Successful Rapid Response Mitigation of High Strength Vapor Plume Underneath a Large, Active Navy Building

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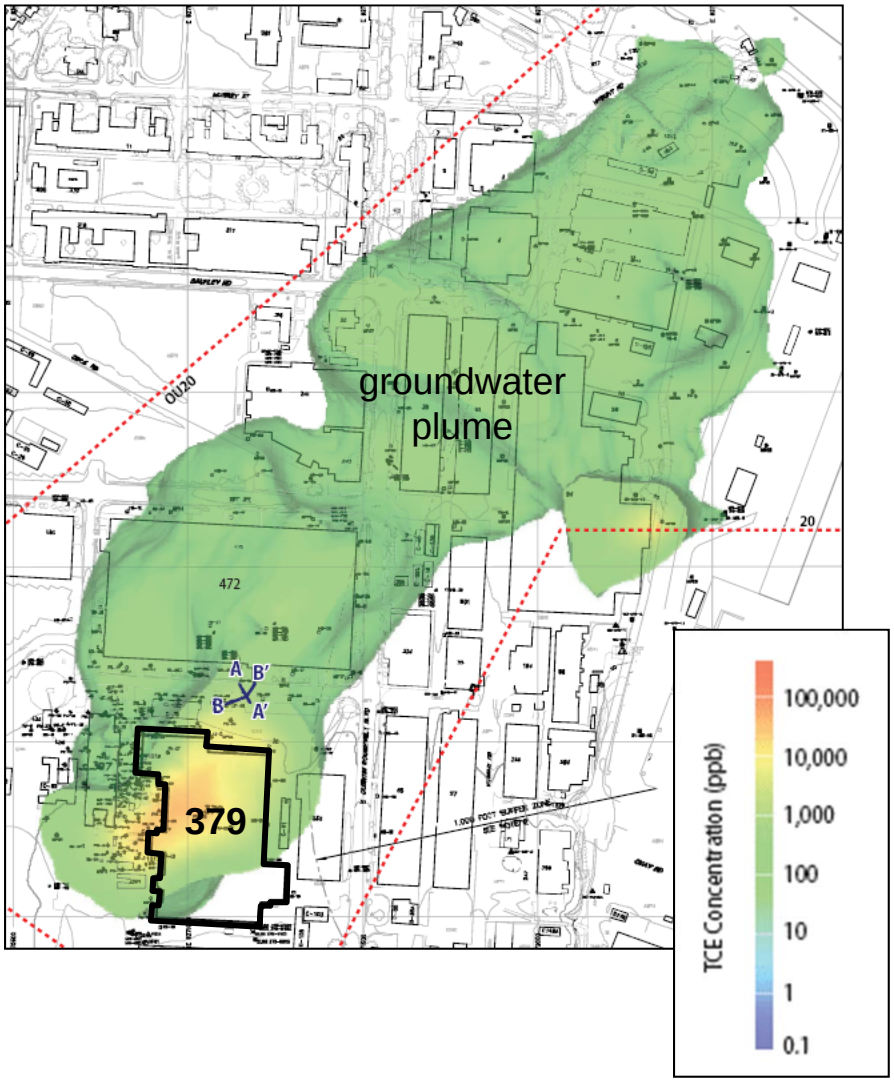
Overview

- **Site Background**
- **VI Investigation Results**
- **VI Time Critical Removal Action**
- **Building Slab Sealing**
- **Horizontal SVE Pilot Test**
- **Indoor Air Monitoring Results**
- **Next Steps**
- **Lessons Learned**

Site Background



Groundwater plume

- Site-wide
- 2,400-feet long
- CVOCs

LNAPL body

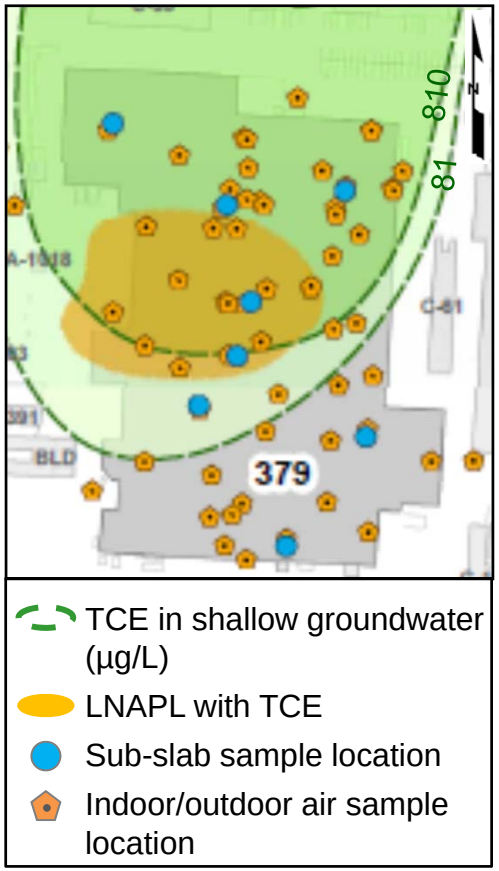
- underneath Building 379
- ~ 23 ft bgs
- Jet fuel (JP-5)
- Stoddard Solvent
- TCE

