Champion Mine
CERCLA Removal Action

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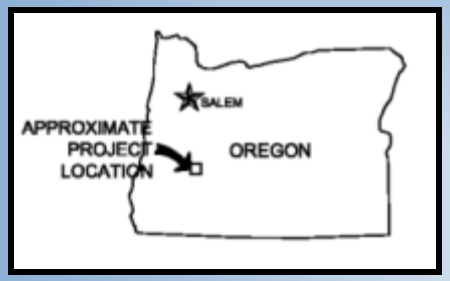
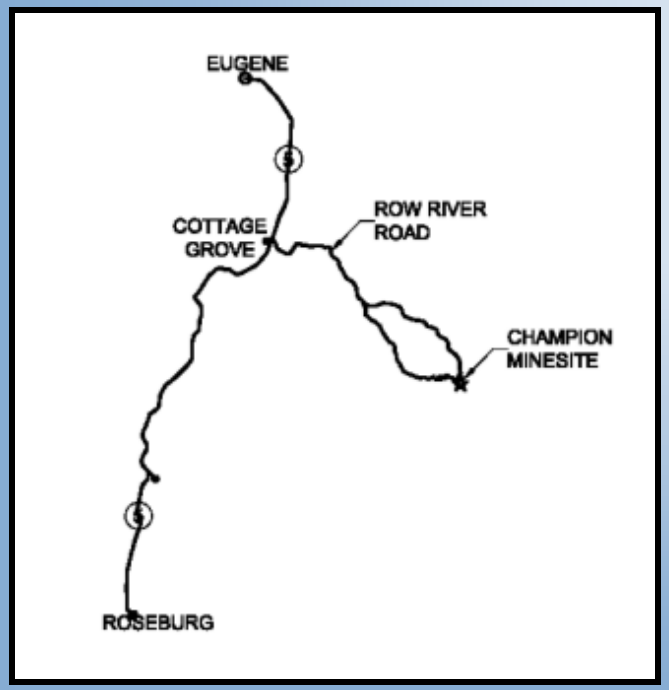
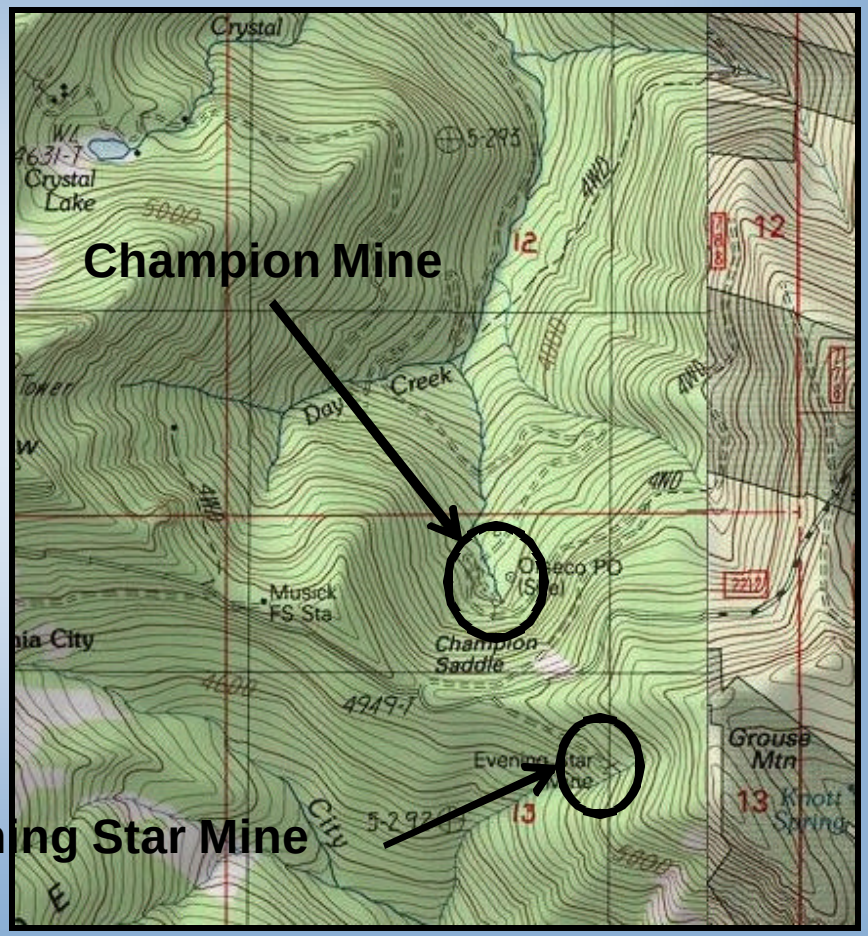
Champion Mine History

