

2007 USEPA/USACE Superfund Remediation  
Conference

# High-Tech Extraction and Injection Innovations at the Lipari Superfund Site

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Lipari Landfill

# History of #1 Superfund Site Lipari Landfill



NICK LIPARI LANDFILL  
PITMAN, NEW JERSEY  
PIC 95042  
DATE FLOWN: MARCH 10, 1971  
SOURCE: AERDI FRAME NO. 533  
APPROX. SCALE: 1 inch = 55 feet

# Site History

## Aerial Morph 1959-1995



1959



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# Twisted Well



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# Problem

- Lipari Extraction Wells were Experiencing Catastrophic Failure



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# Solution

- Design an extraction well that would not lose sandpack into the trash



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# EPA Design Criteria

- Wells Must
  - Have Yields Equal to or Greater Than Existing Wells
  - Screened In Trash
  - Prevent Catastrophic Collapse
  - Be Dual Phase Compliant
  - Be Designed to Recirculate Acid for Maintenance



# Extraction Well In-House Design Innovations

- Muni-Pak® dual screens
- Dual Artificial Filterpacks; Spherical Carbolite® Ceramic Proppant Used Instead of Quartz Sandpack
- Twin Acid-Recirculation Piezometers; Assist in Keeping Screens Clean
- Twin Carbolite Filterpack Replenishment Tubes.
- No Grout or Bentonite Seals Used
- Rotasonic® Drilling.
- Large Borehole Size –12-inch Diameter Boreholes.
- Fugitive Vapor Emission Control System



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# Drill Movie



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# Filter Pack used in New Lipari Wells

Carbolite® 16/20



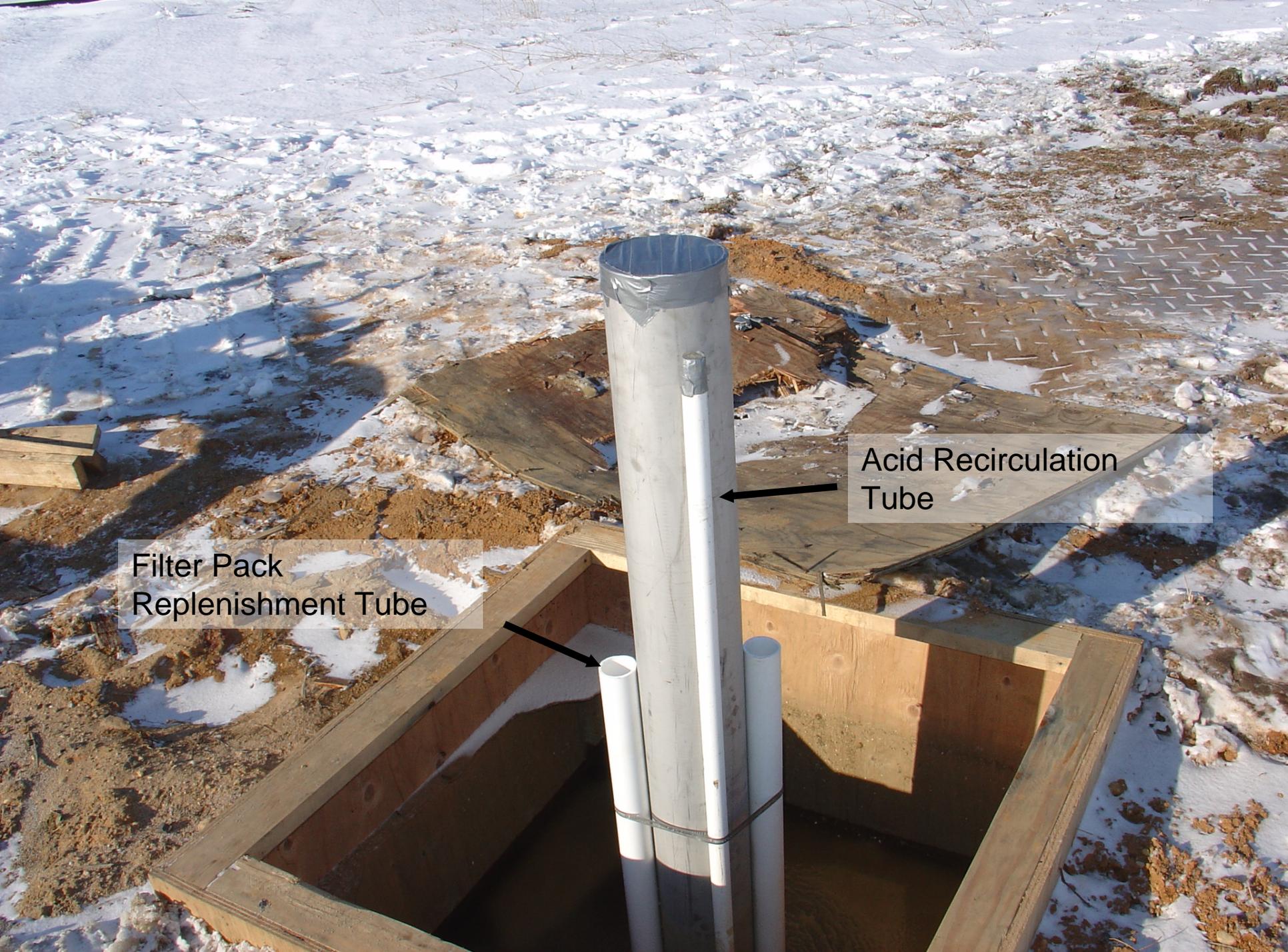
# Contaminated Industrial Trash at Lipari



