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- **Ask for help!** Use the questions box to let us know if you have technical difficulties. You can also raise your hand for help.
LESSONS LEARNED FROM HRSC USED AT LUST SITES

Welcome to NEIWPCC’s addition in the LUST Corrective Action Webinar Series

6/24/2020
TODAY’S SPEAKERS

John Sohl, President and CEO | Columbia Technologies

Dorothy Malaier, P.G. Chief, UST Corrective Action State and Federal Funds Section | Alabama DEM

Ashleigh Thrash, P.G. Section Manager, Assessment & Non-Permitted Petroleum Section | South Carolina DHEC
AGENDA

• Lessons Learned from 150 HRSC Investigations and Failed UST Remediation Sites

• High Resolution Site Characterization in Alabama- A Strategy to Advance UST Release Cleanups in Alabama

• Utilization of High-Resolution Site Characterization (HRSC) In South Carolina

• Q&A

• End
Lessons Learned from 150 HRSC Investigations and Failed UST Remediation Sites

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Focus on Groundwater =>
Expensive & Blinding Misdirection
Technical Scope of Work

1. Review historical work plans and data to establish current CSM
2. Map residual source material and evaluate its characteristics
3. Evaluate stability of the LNAPL body
4. Evaluate impact to groundwater, dissolved phase plume, and migration path mass transport
5. Evaluate potential vapor intrusion concerns.
6. Evaluate spatial orientation of installed monitoring and recovery well screen intervals against the LNAPL location and soil permeability.
7. Evaluate potential for natural source zone depletion.
8. Revise the CSM
## Preliminary Findings from 150 Investigations

<table>
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<tr>
<th>Finding</th>
<th>Number of Sites</th>
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<tr>
<td>1. Significant gaps in the conceptual site models</td>
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<td>2. Residual LNAPL</td>
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<tr>
<td>3. Residual LNAPL below the air-water interface</td>
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<td>4. Layered site stratigraphy</td>
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<td>5. The residual LNAPL is in the tighter zones</td>
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<td>6. Chemical injections did not reach the tighter zones</td>
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<td>7. Redistribution of the LNAPL</td>
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<td>8. LNAPL redistributed by vacuum enhanced extraction</td>
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</tr>
<tr>
<td>9. Residual LNAPL is bound to soil</td>
<td>140</td>
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<tr>
<td>10. Misaligned monitoring and recovery wells</td>
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<tr>
<td>11. Groundwater redox parameters are good indicators</td>
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</table>
CASE EXAMPLE

STEPHENS FUEL
Elevated Benzene in Monitoring Wells (sampled in 01/2020)
Figure 10

Cross-sectional Composite

Stephen's Fuel Stop
Hollywood, AL
March 2020

High-Resolution Site Characterization

East

Water Level

Free Product

Benzene (mg/l)

Elevation (ft-MSL)

LNAPL

Dissolved Phase Plume

MIP-PID (uV) 10,000,000

LIF (%RE) 300

HPT Pressure (psi) 111

Benzene (mg/l) 10,000.0
CASE EXAMPLE

MAPLE AVE
CASE EXAMPLE
FORMER TIGER OIL
*Elevated BTEX in Monitoring Wells
3D IMAGERY – TIGER OIL

OIP, PID, and Co-Located Soil Samples: https://skfb.ly/6SnXM

OIP, PID, and Groundwater Samples: https://skfb.ly/6SnVU
Contracting – State Limitations

1. The State regulators and reimbursement funds do not have a mechanism to identify stalled or failed remediation projects.

2. There is generally not a funding or reimbursement mechanism for reevaluating the conceptual site model where the remediation has failed or stalled.

3. There is generally not a funding or reimbursement mechanism for HRSC with adaptive work plan execution.
Recommendations

1. Encourage the States to upgrade the conceptual site models of failed and stalled remediation sites.
2. Implement ITRC LNAPL-3 Management guidelines.
3. Implement HRSC early, especially prior to any remedial activities that lower the groundwater or inject chemicals.
4. Incorporate saturated soil sampling into protocols and contract mechanisms.
5. Add total petroleum hydrocarbon (TPH) analyses to the soil sampling to verify stability of the LNAPL body.
6. Gather NSZD data to answer questions regarding the residual LNAPL’s effect on groundwater.
Question & Answer

Please address all questions to a speaker
High Resolution Site Characterization in Alabama

A Strategy to Advance UST Release Cleanups in Alabama

Dorothy Malaier
UST Corrective Action State and Federal Funds Section

NEIWPCC WEBINAR
June 24, 2020
Geologic Map of Alabama

- Coastal Plain
- Piedmont
- Valley and Ridge
- Highland Rim
- Karst areas
OPEN UST RELEASE INCIDENT UNIVERSE

TOTAL NUMBER OF UST RELEASE INCIDENTS = 5,249
NUMBER OF OPEN UST RELEASE INCIDENTS = 913

271, 30%

510, 56%

49, 5%

83, 9%

- APPROVED CORRECTIVE ACTION PLAN
- MONITORING
- INVESTIGATION
- INACTIVE
Advancing Cleanups...

? How do we increase the number of cleanups?

? How do we decrease the cleanup time?