- Abandoned Underground Gold Mine
- Umpqua National Forest / Bohemian Mining District, OR
- History
  - 1892 – 1942 Main Production (EO L208)
  - 1945 – 1962 Minor Production
  - 30-stamp mill (1902)
  - 100-ton flotation mill (1939)
  - Average Grades - 0.55 OPT Au / 4.21 OPT Ag
  - Total Production – 50,000 Tons
- 9 Levels Total, 3 Main Levels (900 - 1,050 - 1,200)
  - 15,000 feet total workings / Very stable
  - Main Haulage Adit (1,200-Level) is Headwater of Champion Creek

Champion Mine Location

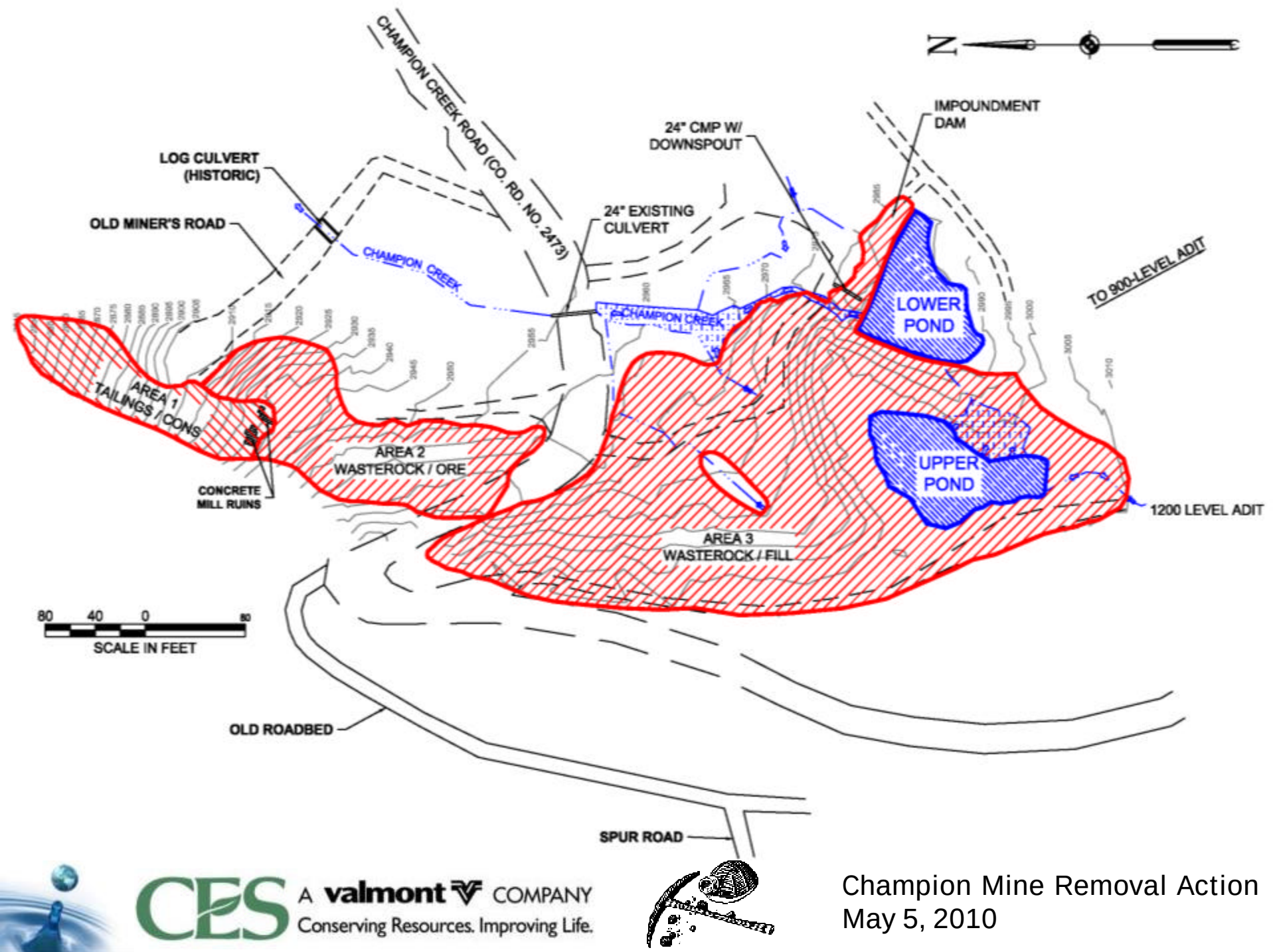






Champion Mine Setting

- Adjacent to County Road / High Recreational Use
- 4,400 Feet Elevation
- 40% Average Slope
- 47-inches Precipitation
- Heavily Vegetation
- Failing Ponds
  - 2 Ponds – Late 70's by Forest Service
  - Lower Pond is breached
- 40,000+ CY Waste Material
  - 3 Main Waste Areas
  - Mainly Waste Rock
  - Minor Tailings/Concentrates



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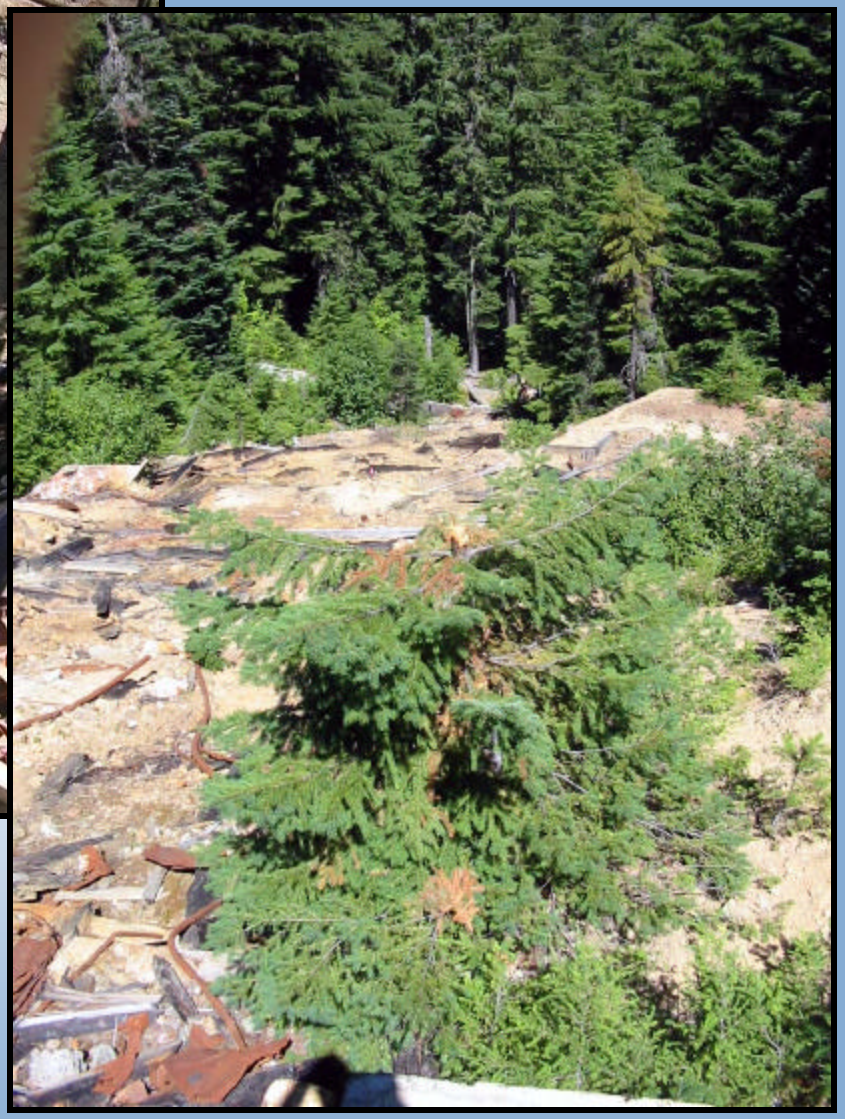
Main Haulage (1,200-Level) Adit – Before

