Blue Ledge Mine Superfund Site Presentation Overview

- Location
- Mine Development
- Site Features
- Acid Mine Drainage
- Distribution of Metals Contamination
- Impacts to Ecosystem
- 2010-11 USFS Non-Time-Critical Removal Action
- Q&A
LOCATION

- Applegate Reservoir
- Middle Fork Applegate River
- Elliott Creek
- Joe Creek
- Blue Ledge Mine

ORECON
CA
Mine Site

CA

OR

600 Acres
Patented Land

Mine Site
Mine Development

- 1898 Discovered
- 1904-1909 Developed
- 1918-1920 8,000 tons shipped in support of WW I
- 1930’s 2,500 tons shipped
- Over 2 miles of underground workings on ten levels
- 13 adits and one shaft
- High grade massive sulfide deposits mined for Cu, Zn, Au, Ag
- Ore hand sorted, sent to ASARCO smelter in Tacoma, WA
- >150,000 tons of sulfide-rich waste rock dumped on slopes/drainages
- No mill or associated tailings on Site
Blue Ledge Mine
Site Features

Copper Ore,
Namesake for
Blue Ledge Mine
Blue Ledge Mine
Acid Mine Drainage
Discharged to the Environment
500k g/p/d
AMD Entered Joe Creek in Spring
Surface Waters
Dissolved Copper & Zinc in Surface Water

![Bar chart showing detected concentrations of copper and zinc at various sample locations.]

- Joe Creek passes site

Sample Location:

Detected Concentration (µg/L)
Arsenic & Cadmium in Water

Chart 2
Dissolved Arsenic and Cadmium in Surface Water

- Joe Creek Passes Site
- Confluence of Joe Creek and Elliott Creek

Sample Location

Detected Concentration (ug/L)
Blue Ledge Mine
Impacts to the Ecosystem
Abundant Aquatic Life Upstream of Mine

Pacific Giant Salamander

Tailed Frog
4 Miles of Sterile Stream Below Waste Rock Piles
One Mile Below Mine
Brown Algal Mat is Only Living Organism
Macroinvertebrates
May 2001 (Wet Season)

Tributary flowing through Blue Ledge Mine Waste Pile (AMD Input)

Number of organisms

Joe Creek
Survey Location

Elliott Ck

Control (PG)
Macroinvertebrates
Sept. 2000 (Dry Season)

Tributary flowing through Blue Ledge Mine Waste Pile (AMD Input)

Number of organisms:

Survey Location:
- F
- E
- D
- C
- B
- A
- EC1
- EC2
- Control (PG)

Joe Creek
Elliott Ck
2010-11
US Forest Service
Non-Time-Critical Removal Action
Emphasis on AMD Source Control by Removing Waste Rock Piles
Solid Rock Excavation For Haul Road at 30% Grades
Construct Repository on Ancient Landslide
Excavate 45,000 Cubic Yards
Prepare Repository Subgrade

BL Mine
Install 60 mil Double-Textured HDPE Liner
Base of Repository System

- Base of Repository System
- Waste Rock
- Drain Rock
- 60 mil Liner
- Leachate Collection Tank and Riser
- Separation Geotextile
- Cushion Soil
- Waste Rock
Excavate Waste Rock by Machine and Manpower
3 Spider Excavators Climb to Top of Piles

Mini-Excavator Flown From Repository to Top by Helicopter

Repository
Spiders Excavated Waste Rock, Uncovered 6 Unknown Buried Adits and 1 Shaft

SEP 2, 2010
Laborers Remove Waste Rock Down to Clean Soil or Bedrock

Chutes Convey Hand-Excavated Waste Rock to Spiders Below
Scalers Remove Rock Above Before Waste Excavation Below
Laborers With Hand Tools
Clean to Bare Rock
D4 Joins Spiders to Push Surge Pile to Excavator & Haul Trucks Below
D8 & D6 Push Surge Pile From Spiders
Excavator Loaded 35-Ton Haul Trucks That Made 5,000 Trips to Repository
Cleaning Unknown Old Stream Channel Buried by Mine Waste