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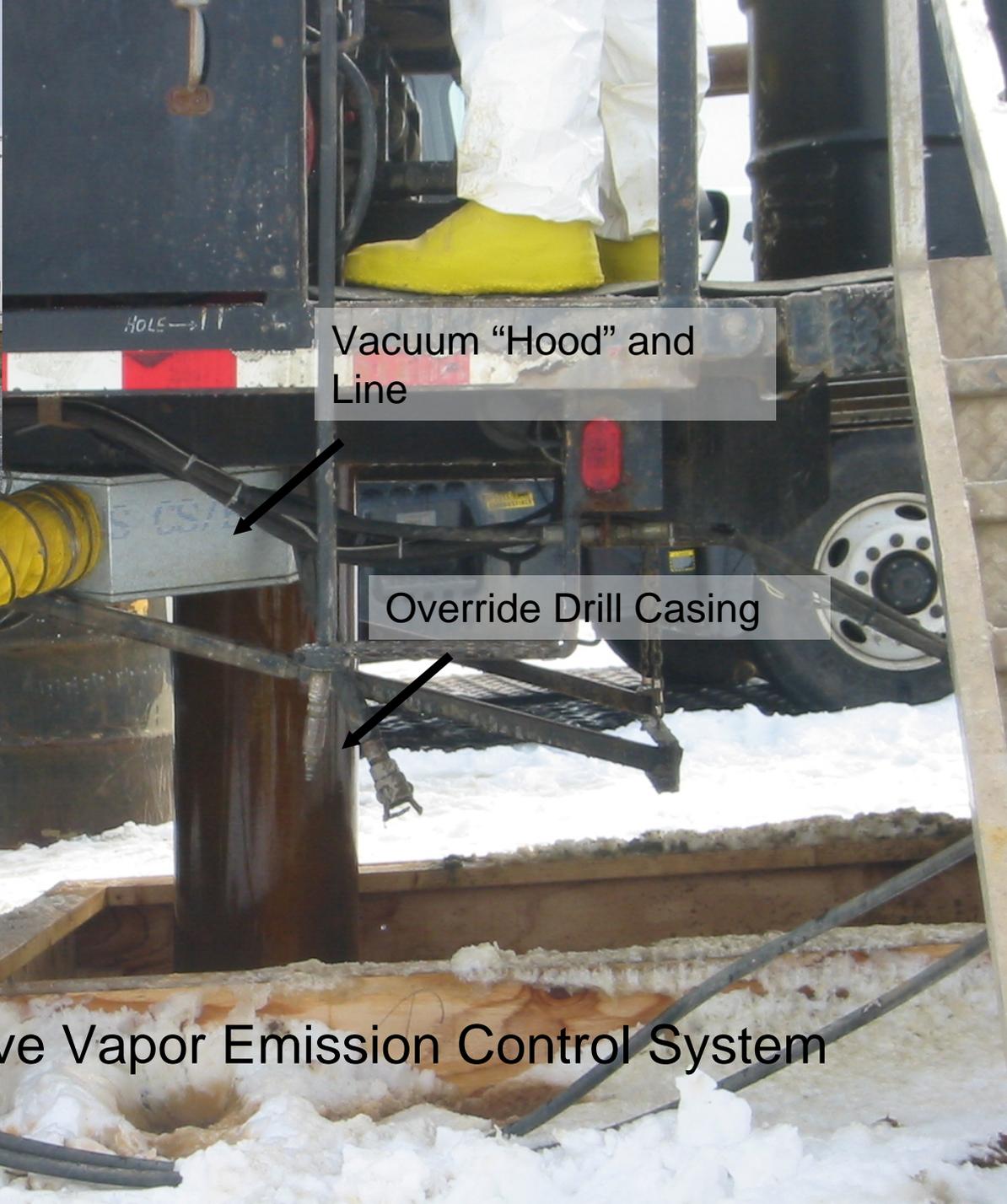
Rotasonic Rig, Muni Pak Well and Acid Recirculation Tubes