Waste Rock Piles and Ponds - Before

Waste Rock and Seeps Below Ponds - Before

Upper Pond - Before

Lower Pond - Before



Champion Mill Foundations - Before

Project Overview / Timeline

- Preliminary Assessment – USFS in 2002
- Site Inspection (SI) – EA in 2003
- Engineering Evaluation/Cost Analysis (EE/CA) – CES in 2004
  - EE/CA Data Gap Investigation – CES in 2004/2005
- Removal Action
  - Awarded to CES in 2006 / Design-Build Contract
  - DGI (Workings, Wetlands, Topo)
  - Year 1 (2007) – Pond Dewatering/ Earthwork
  - Year 2 (2008) – Earthwork and Reclamation
  - Year 3 (2009) – Wetlands, Revegetation
- Post Removal Action Monitoring – 2008 to 2014

EE/CA Overview

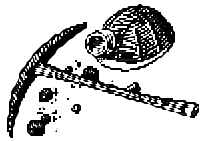
- Main Haulage Adit (1,200) - Headwater of Champion Creek
  - Flow = 300 gpm
  - Interior has pH ~ 3 su / Neutral at ~ Portal
  - ? COCs (Al, As, Cu, Fe, Pb, and Zn)
- Failing Ponds
  - Ponds build from waste rock, unknown amount of sludge
  - Numerous seeps
- Waste Rock Piles, minor amounts of Tailings/Cons
  - Total Volume ~ 40,000+ CY in 3 Main Areas
  - pH Down to 2.8 su / ? COCs (As, Cu, Fe, Pb, and Zn)
  - Slight ARD Potential (ABP +6 to -30 t $CaCO_3$/Kt)
  - Overall SPLP results indicate minimal leaching
  - One TCLP Failure for Pb (Bevill Exclusion)

EE/CA Overview (cont.)

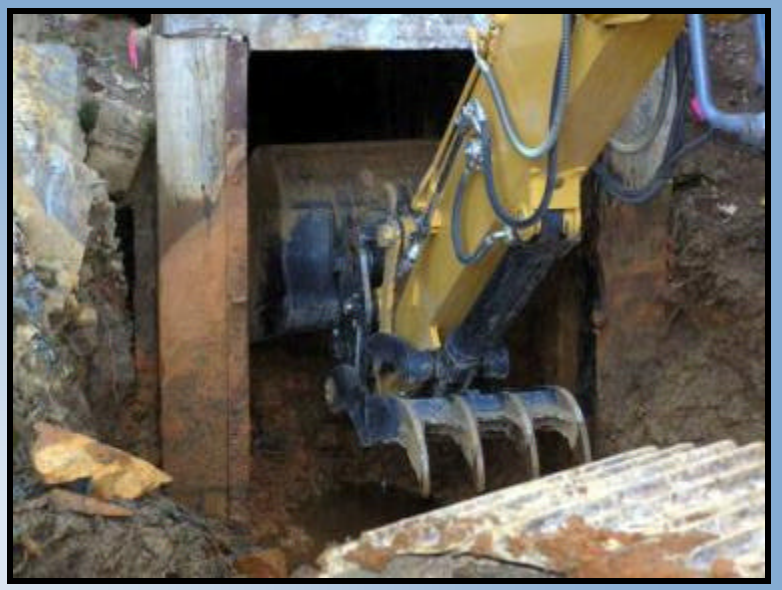
- Risk Assessment – Human and Ecological
  - No Noncarcinogenic Risks
  - Arsenic – Carcinogenic Risks (Worst Case Receptor)
  - Eco Risks to Terrestrial and Aquatic Receptors
  - Risk-Based Cleanup Goal - 85 mg/kg Arsenic in Waste Material
- Removal Action Goals
  - Reduce Exposure to COCs in Waste Material
  - Reduce Erosion of COCs into Surface Water
  - Retain Historical Features, When Practical
- 3 Alternatives (No Action, Onsite, and Offsite)
- Preferred Alternative – Onsite Repositories with Wetland

