Khayyam Mine EE/CA: Investigation Challenges and Risk-Based Justification for No-Action Response
Prince of Wales Island, Alaska

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Is No Action Ever a Cleanup Action?
Summary

• Site Background & Mine History
• Project Background, Goals, & Approach
• Site Investigation Findings
• Engineering evaluation & cost analysis (EE/CA) remedial alternatives
• CERLA comparison → Does No Action protect environment?
Site Background

- Remote site in Tongass National Forest
- Climate:
  - Avg. annual precip./snow ~105”/~45”
  - Avg. summer/winter temps. ~45-65°F/~27-42°F
- Ecology:
  - Mature/sensitive habitat: alpine, muskeg/bog, forest, wetland, riparian, & aquatic
  - Salmon in lower Omar Ck, not upper (falls)
- Geology: Mineralized zones Fe & Cu sulfides in host rock
- Hydrology: Omar Ck glacial basin with steep slopes
48 mi from Hollis (140 people) on ditched, overgrown logging road & steep hike
Mine History

• Found 1899, operated 1901-1907
• 4,100 tons of Cu, Ag, Au ore mined, transported by tram to shipping terminal
• 3 Current Mine Areas:
  – Khayyam Mine: 8 adits, AMD, waste rock (WR) piles, exploration trenches
  – Stumble-On Prospect: 4 adits, WR, acid mine drainage (AMD)/‘black’ stained soil
  – Tram Terminal: by Omar Ck, ore piles, ‘black’ stained soil in a depression
Khayyam Mine
Omar Ck Drainage from W2
Stumble on Prospect
Stumble on Prospect

Adit W3
Black stained soil below Adit W1

Stumble on Prospect
Project Background

• Land Owner: US Forest Service (USFS)

• Prior Studies:
  – BLM 1995: mine inventory & water samples
  – 2008 PA/SI: site investigation & sampling

• Regulatory Framework
  – USFS is landowner & coordinating the work
  – CERCLA non-time critical EE/CA vs remedial investigation & feasibility study
  – Applicable or Reasonable & Appropriate Requirements (ARARs)
    • Other regulations must be followed unless less protective
Project Goals

• Resolve data gaps from prior studies
• Collect enough data to statistically compare impacted and background locations
• Develop removal alternatives appropriate for current site conditions
• Compare EE/CA alternatives with CERCLA criteria
Project Approach

• Remote Site Investigation Challenges
  – Helicopter access or ~48mi from Hollis
  – Weather late June 2009 vs late Aug. 2010
  – Waste rock, soil, surface water, “sediment” sampling
  – Rapid bioassessment protocol (RBP)

• Streamlined Risk Assessment
  – Human health
  – Ecological risk assessment

• Develop/compare EE/CA alternatives
Site Investigation Findings

• **Metal COPCs** *(chemicals of potential concern)*
  - Metals in groundwater not a concern since incomplete exposure pathway *(2008 PA/SI)*
  - Waste rock, soil, sediment, surface water **COPCs** determined with EPA statistical methods *(ProUCL)* & compared with background values

• **Solid media chemical results:**
  - Khayyam Mine *(KM)*, Stumble on Prospect *(SOP)*, Tram: waste rock, soil, ore pile > ADEC risk-based **screening** criteria *(RBSC)*
  - Some Omar Ck sediment d.s. of Tram > **RBSC**
Site Investigation Findings (cont’d)

• Surface water chemical results:
  – Khayyam Mine, Stumble on Prospect seeps:
    • Elevated metal concentrations > RBSC.
    • Ferric hydroxide precipitate (yellow boy) & field pH (2.8 – 6.7) indicative of AMD
    • Adit seeps mostly infiltrate near adits, but some go to small perennial tributaries of Omar Ck
  – Surface water & groundwater had no human health & ecological receptor complete pathways
Surface Water Flow Path
Steamedined Risk Assessment

- Human Health: no complete pathways for solid media or water

- Ecological:
  - 2 seasons of bug surveys in Omar Ck & reference creeks showed no adverse impacts to aquatic receptors despite some elevated metal concentrations in SW
  - Potentially complete pathways were identified for exposure of ecological receptors to solid media
RBP Survey Bug ‘Lode’
EE/CA Alternatives

• 4 for soil, waste rock, and spilled ore:
  – Alt. 1 - No Action
  – Alt. 2 - On-site capping
  – Alt. 3 - Consolidation in on-site repository
  – Alt. 4 - Consolidation & dispose off-site
Alternatives Comparison by CERCLA

• Alt. 1 is recommended because:
  – It protects human health & env. because:
    • Recreational users likely would not drink the obviously impacted water from the adits
    • Low metal concentrations & limited extent in mine waste would be a low risk to recreationalists
    • Soil, mine wastes, surface water, adit water, and sediments do not pose a risk to local populations of ecological receptors
  – Some mine wastes with elevated metals would remain on site, but have low impacts
Alternatives Comparison by CERCLA (cont’d)

• Alts. 2, 3, & 4 are not recommended:
  - Alts. 2, 3, & 4 cost >> Alt. 1, & provide marginal risk reduction
  - Alts. 2, 3, & 4 address elevated metal concentrations in wastes, but have >> env. risk from construction impacts to sensitive habitat & marginal risk reduction

  • Logging ~17 acres
  • ~3.5mi. new roads, staging, cut/fill slope
  • Long re-establishment
  • Temporary creek crossings in sensitive habitat
  • Potential const. release
CERCLA Support of No Action

- CERCLA allows selecting a remedy not satisfying an ARAR if implementing it causes more risk to human health & the environment than other alternatives
No Action
Conclusions

• No Action selected because:
  – Effects of release of existing COPCs (no human health & partial ecological risk) Less Than
  – Temporary & permanent impacts of construction in mature & sensitive habitat

• Caveats:
  – Remote site with mature & sensitive habitat
  – Need sufficient data to perform risk assessment
  – EE/CA is a Draft

• Risk assessment results & ARARs generally support the CERCLA No Action Alt.
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