EPA 6010B	Lead	mg/kg	312	248	100	63.4	75 - 125	W837262	22-Sep-08	M2
EPA 6010B	Selenium	mg/kg	184	94.3	100	89.9	75 - 125	W837262	22-Sep-08	
EPA 6010B	Silver	mg/kg	12.8	8.11	5.00	93.7	75 - 125	W837262	22-Sep-08	

**Mercury by SW846 Methods**

EPA 7471A	Mercury	mg/kg	15.2	22.8	0.167	R > 4S	75 - 125	W839005	23-Sep-08	D2,M3
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MSE - Boise  
 1605 N. 13th Street  
 Boise, ID 83702

Work Order: **W810081**  
 Reported: 25-Sep-08 09:21

**Quality Control - MATRIX SPIKE DUPLICATE Data**

Method	Analyte	Units	MSD Result	Spike Result	Spike Level	RPD	RPD Limit	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Arsenic	mg/kg	449	451	100	0.4	20	W837262	22-Sep-08	
EPA 6010B	Barium	mg/kg	115	113	100	1.9	20	W837262	22-Sep-08	
EPA 6010B	Cadmium	mg/kg	83.0	84.9	100	2.2	20	W837262	22-Sep-08	
EPA 6010B	Chromium	mg/kg	96.2	97.3	100	1.1	20	W837262	22-Sep-08	
EPA 6010B	Lead	mg/kg	336	312	100	7.4	20	W837262	22-Sep-08	
EPA 6010B	Selenium	mg/kg	188	184	100	2.0	20	W837262	22-Sep-08	
EPA 6010B	Silver	mg/kg	12.6	12.8	5.00	1.3	20	W837262	22-Sep-08	

**Mercury by SW846 Methods**

EPA 7471A	Mercury	mg/kg	21.5	15.2	0.167	34.5	20	W839005	23-Sep-08	D2,M3
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**Quality Control - POST DIGESTION SPIKE Data**

Method	Analyte	Units	Spike Result	Sample Result (R)	Spike Level (S)	% Rec.	Acceptance Limits	Batch ID	Analyzed	Notes
<b>Metals (Total) by EPA 6000/7000 Methods</b>										
EPA 6010B	Lead	mg/kg	322	248	100	73.1	75 - 125	W837262	22-Sep-08	M2

**Notes and Definitions**

- D2 Sample required dilution due to high concentration of target analyte.
- H1 Sample analysis performed past holding time.
- M2 Matrix spike recovery was low, but the LCS recovery was acceptable.
- M3 The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to spike level. The LCS was acceptable.
- LCS Laboratory Control Sample (Blank Spike)
- RPD Relative Percent Difference
- UDL A result is less than the detection limit
- R > 4S % recovery not applicable, sample concentration more than four times greater than spike level
- <RL A result is less than the reporting limit
- MRL Method Reporting Limit
- MDL Method Detection Limit
- N/A Not Applicable

**APPENDIX D**  
**Columbia Ridge Landfill Waste Profile Forms**

# Columbia Ridge Landfill

18177 Cedar Springs Lane, Arlington Oregon 97812

## Profile # 102118OR

### PERMIT TO DISPOSE OF NON-HAZARDOUS MATERIALS

This permit authorizes disposal of Customer's waste materials in accordance with the Industrial Waste & Disposal Services Agreement dated 8/2008.

EXPIRES: 11/13/08

**GENERATOR: USDA FOREST SERVICE - KIGGINS MINE**

DESCRIPTION: <i>MINING WASTE SOIL/ROCK</i>	VOLUME: <i>15 tons</i>
<input checked="" type="checkbox"/> SPECIAL WASTE <input type="checkbox"/> PCS <input type="checkbox"/> CLEAN-UP MATERIAL	
LOCATION: <i>MT. HOOD, OREGON</i>	COUNTY: <i>* clackamas</i>
CONTACT: <i>DON TIBBETS</i>	PHONE: <i>208-345-8292</i>
	FAX : <i>208-344-8007</i>

BILLING: <i>Landfill account MILLENIUM SCIENCE AND ENGINEERING</i>	PO#: <i>N/A</i>	JOB#: <i>N/A</i>
--	-----------------	------------------

TYPE OF DISPOSAL/ SPECIAL HANDLING/LOAD TYPE: *BULK, ADC*

\*\*\*\*\*

ALL LOADS MUST BE SCHEDULED 24 HOURS IN ADVANCE.  
CONTACT GREG AT 541-454-3220 OR JULIE AT 541-454-3310

APPROVED:  *KRISTIN CASTNER*    DATE: *03/02/09 11:56:54 AM*

**A COPY OF THIS PERMIT MUST BE SHOWN BY EACH DRIVER**



# WASTE MANAGEMENT

# Columbia Ridge Landfill

18177 Cedar Springs Lane, Arlington Oregon 97812

## Profile # 102119OR

### PERMIT TO DISPOSE OF NON-HAZARDOUS MATERIALS

This permit authorizes disposal of Customer's waste materials in accordance with the Industrial Waste & Disposal Services Agreement dated 8/2008.

**EXPIRES: 11/13/08**

**GENERATOR: USDA FOREST SERVICE - AMES  
BANCROFT MINE**

<b>DESCRIPTION: MINING WASTE ROCK/SOIL</b>	<b>VOLUME: 15 tons</b>
<input checked="" type="checkbox"/> SPECIAL WASTE <input type="checkbox"/> PCS <input type="checkbox"/> CLEAN-UP MATERIAL	
<b>LOCATION: MT. HOOD, OREGON</b>	<b>COUNTY: * clackamas</b>
<b>CONTACT: DON TIBBETS</b>	<b>PHONE: 208-345-8292</b>
	<b>FAX : 208-344-8007</b>

<b>BILLING: Landfill account MILLENIUM SCIENCE AND ENGINEERING</b>	<b>PO#: N/A</b>	<b>JOB#: N/A</b>
--	-----------------	------------------

**TYPE OF DISPOSAL/ SPECIAL HANDLING/LOAD TYPE: BULK, ADC**

\*\*\*\*\*

**ALL LOADS MUST BE SCHEDULED 24 HOURS IN ADVANCE.  
CONTACT GREG AT 541-454-3220 OR JULIE AT 541-454-3310**

APPROVED:  **KRISTIN CASTNER**    DATE: **03/02/09 11:18:25 AM**

**A COPY OF THIS PERMIT MUST BE SHOWN BY EACH DRIVER**



# WASTE MANAGEMENT