



*Soil Vapor Extraction Using
Horizontal Remediation Wells and
Condensation Treatment to Recover
Chlorinated and Petroleum NAPLs*

Agenda

- Site Setting / Project Requirements
- Selection of Remedial Technology
- Pilot Test
- Full Scale Operations
- Lessons Learned

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Site Setting / Project Requirements

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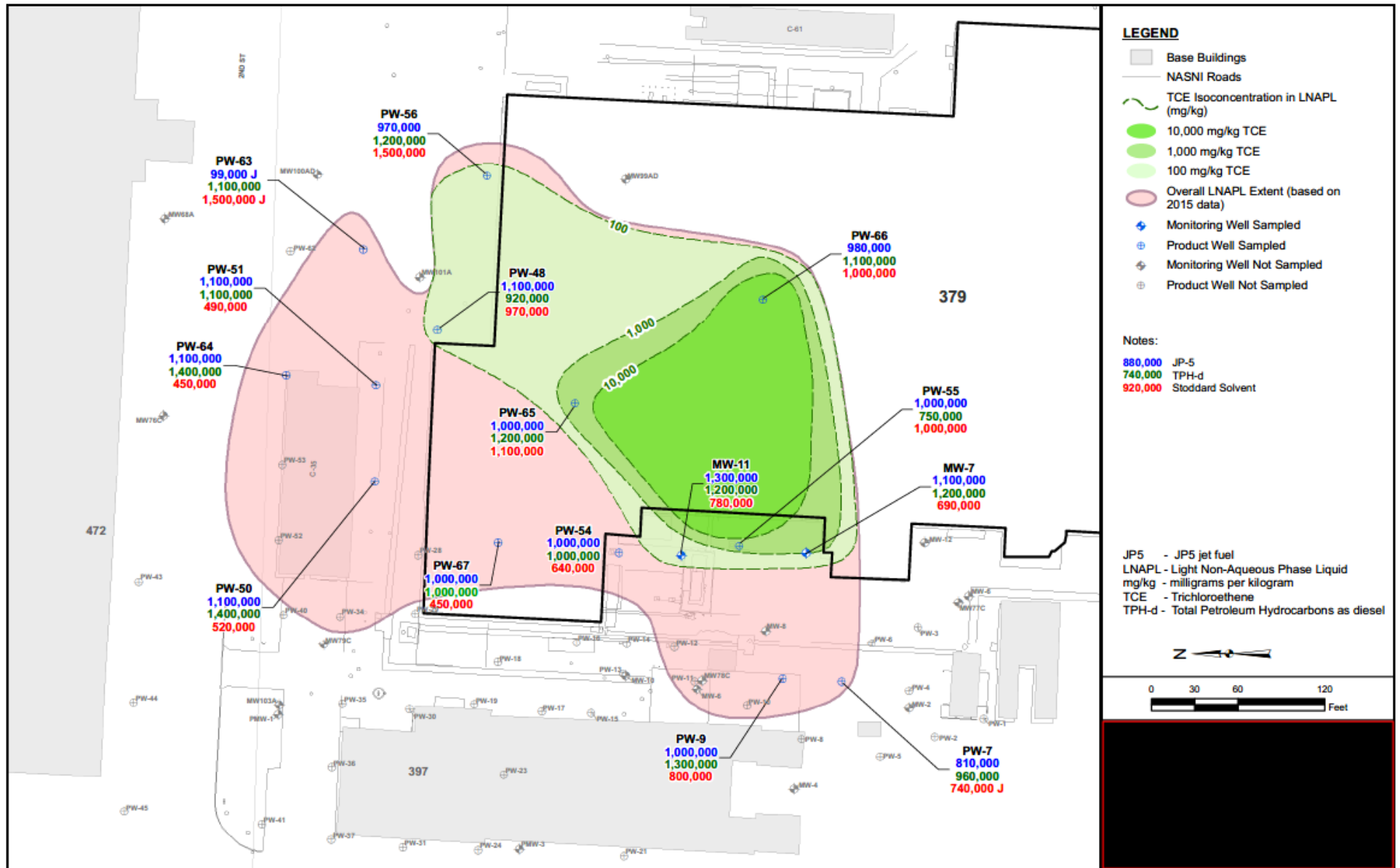
Aircraft Engine Overhaul Facility that has been in operation since 1945.

fuels, solvents, process chemicals, and waste fluids.