Current Stream Channel
Final Cleaning of 35’-Deep Pre-Mining Era Drainage Channel
Chute Cleaned by Spiders And Laborers
Aerial View
After Removal

Pre-mining stream path

Adits
Blue Ledge Mine Reclamation

- Repository Cover
- Erosion Control Haul Roads
- Sediment/pH Treatment Basins
- Log & Straw Wattles on Residual Soil
- Plant 10,000 Native Plants, 18 Different Species
- Native Grass Seed
- Straw, Bark, Hydromulch, Slash
- Riprap Channel Banks
- Stabilize Channel Bank
- Install Bat Gates
66,500 CY of Waste Rock Placed in the Repository

- 60 mil Double-Textured HDPE Repository Cover
- Screened Cushion Soil
Repository Cover Drainage Layer

Geocomposite Top Deck

1’ Pea Gravel On Slopes
Completed Repository Cover

Flexterra Hydromulch with Native Grass Seed

Bark Mulch and Native Shrubs

Maintenance Access Road
Pull Culverts
Riprap Creek Banks

Decommission Haul Roads
Outslope, Waterbar, Seed, Straw, Slash
Sediment/pH Treatment Basins

- Geomembrane Liner w/Drain Holes
- Rock Buttress
- Limestone Sand
- Geotextile Cover Over Lime Sand

09.22.2011
Residual Coarse-Fine Waste Rock Eroded From Bedrock Slopes

Overflow Spillway

Geomembrane Liner
During Low Flows
Seepage Through Limestone Sand in Basins Raises pH From 4 to 7
Copper and Other Metals Precipitate
80%-90% Slopes Underlying Waste Rock Piles 3, 4 Needed Short/Long-Term Erosion Control Measures
50’ Spacing for Log Wattles
2 Rows of Straw Wattles Between
Power Augers, Picks, Shovels to Create Planting Holes in Rocky Soils
10-Man Evergreen Reforestation Crew
Mix Lime Sand, Compost, Soil, Fertilizer
Conifers, Hardwoods, Shrubs, Straw Mulch
Flexterra Hydromulch, Channel Riprap
Stockpile Sites And All Disturbed Site Planted, Bark Mulched, Hydromulched
100% Slope Raveling Above Channel Needs Stabilization
Double-Twisted PVC-Coated Steel Mesh With Lofted Polypropylene Netting

Running Skyline Delivers Mesh Rolls to Slope
Completed Mesh Slope Stabilization

Flexterra Hydromulch

Riprap
Channel Protection
Bat Gate Steel Members & Welding Equipment Was Transported by Helicopter to 10 Adits
Each Bat Gate Was Custom Fit/Welded

Drilled and Epoxied Gate Anchors

Lock Box
Completed Bat Gate With Controlled Access

Removable Bar with Locks
Operations/Maintenance/Monitoring
2011-May 2015

- Leachate sampling
- Sediment/pH basin cleaning
- Erosion control
- Revegetation monitoring
- Surface water sampling
- Stream sediment sampling
- Macroinvertebrate and fish sampling
- Residents water well sampling
Blue Ledge Funding Sources

Removal Action Contract - $15 million

**CY 2010 Funding Sources:**
- American Recovery & Reinvestment Act - $12.4 million
- ASARCO Trust – CY ‘10 $1.4 million

**CY 2011-2015 Funding Sources:**
- ASARCO Trust – CY ’11 $1 million
- ASARCO Bankruptcy Settlement (to EPA) $200k

**CY 2015 & Beyond Funding Sources for EPA:**
- ASARCO Bankruptcy Settlement (to EPA) $2.5 million
- Superfund Program Funds
Prime Contractor: Engineering/Remediation Resources Group, LLC Martinez, CA

Earthworks Contractors: Granite Construction, Sacramento, CA
All Mountain Construction, Breckenridge, CO
Carlson’s Construction, Yreka, CA
D & E Construction (Liner), Visalia, CA

Site Inspection, EE/CA, Removal Design: URS Corp, Portland, OR

Independent Quality Assurance: JBR Environmental, White City, OR

*Over 75 workers and support staff put to work under the American Recovery and Reinvestment Act

*More than $4 million spent in the local economy, with some of the highest unemployment rates in the nation
Questions???
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