Removal Action Data Gap Investigation

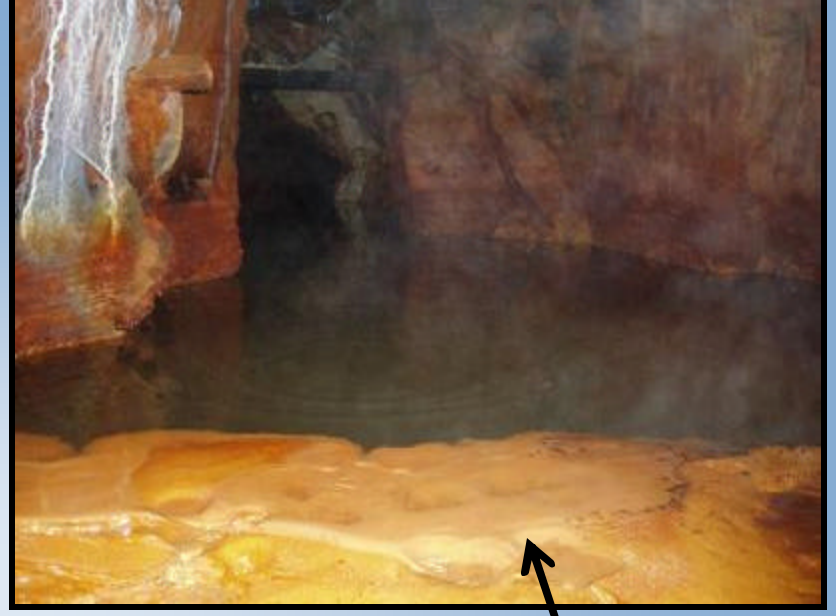
- Additional Champion Creek Sampling
- Wetland Delineation
- Topographic Survey
- Lower Pond Breach Repair
- Underground Workings Assessment – 1,200 Level
  - Mapping Load Sources, Quality, and Mass
  - Evaluate Potential For Segregation and Separate Treatment



Lower Pond Repair



- **Original Adit Door**
- **Opening & Draining**
- **Build A Dam**
- **Install DataLogger**
- **Monitor Q&Q**