LNAPL plume incl. JP-5, Stoddard Solvent, TPH-d

CVOC subslab vapor concerns incl. TCE

Site Setting / Project Requirements



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Selection of Remedial Technology



LNAPL / Free Product Extraction & Recovery

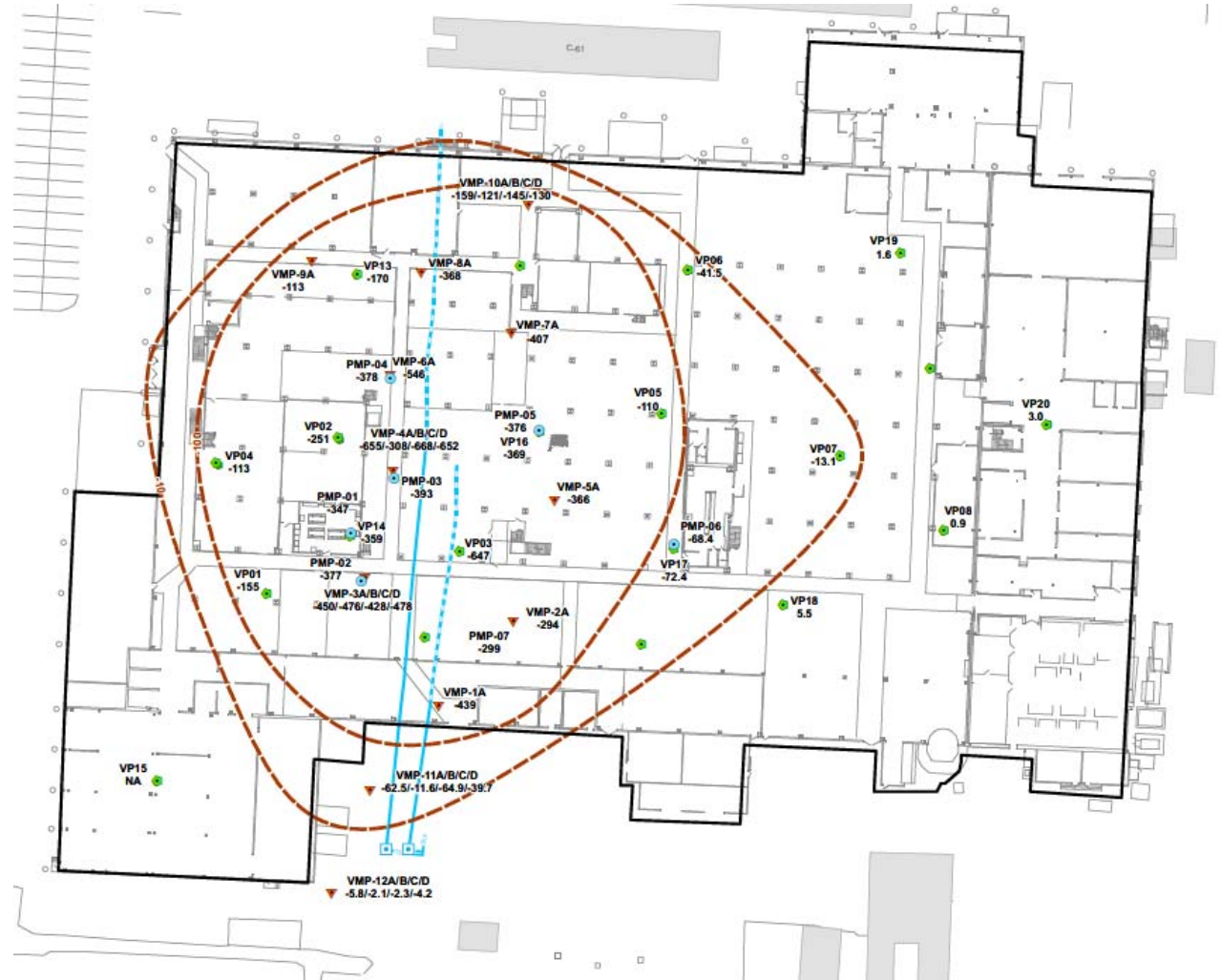
Soil Vapor Extraction & Treatment

Mass Removal

Subslab Depressurization

Selection of Remedial Technology

1. Horizontal Soil Vapor Extraction Wells
2. Subslab Depressurization & Mass Recovery: 200 scfm



Selection of Remedial Technology

- Off-Gas Mixture of TCE, 1,1,1-TCE, Stoddard Solvent and DRO
- Concentrations Observed $> 1,000$ ppmV
- 99% DRE Vapor Treatment