Filter Pack  
Replenishment Tube

Acid Recirculation  
Tube

# Trailer-Mounted Vacuum System



Vacuum "Hood" and Line

Override Drill Casing

Fugitive Vapor Emission Control System

# Extraction Well Performance

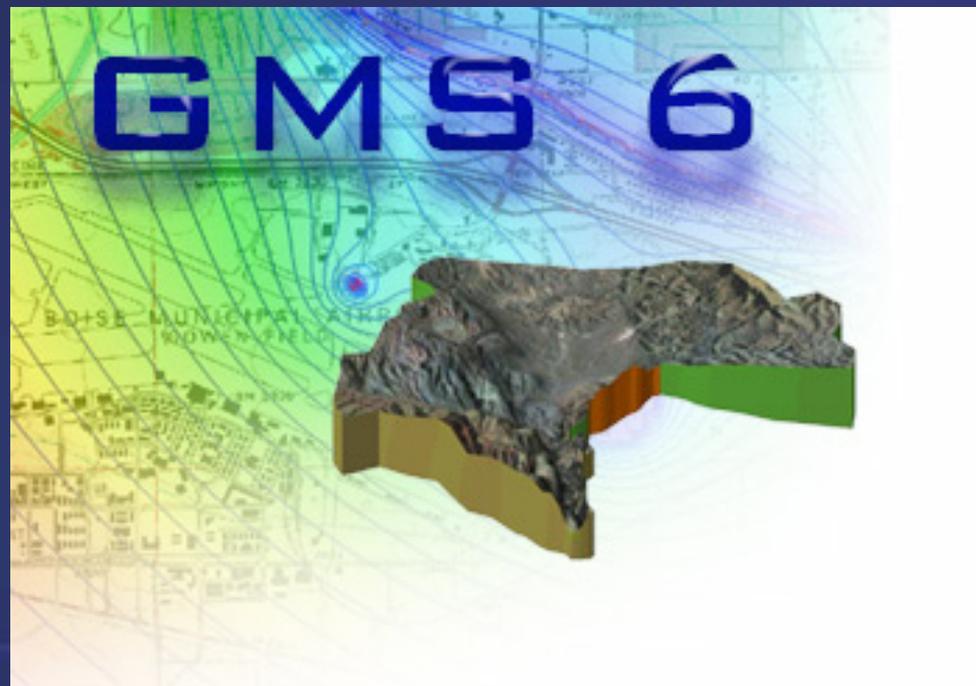
- New Wells have Outperformed Old Well Design by an Average of 17% which is an additional 2.8 million gallons per year
- New Wells Appear to Clean up Quicker When Undergoing Acid Recirculation
- No Evidence of Catastrophic Failure