? What do we not know that we could know?
5 Experiences with High Resolution Site Characterization

- Emergency Response - Decatur
- Multiple Sources - Theodore
- Old Release - Tuscaloosa
- Vertical Extent of Contamination - Glencoe
- Large Release - Spanish Fort
Emergency Response

- Decatur, Alabama
Emergency Response: HRSC’s role in the emergency response

- Emergency response in January 2020
- High resolution investigation performed in early February 2020
- The purpose of the study was to accurately delineate both vertically and laterally any residual light non-aqueous phase liquid (LNAPL) at the site, to identify the soil structure in which any LNAPL resides for permeability and potential for recovery, and to identify pathways from the source area to the sanitary sewer.
- Remediation system installed in late January 2020
Are there multiple sources?

- Theodore, Alabama
“The highest concentrations of contaminants in groundwater monitoring wells are off site both to the north (MW-12) and to the south (MW-20). These do not appear to have originated on the property itself, based on significantly lower MIP-PID responses and groundwater concentrations in monitoring wells near the tank enclosure and service island.”
Going forward….

- Highest benzene concentrations continue to be in offsite wells
- Site continues in a monitoring only program
- Investigation into deed documents to determine if adjacent properties may have been used for fuel storage is underway
Old Incident (1991)

- Tuscaloosa, Alabama
Going Forward after the HRSC.....

- The DPVE system will remain shut off
- Periodic MEME events will be performed in the vicinity of the well with the highest groundwater contamination
- Contamination is better delineated and will allow for a more focused remedial method - Injection?
Vertical Extent of Contamination

- Glencoe, Alabama
Visual Confirmation of LNAPL (Zone 1 wetting fluid)
After the HSRC…. 

- New recovery wells were installed in the identified zones (with difficulty)
- Recently .9’ of free product observed in a site well that typically contained over 19 ppm benzene
- MEME events will be performed to reduce free product and dissolved concentrations in a more focused manner
Large Release Site

Spanish Fort, Alabama
Going Forward...

- Modified Corrective Action Plan was developed
- Horizontal wells will be installed to focus on zones under the highway
- New recovery wells to be placed on site; DPVE system has been re-installed
- SVE wells were installed to address the shallow intervals identified during the HRSC
CONSIDERATIONS AND CHALLENGES:

- Property owners may be concerned about numerous boreholes.
- Select the tool suite that will provide the data you need to make future decisions.
- The right of way at some sites reduces the ability to “define” the plume.
- Active stations are often difficult to drill due to existing tanks, piping and dispensers.
CONSIDERATIONS AND CHALLENGES:

- Utility corridors often are a barrier - the extent of plume still may not be defined
- The direct push rigs have depth limitations
- Existence of “pinnacles” and bedrock can reduce effectiveness of site investigation
- Collaboration between all parties - education is key
- Use of data by consultants
- It’s a dynamic process! Be Flexible!
HIGH RESOLUTION SITE CHARACTERIZATION

- Over 88 HRSCs have been approved/performed
- Spent over $3.5 million on this technique
- Average cost is about $42,000 per evaluation
- Information is valuable to site decision making
Question & Answer

Please address all questions to a speaker
Utilization of High-Resolution Site Characterization (HRSC) In South Carolina
Why HRSC?

- Continuous improvement
- Input from contractor community
- Utilization of newer technologies
  - Data gaps?
- Improve Site Conceptual Models (SCM)
  - Optimize clean-up
Research and Training

- Met with contractors
- EPA training & guidance
- Interstate Technology and Regulatory Counsel (ITRC)
Goals

- Learn about technology
- Explore cost vs. benefit
- Fill in data gaps
- Optimize clean-ups
- Determine limitations & best use
- POSSIBLY determine a rate structure for more widespread use
Strategy

- Pilot study
- Solicitation of bids for a collection of sites
- 2 contracts, 2 different contractors, 26 total sites throughout state
- Follow up with traditional methods
Site Selection

- Good Direct Push Technology candidates historically
- Legacy sites
- Different stages of assessment/corrective action
- Corrective action did not succeed
- Varying geology
The Tools

- Direct Push Technology
  - UVOST, MiHPT, OIPHPT
  - Traditional Field Screening
- Groundwater Sampling
- Soil Sampling
  - TPH
- Smartdata Solutions
- Rockworks, 4DIM
Case Study 1 – Larry’s Body Shop

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Larry's Body Shop - Results

- Identified Residual LNAPL
- Better source area characterization
- Better idea of groundwater flow and dissolved plume
- Better understanding of site geology
Lessons Learned

- Limitations/set backs
- Time commitment
- Actual Free-Phase Product (FPP) distribution
- Communication is KEY
Benefits and Results

- More accurate SCM
- Knowledge/Experience
- Outlook on future of assessments
- Gain information necessary to choose appropriate cleanup strategies
- Targeted clean-up approaches for faster and more effective clean-up
Question & Answer

Please address all questions to a speaker

Thank you for your participation
LUST Corrective Action Series: https://neiwpcc.org/our-programs/underground-storage-tanks/lust-training-resources-corrective-action/webinar-archive-corrective-action/


LUST Line: https://neiwpcc.org/our-programs/underground-storage-tanks/l-u-s-t-line/

THANK YOU FOR YOUR PARTICIPATION
LUST Corrective Action Webinar Series

Lessons Learned from HRSC used at LUST Sites

6/24/20

Moderated by Nick Bissonnette - Environmental Analyst, NEIWPCC

THANK YOU FOR YOUR PARTICIPATION