Selection of Remedial Technology

- VOC contaminants recovered as a non-aqueous phase liquid (NAPL)
- $> 99.9\%$ removal efficiency



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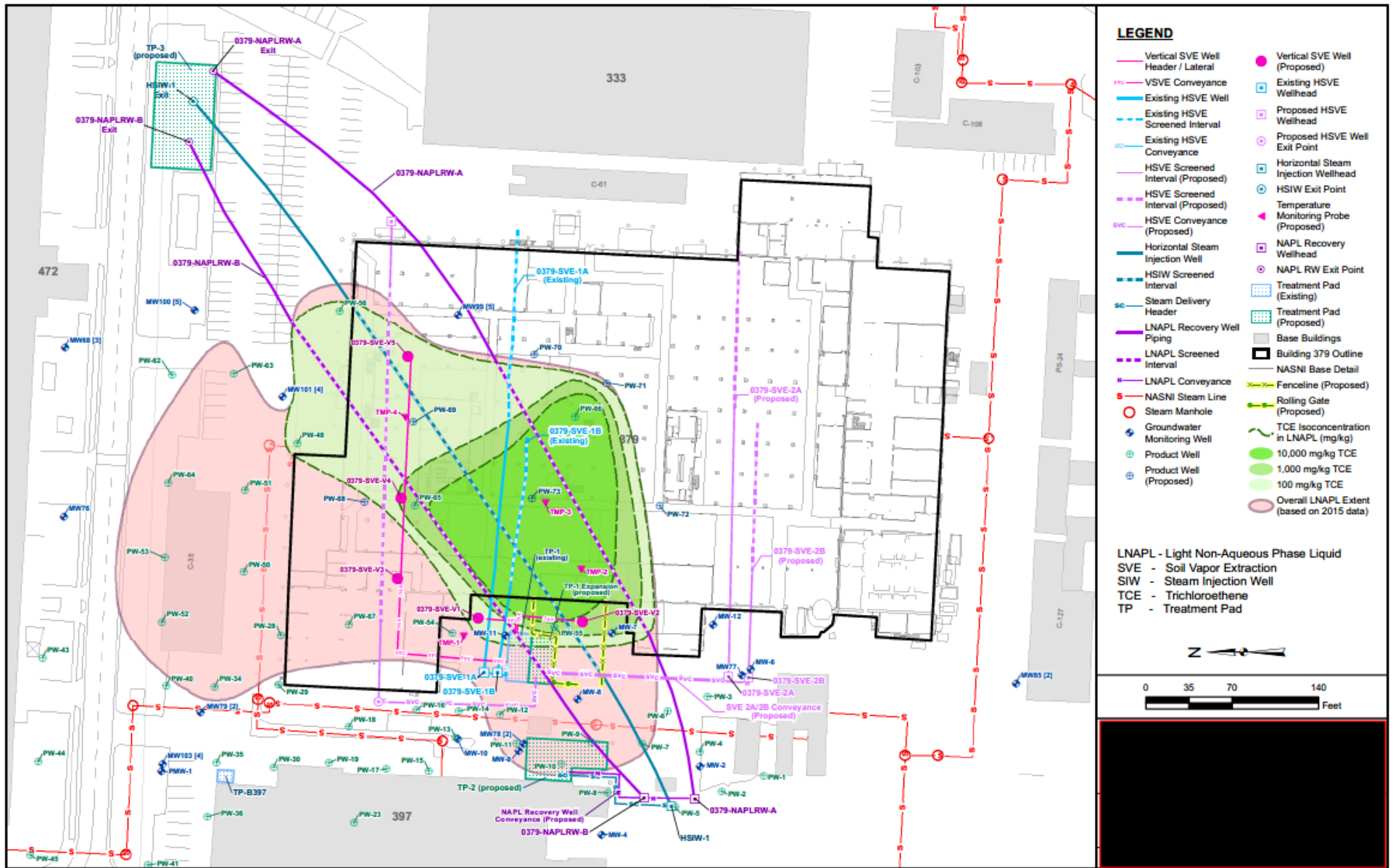
Pilot Test

