Managing Complex Fund-Lead Superfund Sites with Uncertain Funding
Velsicol Chemical Corporation Superfund Site
St. Louis, Michigan

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Velsicol Chemical History

- Located in St. Louis, Michigan (Middle of the Mitten)
- 52-acre former chemical plant site adjacent to Pine River
- Produced DDT, Polybrominated Biphenyl (PBB) plus many other chemicals
- PBB disaster in 1973, facility closed in 1978 and demolished in-place
- Consent Judgement in 1982 (Velsicol/EPA/State of Michigan)
  - Cap/Slurry Wall with covenant for sediment contamination
- Due to DDT levels in fish tissue, EPA began sediment cleanup in 1998
  - 675,000 cubic yards, completed 2006, 98% DDT reduction in fish
- Velsicol Bankruptcy in 2002
- Velsicol Burn Pit northwest of Velsicol plant site across Pine River
Remedial Action History

- Evidence of remedy failure
- State of Michigan began RI/FS
- NAPL leaking from site into sediment excavation
- Collection trench constructed
- EPA signed ROD for former plant site in June 2012
  - City drinking water supply replacement
  - Residential cleanup
  - In-situ thermal treatment (ISTT) in two areas, excavation, In-situ chemical oxidation (ISCO)
  - Barrier wall, cap
  - $374 million
Challenge at Complex Sites
Implementing Large Multi-Component Remedies

1. Managing Stakeholders
   • Large amount of community, City, political and media interest

2. Finite budgets and funding procedures require EPA to divide large remedies into multiple RD/RA projects
   • Worst first with logical approach
   • Coordinating RD/RA project schedule with EPA Headquarters RA funding process (Budget RA funding increments by year)

3. Being innovative and cost effective
Risk/Public Perception Drove Initial Funding

- Remedy broken into multiple projects
- Residential cleanup
  - Only 16% of properties exceeded human health criteria
  - Ecological risk provided compelling basis for action.
- Joint water authority formed with neighboring city

$374 Million

Former Plant Site

Drinking Water Replacement

Residential Cleanup
Remedial Action Funding for Fund-Lead Sites

- **Worst first**: Prioritization Panel ranks sites for Remedial Action funding
  - HQ carved out funding for residential cleanup & water supply replacement
  - Remedies on former plant site evaluated separately (considered new start)
- EPA prioritized designs to ensure capability to conduct remedial actions
- EPA has completed designs for:
  - Residential cleanup (RA completed)
  - City drinking water supply replacement (RA nearly complete)
  - In-situ thermal treatment Area 1 (RA just started)
  - In-situ thermal treatment Area 2 (unfunded)
  - Excavation of 100,000 tons of contaminated material (unfunded)
  - Groundwater treatment, in-situ chemical oxidation and barrier wall designs underway
  - Final cap design not yet started.
Innovative and Cost Effective Approaches

- Sampling strategy for residential yard cleanup
- Replacement of City of St. Louis, Michigan drinking water supply
- In-situ thermal treatment performance standards
Residential Soil Sampling for DDT, DDT derivatives, and PBB

• Birds drove need to be thorough in sampling approach

• Samples were collected from each yard area (3 yard areas per property) to determine where remediation is needed

• Each sample consisted of a number of subsamples mixed together and then sent to a laboratory for analysis
Replicate Sampling at 15% of Yard Areas

Replicate subsamples co-located with normal field subsamples.

Replicates composited separately from, and by same method as, normal field samples.

Purpose is to measure the amount of variability with this sampling design.

Sources of variability:
- Unequal distribution of contaminant
- Mixing process
- “Nugget effect”
Why use this sample design?

It answers a specific question (What is the average concentration per yard area).

It addresses hotspots (isolated hotspots more likely to be sampled).

However, it is not useful in determining where the highest value occurs or what the highest value is within a yard area.

It is probabilistic. We will have a built in buffer to ensure contaminated sample areas are found.
Sampling Outcomes

- Determined the representative concentration of the contaminant (DDT, PBB) in the soil for each yard area.

- Determined a lower threshold (decision level) to be 95% confident that a yard area is less than 5 mg/kg (ppm).

- Determined which yards exceed the decision level threshold of 4.1 mg/kg.

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City Drinking Water Supply Replacement

- City water supply contaminated with pCBSA (DDT production by-product)
- Concentration under State drinking water standard of 7,500 ppb (460 ppb)
- Drinking water production wells very near site
- State demands replacement of drinking water supply
- Political and community pressure
- EPA could not replace drinking water supply under Superfund.
  - Drinking water standard not exceeded or potential to exceed.

- Groundwater modeling was used to compare pumping rates and P&T costs for hydraulic containment under 3 scenarios:

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
<th>City Wells</th>
<th>Future Remediation System</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Average monthly pumping City Wells 1, 4, 5, 6, 7, and 8.</td>
<td>Average monthly pumping rates.</td>
<td>FS treatment system.</td>
</tr>
<tr>
<td>2</td>
<td>Average monthly pumping from City Wells 5, 6, 7, and 8.</td>
<td>Same as Scenario 1, but with City Wells 1 and 4 turned off.</td>
<td>Same as Scenario 1, but with fewer extraction wells and reduced pumping rates.</td>
</tr>
<tr>
<td>3</td>
<td>All city wells off.</td>
<td>No pumping.</td>
<td>Same as Scenario 2, but with even fewer extraction wells and further-reduced pumping rates.</td>
</tr>
</tbody>
</table>
Groundwater Modeling Maps

- Top: Scenario 1
- Middle: Scenario 2
- Bottom: Scenario 3
- 3 Key aquifer units shown left to right.
- Capture evaluated at steady state conditions.
- Forward particle tracking with color-coding by particle fate at steady state.
### City Drinking Water Replacement

- Using estimated treatment costs for groundwater ~$5 million/year savings
- Drinking water supply replacement ~$33 million
- Justified drinking water supply replacement based on cost
  - Payback window ~ 7 years
  - 30+ years of P&T operation

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Number of Remediation Extraction Wells</th>
<th>Combined Remediation Pumping Rate (gpm)</th>
<th>Reduction in Remediation Pumping Wells/Rate Compared to Scenario 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23 + Perimeter Drain</td>
<td>189</td>
<td>0 wells / 0 gpm</td>
</tr>
<tr>
<td>2</td>
<td>17 + Perimeter Drain</td>
<td>142</td>
<td>6 wells / 47 gpm</td>
</tr>
<tr>
<td>3</td>
<td>13 + Perimeter Drain</td>
<td>76</td>
<td>10 wells / 113 gpm</td>
</tr>
</tbody>
</table>
In-situ Thermal Treatment

• Funding provided to begin remedies on former plant site
• Source material to be addressed first
• In-situ thermal used to address DNAPL
• Level B pre-design sampling refined area to be treated (one-acre)
• Site preparation completed prior to funding for in-situ thermal treatment (State cost share)
  • New electrical circuit, process equipment pad, new roads and new access gate
• Using diminishing returns to determine shut down criteria and when to soil sample

• Use information from the in-situ thermal treatment of Area 1 to help with the more complex, larger Area 2
Summary

• Be flexible in approaches
  • Ecological basis for residential cleanup
  • Cost-effectiveness basis for City water supply replacement

• Complete as much design work as possible if little or no changes will be needed over time

• Value engineering when needed

• Break up large remedy into RA projects with attainable shorter term budgets

• Budget funding increments for RA projects by year

• Update overall site budgeting plan annually and early in FY, and communicate to funding planners

• Communicate frequently with stakeholders