Investigating Vapor Intrusion at a Superfund Site – Lessons Learned

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Site Setting

• Site is composed of four Superfund Sites
• Multiple Parties – Private and Federal
• Mixed industrial – commercial – retail – residential
Site Remedy

• Groundwater remedy in place and on-going
• Soil cleanup completed
• Large portion of Site redeveloped into Class A buildings
Regulatory Background

- Record of Decision in place (late 1980s) but did not address vapor intrusion pathway
- EPA requested formal RI/FS to amend the ROD to include provisions for VI:
TCE Plume – Shallow Aquifer

- 0.005 - 0.1 mg/L
- 0.1 - 1 mg/L
- > 1 mg/L
Sampled Buildings – South Area

40 Commercial and 32 Residential Buildings
Sampled Buildings– North Area

21 Commercial and 14 Residential Buildings
Air Samples: About 3,000 samples collected

Utilities Room/ Limited Access

Outdoor Intake

Outdoor Reference or Background Sample

Pathway Sample

Indoor Exposure

Possible Crack(s)
Conduits through Floor
Chemicals Analyzed

Analyzed only for VOCs found in the groundwater

• 1,1-Dichloroethene

• Trichloroethene

• 1,1-Dichloroethane

• 1,2-dichloroethene

• Vinyl chloride

• Perchloroethene
Selected Remedies in ROD

- Sub-slab ventilation (passive, pressurization, or depressurization)
- Alternatively, HVAC if owner chooses
- VI provisions for future construction
- Remedy supplemented by institutional controls

Ref: Ludlow J, 2005
Lesson 1: Interim Mitigation Measures

- Implement readily
- Communicate plan/results to building owner and regulatory agency
- Respect privacy
- Do not underestimate access

Ref: Hawthorne, 2005
Ref: Haddad, 2005
Ref: ITRC, 2007
Lesson 2: Soil Gas vs Indoor Air

• Public wanted to know what they were breathing

• Translating soil gas to indoor air could be complicated – not too much trust in modeling

• When collecting indoor air samples, understand limitations and be thorough with collecting indoor use information

• For this site, we ultimately decided with indoor air
### Lesson 3: Mitigation - Iterative

<table>
<thead>
<tr>
<th>Building</th>
<th>Mitigation Method</th>
<th>Pre-Mitigation</th>
<th>Post-Mitigation</th>
<th>Percent Change</th>
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<tr>
<td></td>
<td>No. Samples</td>
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<td>Max TCE (ug/m³)</td>
<td>No. Samples</td>
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## Lesson 3: Mitigation – Modification of Existing System – Simple and Fast

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Lesson 3: Mitigation – Air Exchange Rates

![Graph showing air exchange rates with TCE (μg/m³) on the y-axis and air exchanges (1/hr) on the x-axis. The graph includes data points and a dashed line at 5 μg/m³ labeled as 'Commercial Interim Action Level = 5 μg/m³'.]
Lesson 4: Flexibility in Remedy Selection

• For VI, one remedy does not fit all buildings
• Allow for flexibility in VI remedies
• Remedy should accommodate variety in existing buildings and future developments
• Disruption to operations
• Consideration for current and future access needs
Lesson 5: Distribution of Information to Stakeholders

• Buildings owners
• Tenants
• General Public
• Local agencies (e.g., town, city, or county)

Information – Acceptance – Remedy Selection

Who should distribute information?
Lesson 5: Avoid This:

**Chicago Tribune**

- **Round-the-clock exposure**
- **Residents getting alarmed**
- **Vapors rising into buildings**
  - **Jan 29, 2003**

**The New York Times**

- **Group of brain ailments raises questions**
  - **Nov 22, 2002**

**The Mercury News**

- **Pollution thwarts housing plan**
  - **Mar 07, 2003**

- **Hundreds question toxic gas risk**
  - **Jan 31, 2003**

- **Toxic gas enters offices**
  - **Aug 29, 2003**

- **Polluting Superfund system to be shut down**
  - **Feb 21, 2003**

- **Unforeseen risk**
  - **May 9, 2003**
Lesson 6: Applicability/Limitations of Institutional Controls

• Complex at large multiple third-party owners

• Cooperation and competing needs of many stakeholders: regulatory agencies, responsible parties, building owners, local agencies

• Time consuming

• Which one? Deed restrictions – city ordinance – access agreements?
Lesson 6: Institutional Controls – Typical concerns

- Responsibility of implementation – who pays?
- Potential for disruptions to operations
- Security measures in limited-access buildings
- Potential for restriction on future developments
- Effect on local real estate market
Lesson 6: Applicability/Limitations of Institutional Controls

- Layered: local permits, building codes, agreements, information devices
Lesson 7: It Is a Long Process

Lesson 1: Implement Interim Mitigation Measures Readily
Acknowledgements

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