- 200 scfm SVE system operated for 3 months
- ~ 1,000 pounds CVOCs removed in vapor phase, mostly composed of TCE
- Correlating mass recovery variations: What we suspect: Highest sustained off-gas concentrations occurred in areas of steam in subsurface
- Swift response to mitigating subslab vapors causing VI impacts to breathing space inside buildings

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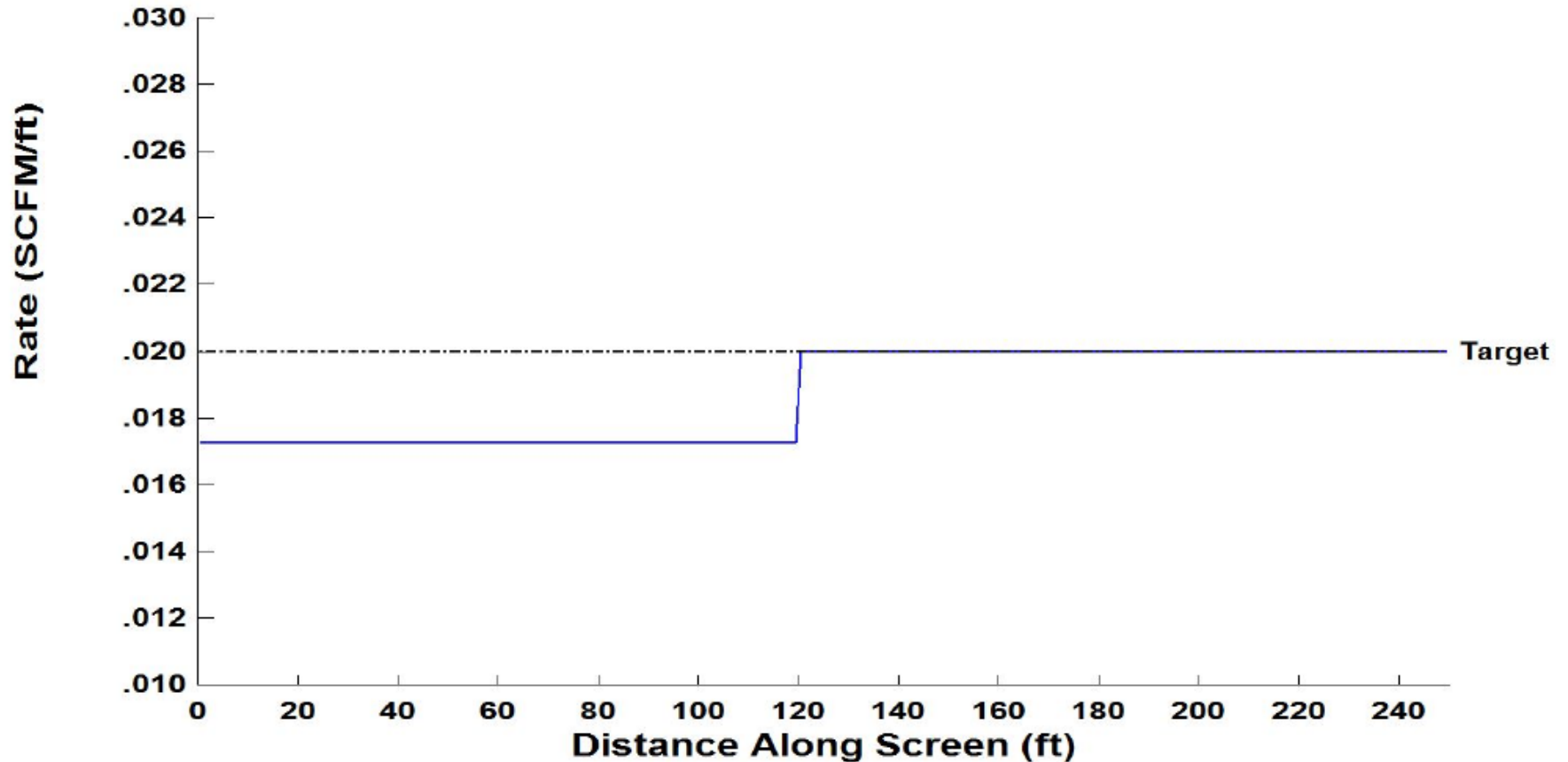
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Full Scale Operations

