Applications of Activated-Carbon Based Amendments at Commonwealth of Pennsylvania Storage Tank Release Sites
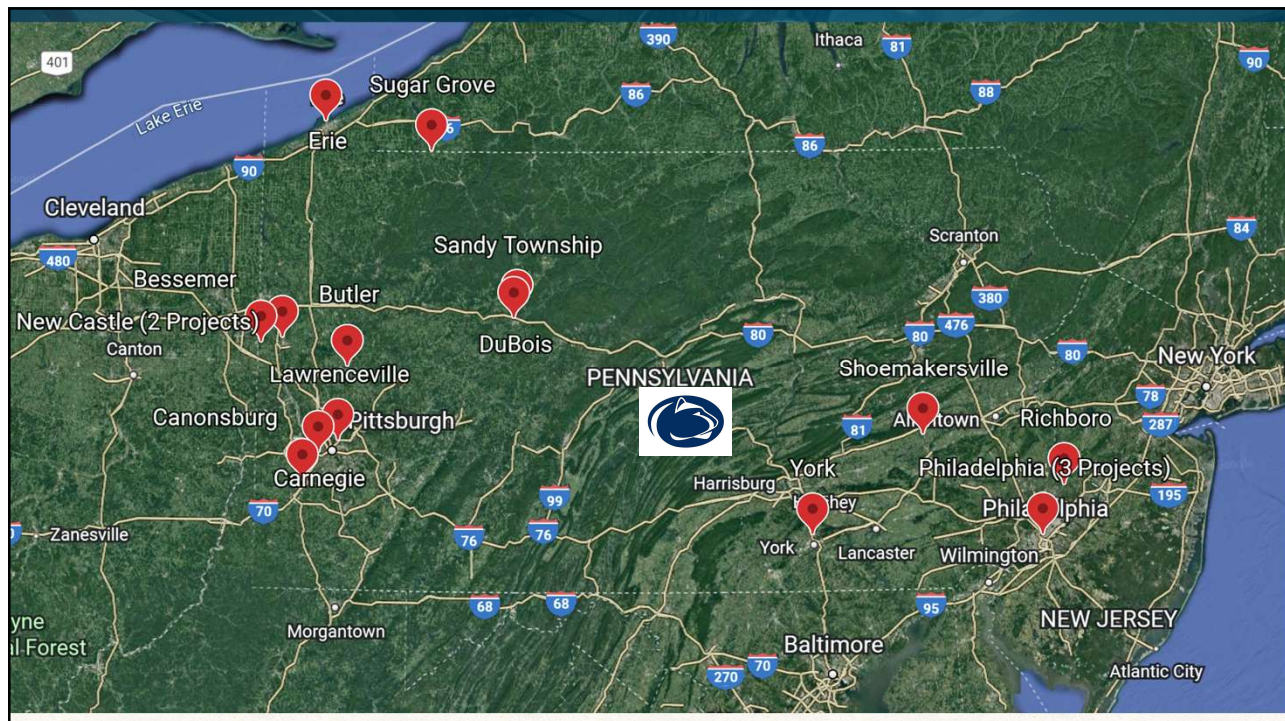
Mike Mazzarese

Senior Remediation Engineer

Denver, CO

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Typical Applications

- Gas and Diesel Range Hydrocarbons
- Source Treatment
  - NAPL (possible) to ppm level
- Plume Treatment
  - Sub-ppm to low ppb
- Geology/Applications:
  - Clay/Silt/Sand/Gravel (usually via DPT)
  - Bedrock (via packers)
  - Pre-drill technique (GeoTAP)

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Application Techniques

- Direct Push (top-down)
  - Clay/silt/sand/gravel
- Pre-Drill Technique (top-down)
  - Weathered bedrock, till, fill, etc.
  - Sonic or auger < DPT
- Bedrock (bottom-up)
  - Straddle packer isolates fractures
  - Not covered in this presentation but can be given separately
- Soil mixing (trench or areal)

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Trap & Treat Concept

- Contaminants sorb to activated carbon "Trap"
  - Decreases groundwater mass and flux upon contact
    - Excellent PRB technology
  - Disrupts groundwater/soil mass equilibrium to drive desorption
    - Key to source area remediation
    - Dosing designed to account for total mass to manage back diffusion => RDC (high resolution soil/gw sampling)
- Various degradation mechanisms are used to "Treat"
- BOS 200®
  - Product consists of:
    - Activated Carbon (PAC or Fine Grind ~ 10um)
    - Terminal electron acceptors (nitrate and sulfate)
    - Micro and macro nutrients
    - Consortium of hydrocarbon degrading bacteria