Mapping

1,200 Level Reservoir

1,200 Level Sublevel Shaft

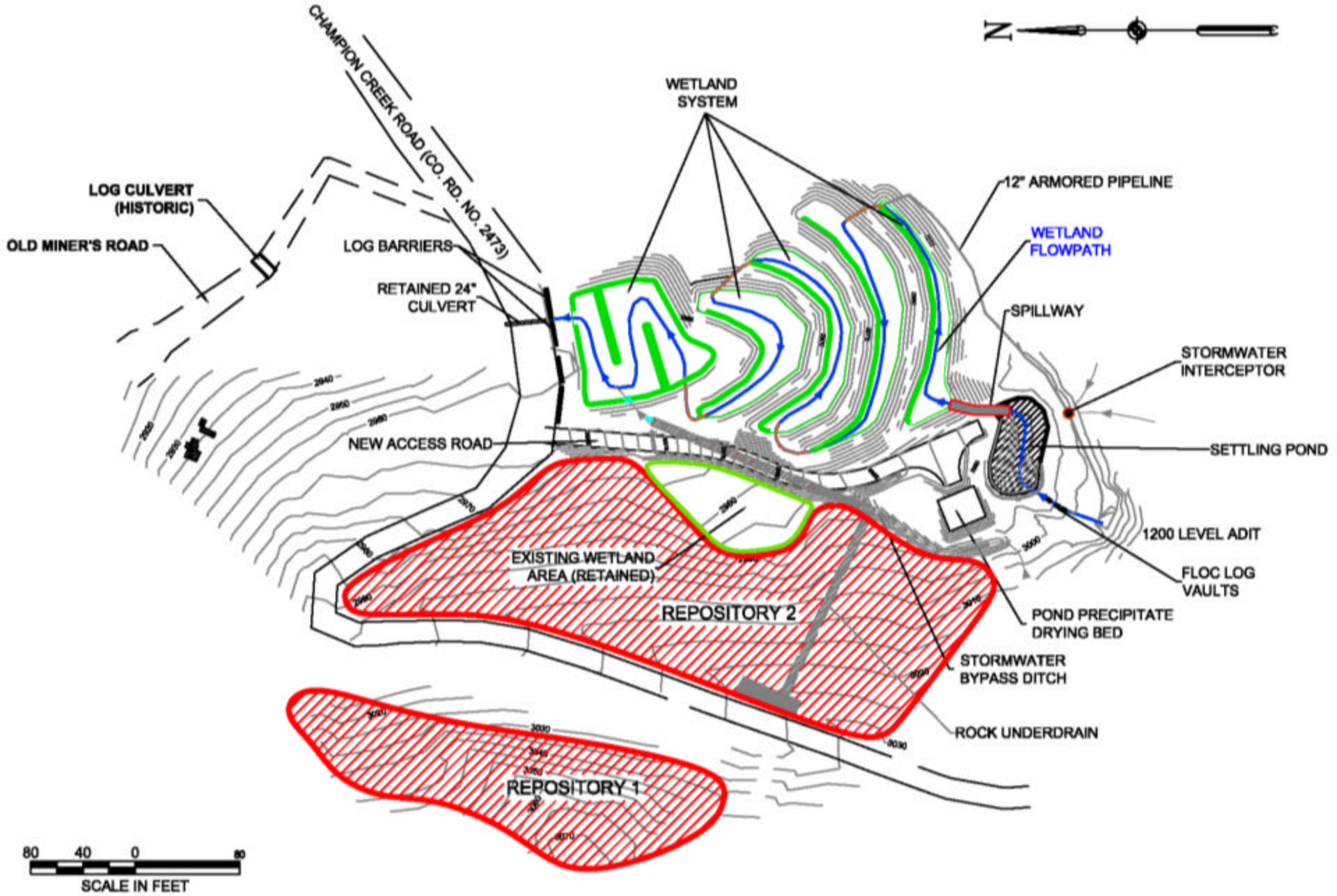
Underground Workings Assessment

- Conclusions
  - The Majority of Flow from the Main Fault/Vein Near Faces
  - Acid (pH = 2.8-3.8 su) Discharging from Several Small Stopes at the Midpoint
  - Alkaline Seeps Neutralize Flow Before the Portal

- **<u>Bottom Line - Segregation Not Worth Cost & Maintenance!</u>**

Removal Action Plan (3 Years)

- Step 1 – Main Haulage Adit / Champion Creek Diversion, and Erosion Control
- Step 2 - Pond Dewatering, and Sludge Mixing, Drying, and Stockpiling
- Step 3 – Cover Soil Borrow Area Development
- Step 4 – Onsite Repositories and Grading
- Step 5 – Wetland, with Settling Pond & Polymer Addition
- Step 6 – Cleanup and Debris Removal
- Step 7 – Revegetation/Reclamation



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12-inch Corrugated HDPE

1. **Bypass of Drainage/Creek During Construction**
2. **Storm Run-on Diversion During Normal Operation**
3. **Temporary Bypass During Settling Pond Cleaning**