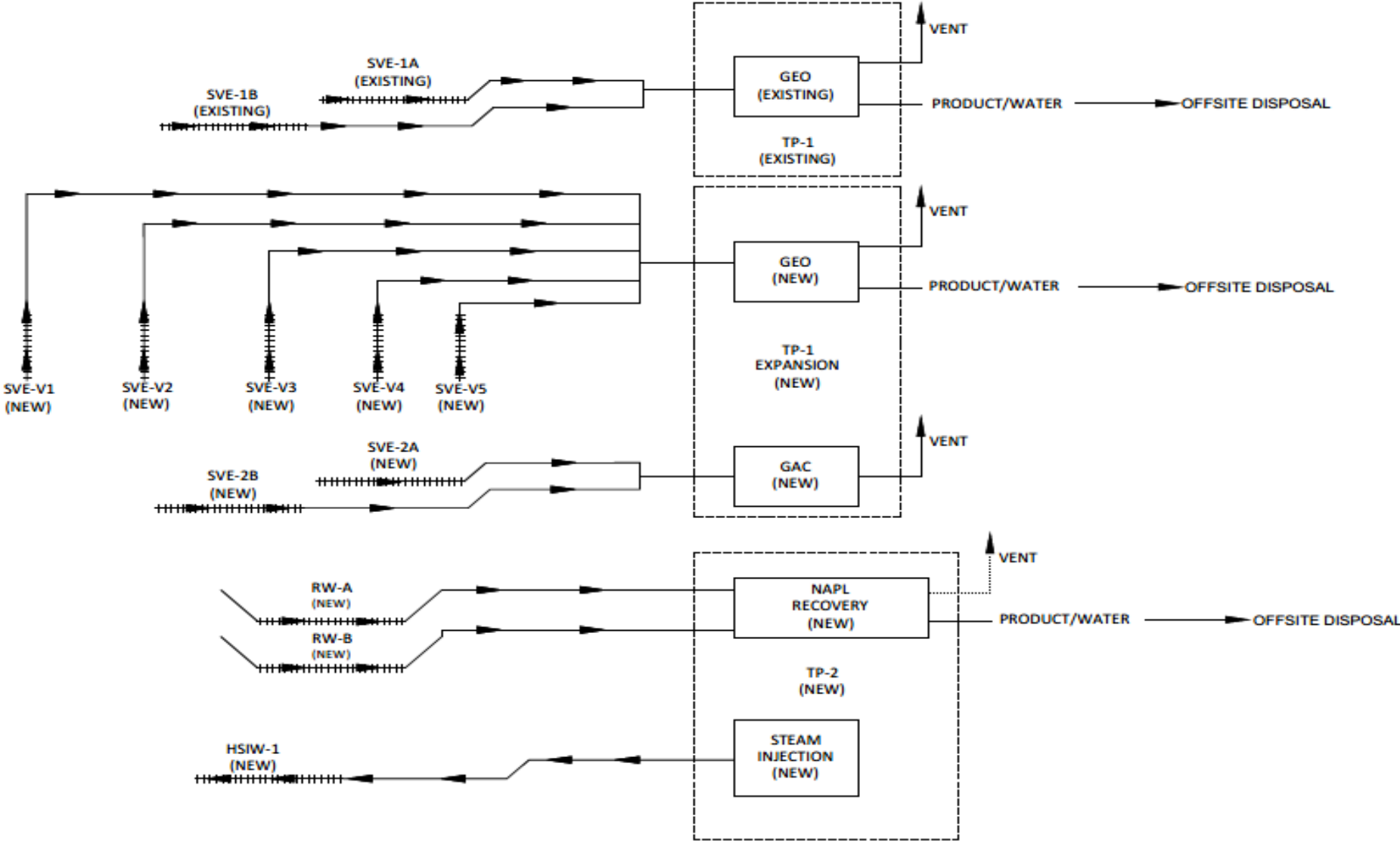


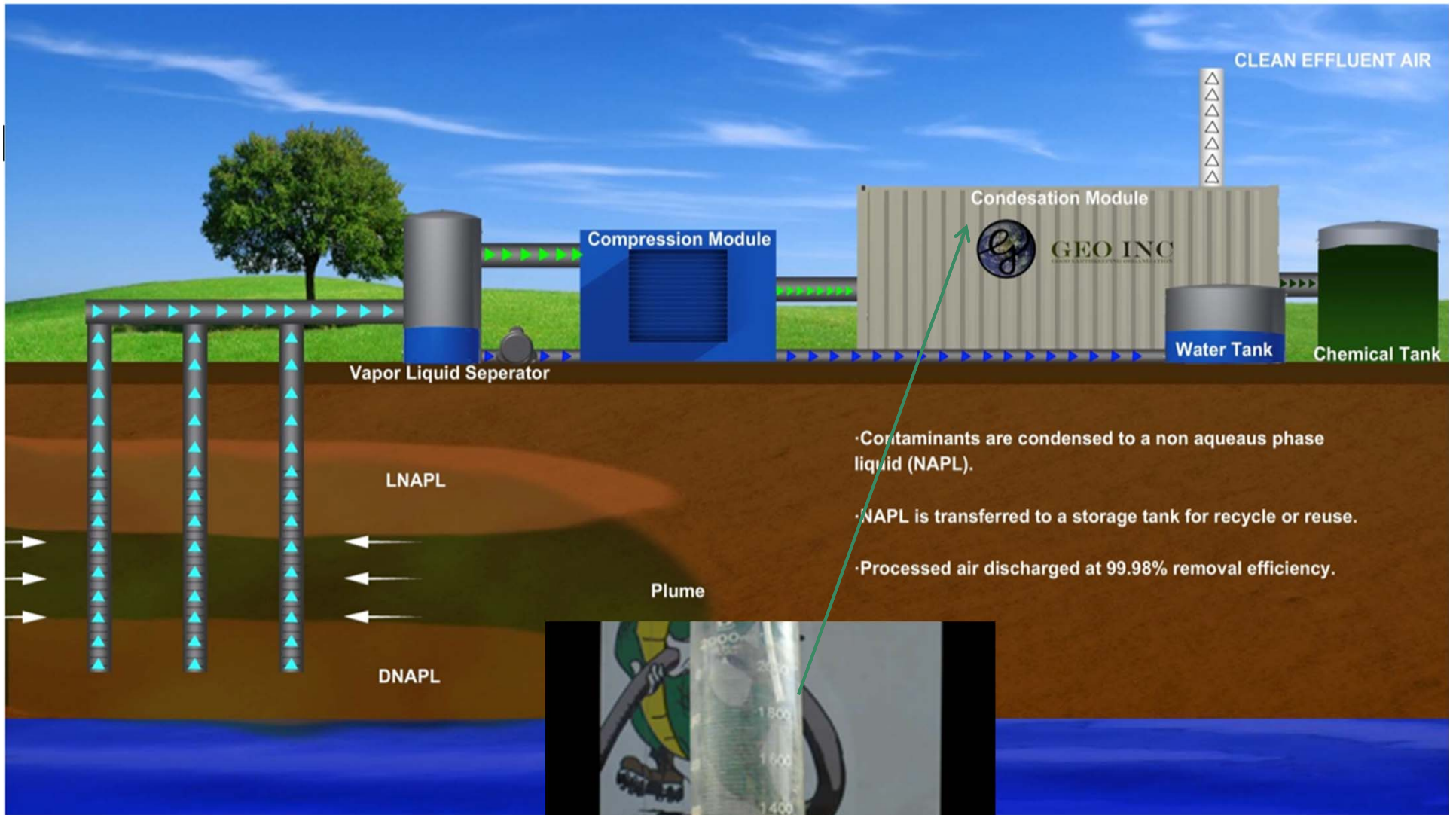
Design of HRW for Steam

Steam Injection Rate (SCFM/ft) vs. Screen Location



Full Scale Operations







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Recommendations, Lessons Learned

- 3X increase in mass removal in 3 days...Steam / Thermal Enhancements can expedite VOC mass removal in the vapor phase
- Sustainable? aspects of this unique application
- Upstream vapor conditioning equipment is recommended for cooling hot, humid off-gas during thermally-enhanced effluent extraction projects.
- Subsurface pressures should be monitored and extraction (off-gas) rates adjusted to accommodate for in-situ steam formation and injected steam.