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## High Density Conceptual Site Model Development
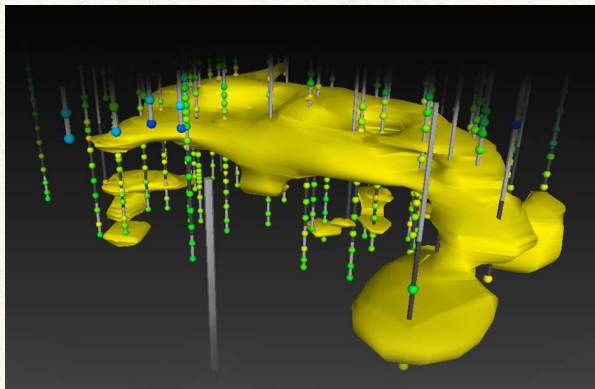
3D Image of Soil Sampling Data

- Everything works in a beaker – so why do sites fail?
  - Reagent Loading
    - Contaminant mass distribution is almost always complex and scales with the heterogeneity of the lithology
    - Soil mass contribution can be underestimated (source areas)
  - Contact/Poor Distribution
   - Low perm mass storage zones difficult to target

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Remedial Design Characterization (RDC)

- Detailed understanding of vertical and horizontal distribution of speciated AND total mass
- Collaborative process used to fine tune the CSM, fill data gaps, and optimize the remedial design
  - Dense soil vertical profiles (e.g. 1-2 ft)
  - Nested wells for groundwater (e.g. < 5 ft)
- Recognized in recent ITRC Guidance Doc
- RPI Project Support Lab (Denver) runs pro bono soil and water analytical pre and post project
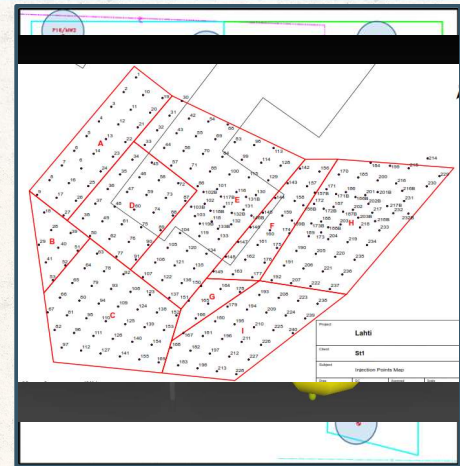
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3-D Quantitative Model Example
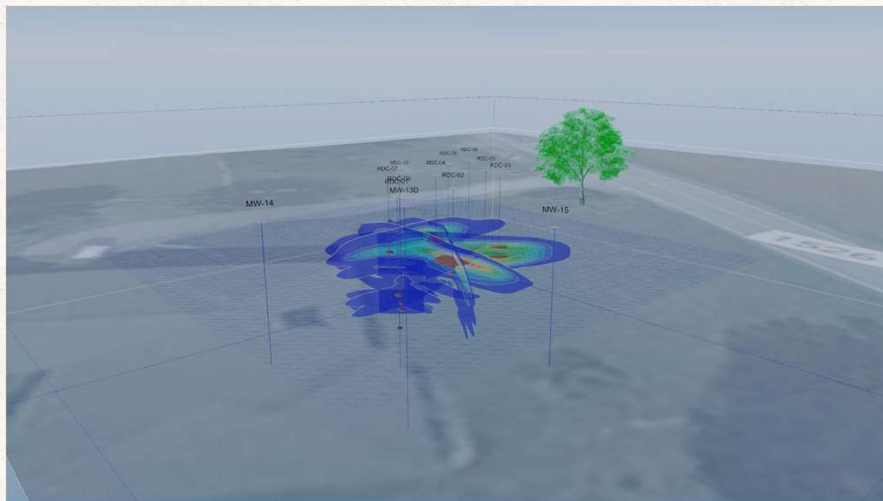
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Summary

- BOS 200/200+ Applied at 17 sites to date in PA
- Approximately 50% have been issued NFA status
- Application techniques include DPT, GeoTAP, Packers (Bedrock), and Soil Mixing
- Several sites have/had measurable NAPL
- Most sites have utilized the RDC quantitative CSM process

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Thank you for your time.

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Visit www.astenv.com for more information and project summaries

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