Superfund and Mining Megasites - Lessons from the Coeur d’Alene River Basin

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National Research Council
Board on Environmental Studies and Toxicology
National Academies of Science
The Coeur d’Alene River Basin
The Coeur d’Alene River Basin

- Coeur d’Alene River System 70 miles long
- Flows into 25 Mile long Coeur d’Alene Lake
- From there Flows into the Spokane River - Source of Water for Spokane Washington
- Home to the Coeur d’Alene and Spokane Tribes
- Long History of Mining
Mining in the “Silver Valley”

• “Gold Rush” in 1880’s (Brief)
• The “Real” Riches: Silver, Lead and Zinc
• Over a century, 140 Million Tons of Ore
• 20% of US Silver, Lead and Zinc Production
• Massive Pollution of the River Basin and Lake with Mine Tailings
• Health Effects for Miners was Known
FIGURE 2-6  Workers taking the Clague electrolytic treatment. Source: Bennett 1994. Permission Pending.
Bunker Hill Mine and Smelting Complex

- Largest Mine in the Valley
- Smelter Served over 100 Mines
- Largest Smelter in the World
- Produced High-Purity Silver, Zinc and Lead
- 1973 -- Pollution Control Equipment Damaged
  - Owners Secretly Elected NOT to Repair
  - Emitted 160 tons/month particulates (50-70% Lead)
  - Large Areas of the Basin Contaminated with Lead
  - Air Concentrations up to 30mcg/cu meter
Human Health Concerns

- 1976 Study: 99% of Children had Blood Lead >40 mcg/dL, including 40% of Children aged 1-9
- Bunker Hill Complex Spent $21M to Decrease Air and Water Pollution
- Metal Prices Dropped, Plant Closed in 1981
  - Loss of 2,100 Jobs (75% of Region’s Workforce)
- 1983 “Bunker Hill Box” named NPL site for “Fast-track Clean-up)
  - 3 Miles Wide and 7 Miles Long
  - Remediation Began in 1986
Contamination Outside the “Box”

- EPA Tried non-Superfund Mechanisms
- Multiple Law Suites Brought Against Mines, State, Feds
- 1998 EPA Designated 1,500 Square Mile Area as NPL Site: Stretching from Montana through Idaho to Spoke, WA
- Storm of Controversy
  - “Leave it Alone”
  - “Clean up to Historical Background”
  - “Protect Human Health, then STOP”
- NAS Asked to Evaluate
EPA’s Responsibilities Under CERCLA

• Site Characterization
• Risk Assessment
  – Human Health
  – Ecological Health
• Clean-up Goals and Approaches (Remedial Investigation)
• “Selected Remedy”
Superfund Process

- Ecological Risk Assessment
  May 2001
- Human Health Risk Assessment
  July 2001
- Remedial Investigation
  October 2001
- Feasibility Study
  October 2001
- Proposed Plan
  October 2001
- Record of Decision
  September 2002

Statement of Task

- Directs the committee to examine the scientific and technical practices in EPA’s decision making.

- Roughly parallels the Superfund Process.

- Directs the committee to develop lessons learned from the Coeur d’Alene River Basin and approaches for dealing with large complex Superfund sites.
The “Health” Issues

• Human Health
  – Lead, Lead and Lead

• Ecological Health
  – Lead
  – Zinc

• Different Regulatory Teams

• Different Political Agendas

• Different Budgetary Implications
Bunker Hill
Mean Blood Lead Levels: 1974-2002
Ecological Health

- Fish and Other Aquatic Life
  - Zinc

- Waterfowl (Tundra Swans, Geese, Ducks)
  - Lead
Floodplain blanketed by sediment enriched in lead (Pb) 
(*background Pb concentrations about 25 ppm*)
Coeur d’Alene River’s Inflow Plume into Lake
Selected Remedy... In brief

Human Health Protection: Final Remedy

- Residential yard remediation, provide a barrier above 700 mg/kg lead; remove and replace upper foot of soil when greater than 1000 mg/kg lead.

- Removals at public use areas, an institutional controls program, and a lead health intervention program.

- Cost estimate: approximately $92 million.
Selected Remedy... In brief

Environmental Protection: “Interim Remedy”, 20-30 years of prioritized actions...

- **OU2 & 3**: Inconsistent with “Systems Approach”
- **Canyon and Ninemile Creeks**: Combination of removals and passive water treatment
- **South Fork Coeur d’Alene River**: Removals and bank stabilization
- **Main Stem Coeur d’Alene River**: River bank removals, riverbed dredging (one area), and “splay removals”.
Selected Remedy… In brief

Environmental Protection:

• **Lower Basin floodplain:** Remediate:
  – 1,200 acres of wetland area
  – 1,900 acres of lake bottom (less than 6ft deep)

• **Coeur d’Alene Lake:** Not included in the selected remedy

• **Spokane River:** Remediation of shoreline and sediment sites.

• **Approximate Cost:** $270 million
NRC Report

Superfund Process

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Site Characterization/Remedial Investigation

- Historical and collected data provide a useful depiction of metals concentrations in the surface waters, sediments, and soils over the wide spatial area.
- Groundwater – the primary source of dissolved zinc to surface water – was not adequately addressed.
- The RI did not adequately address the substantial hydrologic variations that occur in the basin.
Human Health Risk Assessment

• Lead intake by current and future populations of children was estimated with a reasonable degree of certainty.
• Universal blood lead screening of children aged 1-4 is indicated for the Coeur d’Alene River Basin given the high prevalence of environmental lead.
Ecologic Risk Assessment

• Found the assessment to be generally consistent with best scientific practices.
• Only a limited assessment of impacts to some organisms and communities
  – Coeur d’Alene River
  – Coeur d’Alene Lake
• Extensive evaluation with nominal impact.
Remedial Decisions for Human Health Protection

• The scientific evidence supporting substantial benefits of yard remediation for decreasing blood levels is currently weak.

• However, there are logical reasons to believe that yard remediations decrease exposure to lead and there is suggestive evidence of efficacy within the Bunker Hill Box and Basin.

• Barring recontamination, the proposed remedies are likely to reduce human health risks.
  – Long-term support will be needed to maintain the integrity of the remedies.
Remedial Decisions for Environmental Protection

- Feasibility and effectiveness of actions intended to protect fish and wildlife have not been adequately characterized.
  - Repositories
  - Floodplain removals to stem zinc input
  - Recontamination:
    • Wetland remediations
    • Riverbank removals

- Recommendations largely recommend defining:
  - specific source areas contributing dissolved zinc
  - largest potentially mobile sources of lead

- Emphasize potential for recontamination in RD
The Valley
The Stakeholders
The Issues

- Cost & Economic Impact to the Region
- Feasibility
- Recontamination
- Further Damage to Environment
- Safety to Humans (Traffic Accidents)
- What About the Lake?
- Oversight and Funding Over Centuries???
Mining Megasites

- Necessary to establish long-term management, funding, and administrative structures; Where final remedies cannot be implemented, establish a rigorous adaptive management process.

- The committee does not recommend amending CERCLA, but there has to be flexibility.