# Analyses of Drill Core



# Site Geology

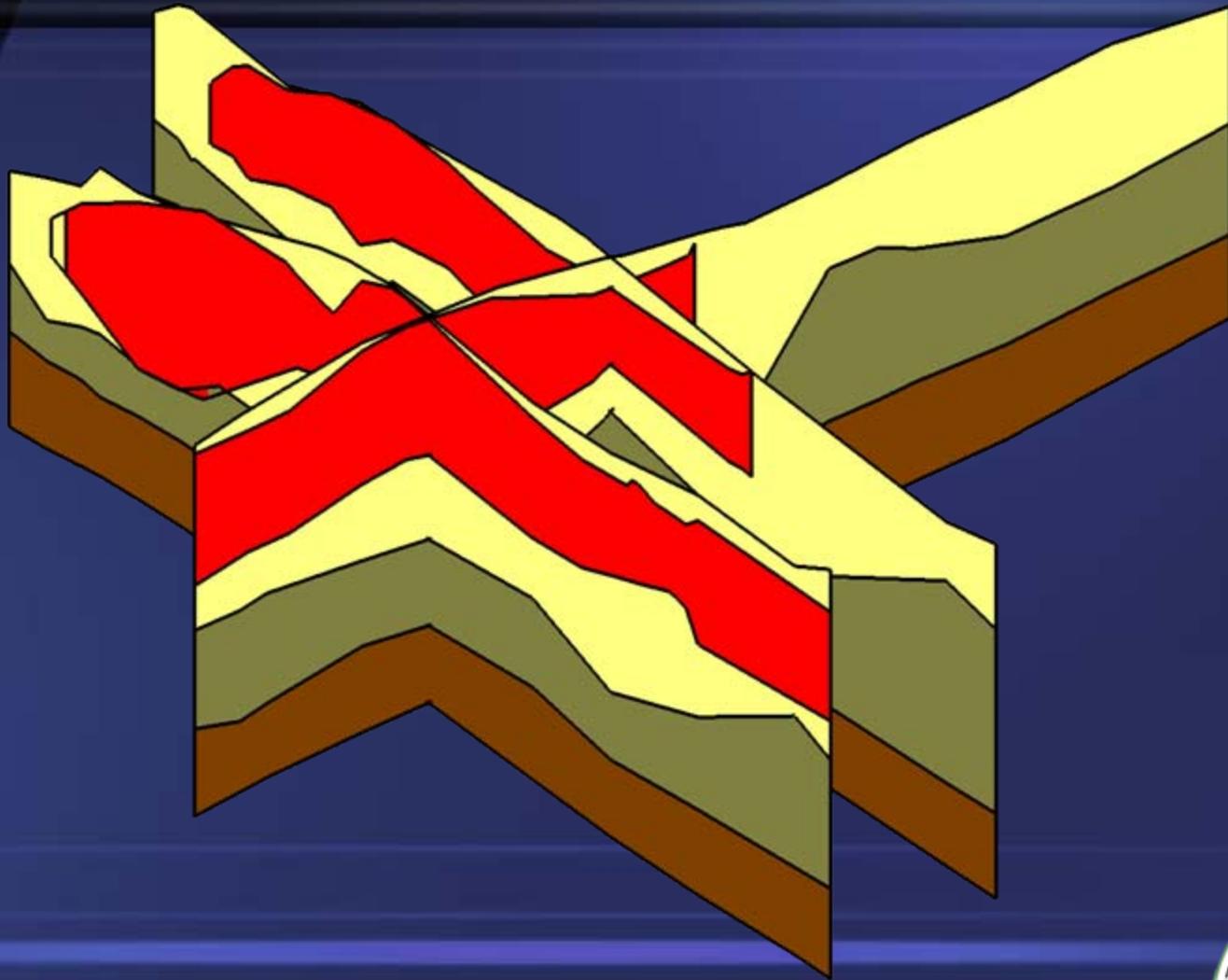


(GMS Visualization)



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Geologic Framework Fence Diagram