1,200-Level Drainage / Champion Creek Diversion

Pond System Removal/ Sludge Dewatering

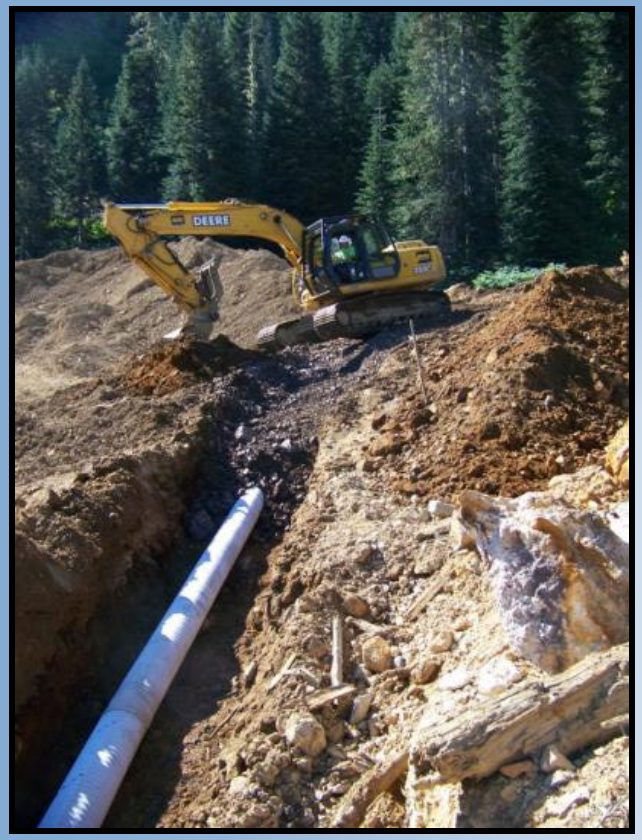
Dealing with the Wet Material

Generated All Cover Soil Onsite

Cover Soil Borrow Area / Repository 1

Repository 1 ~ 15,000 CY

Repository 1 Placement and Compaction



1. Repository Underdrain to Wetland
2. Regrade Road above Repository
3. Remove/Redirect Ditch Relief Culverts

Repository 2 – Keeping It Dry

Repository 2 Construction

Repository 2 ~ 25,000 CY

Repository 2 Construction

Wetland Design Concepts

- Pretreatment - Flocculation w/ Polymer Addition
  - "Floc-Logs" – Applied Polymer Systems
- Settling Pond
  - Sludge removal, drying, and placement in Repository 2.
  - Every 10 years
- 5-Tiered Aerobic Wetland
- Wetland Mitigation (1:1 Goal under CERCLA)
  - Before 1 acre of wetlands
  - Retained 0.25 acre wetland, added 1.25 acre
  - Achieved 1.5:1

Floc-Log Vaults and Settling Pond

Wetland Construction

Revegetation / Reclamation

- Repositories and Disturbed Areas
  - Repositories – Minimum 24-inches Cover Soil
  - Access Roads – Ripped to 2-feet
  - Seed / Fertilizer / Woodstraw™
  - Slash and Trees Scattered Parallel to Slope
  - 1,000 Douglas Fir 2-Year Seedlings on Repositories
- Wetlands Slopes and Terraces
  - Red Elderberry and Service Berry (Slopes)
  - Willows (Terrace Edges)
  - Various Wetland Plants and Sod (Terraces) - Transplanted from nearby FS-selected source

Champion Mine – Before

Champion Mine – Before

Constructed Wetland - After

Mill Area - After

Downslope Mill Area - After

Repository 2 - After

Panoramic View of Repository 2 and Constructed Wetlands Fall 2009

Post Removal Action Monitoring

- Spring 2010 Inspection – May 17th
- CES to conduct 4 more years of annual surface water and sediment sampling for main COCs.
- Forest Service to maintain Floc-Log replacement, on a semi-annual to annual basis.
- Forest Service to assess BioChar test plots.
  - FS Objective, can BioChar help restore high elevation wetlands, Forest Service to monitor over the years.

PROJECT ACKNOWLEDGEMENTS

Region 6 Forest Service

Pete Jones – Oregon Regional COR/OSC
Dennis Boles (Retired) – COR/OSC
Local Umpqua FS Resource Staff

CES Team

Tim Otis, John Martin, Bob Lambeth, Ryan Tobias, MaryAnn Amann, and Dustin Wasley

Contractor

Munitor Construction - Portland

900-Level Mine Operators

Dick and Duck Secord