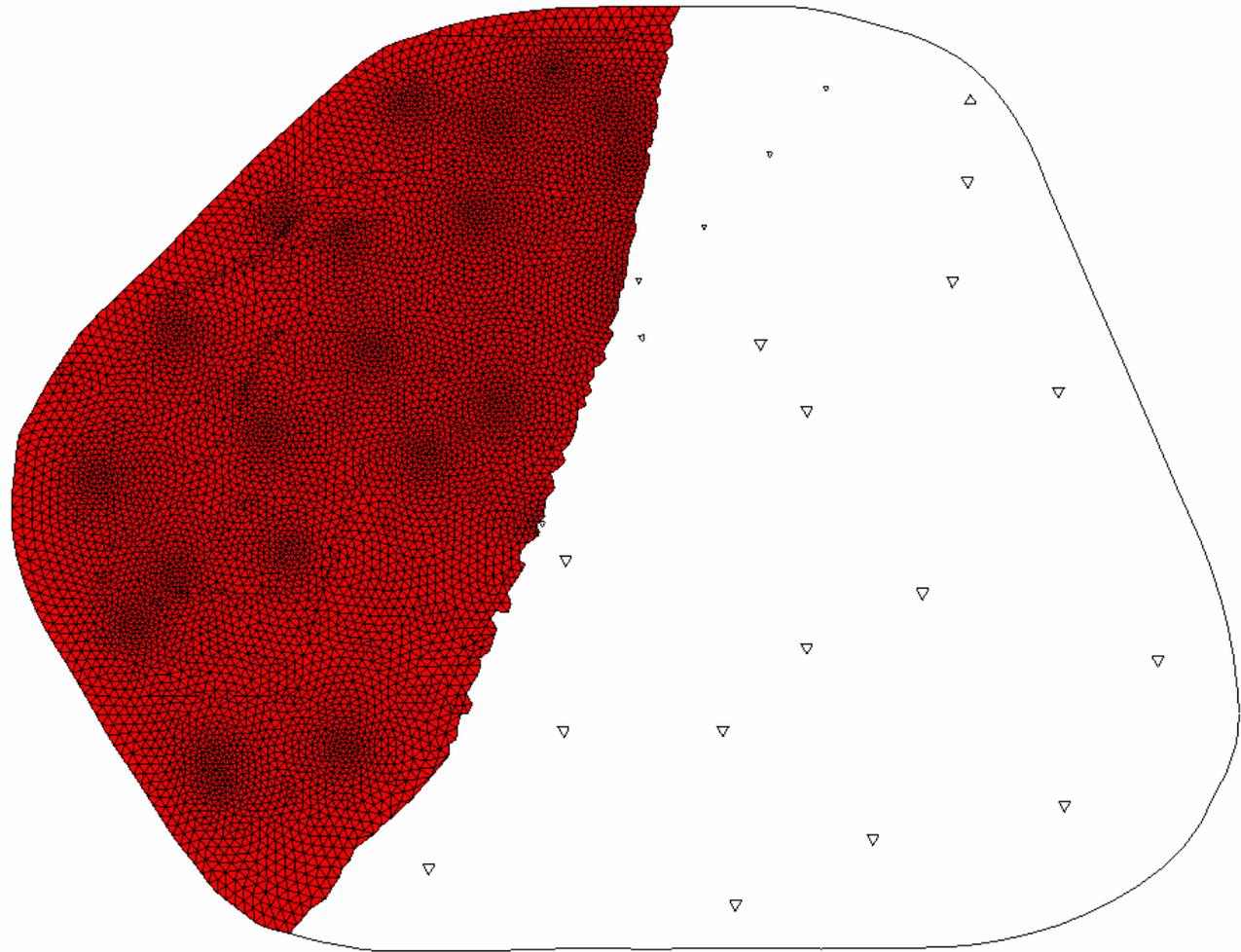
# Contaminated Trash TIN

## Legend

— Slurry Wall Location

Surface of Bad Trash

Water Table Surface



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# Unsaturated Contaminated Trash

Location of  
Unsaturated Trash

## Legend

- Slurry Wall Location
- Surface of Bad Trash
- Water Table Surface



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# Problem

- Unsaturated Highly Contaminated Trash Discovered During Extraction Well Installation Needed to Be Remediated



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# Solution

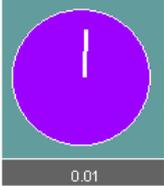
- Design an Injection Gallery Underneath the Cap
- Perform Groundwater Model to Locate and Size Gallery
- Partner with Severson (LTRA Contractor) to Build it Quickly



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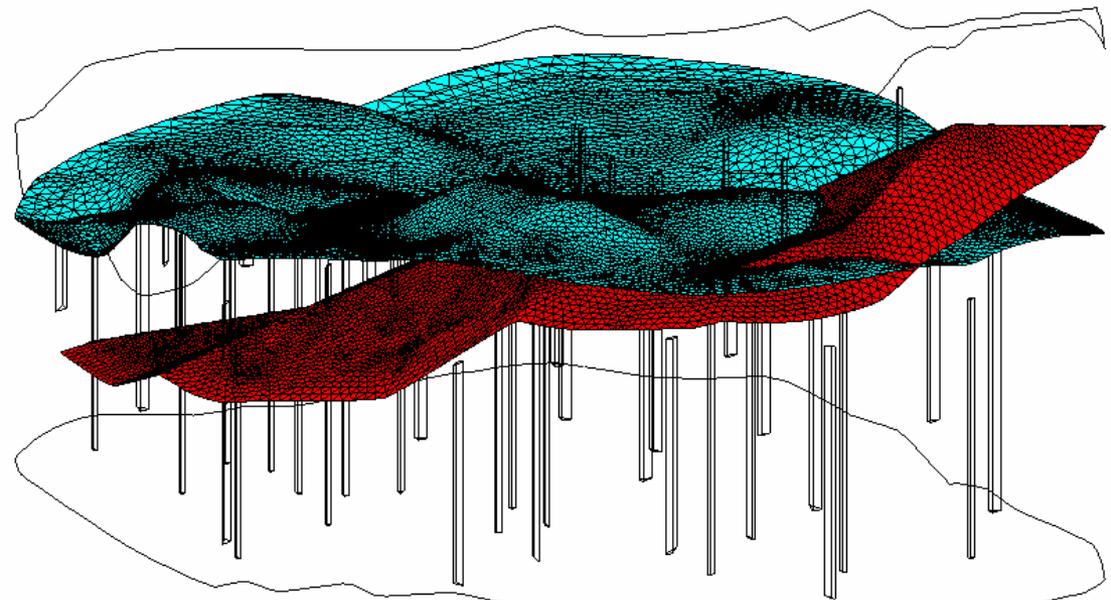


# Model of Injection Gallery



## Legend

- Slurry Wall Location
- Surface of Bad Trash
- Water Table Surface



**Trash ( $K_h = 1.0$  ft/day  $K_v = 0.5$  ft/day)**  
**Backfill ( $K_h = 0.5$  ft/day  $K_v = 0.1$  ft/day)**  
**Revised Blanket Configuration**  
**Injection in Blanket Only (80 gpm)**  
**No Extraction**



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# EPA Design Criteria

- Design Must
  - completely saturate 0.75 acres of unsaturated contaminated trash
  - Increase overall Landfill injection capacity
  - Clean up unsaturated area at an accelerated rate
  - Be capable of performing Soil Vapor Extraction
  - Be capable of monitoring uplift pressure on cap



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# USACE In-House Design Firsts for Superfund Sites

- First Use of Geonet for Injection Gallery
- Dual-Use Gallery for Injection and Soil Vapor Extraction
- First Use of Vacuum Cap Leak Detection
- First Use of Vacuum Cap Stabilization Prior to Backfill
- First Multi-purpose Sumps for Inspection of Geonet (for Possible Fouling), Injection Gallery Head Measurement, and Acid Recirculation



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# Lipari South Injection Gallery Construction



# Geomembrane Installation





Landfill SVE System Creates Vacuum Under Cap Resulting in “Vacuum Stabilization” of Membrane Prior to Backfilling

# Gallery Performance

- Current Gallery Operation is 75 GPM with Minimal Uplift Pressures
  - Operated at a Maximum of 90 gpm
  - Goal of Injection Gallery Design was 40 GPM
- Gallery Successfully Tested for Soil Vapor Extraction Use
- Use of Geotextiles Saved 50K Over Standard Crushed Stone Construction



# Question/Comments



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