VI Investigation Results – Building 379

Seasons 1 and 2:

- **TCE Maximum Concentrations**
  - Sub-slab 6,000,000 µg/m^3 (June 2014)
  - Indoor air 53 µg/m^3 (July 2015)

- **USEPA Region 9 Indoor Air Response Action Levels for Short-Term TCE Exposure**
  - Accelerated 8 µg/m^3
  - Urgent 24 µg/m^3



VI Time Critical Removal Action

- **Sealing the building slab**
  - *Improve barrier between soil gas and building*
- **Horizontal well SVE**
  - *Reduce pressure differential across slab*
- **Other response actions taken:**
  - Risk communication with stakeholders
  - Temporary relocation offered to employees
  - Workplace indoor air monitoring
  - Modified heating and ventilation system
  - Installed portable air filtration units
    - First floor lunch room
    - First floor restrooms

Building Slab Sealing

Cleaned out and re-sealed all accessible concrete slab expansion joints:

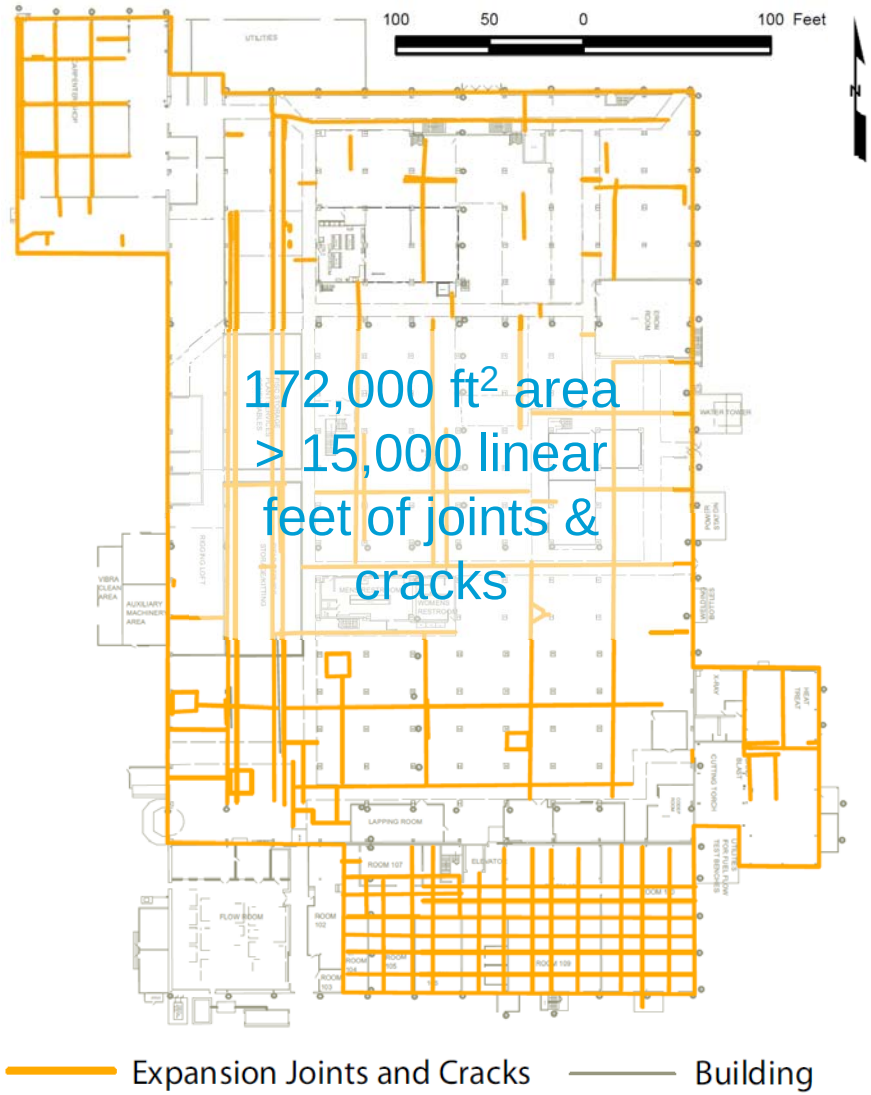
Hydroblasting (wet)

- Jets of high pressure water
- Cleans and etches concrete surface
- Creates a clean surface for sealant adhesion

Mechanical (dry)

- Saw cutting and grinding
- Vacuum attachment for dust collection
- Reduced cost and improved efficiency

Building Slab Sealing



Cleaned out and re-sealed all accessible concrete slab expansion joints:

Backer rod - For support in larger joints

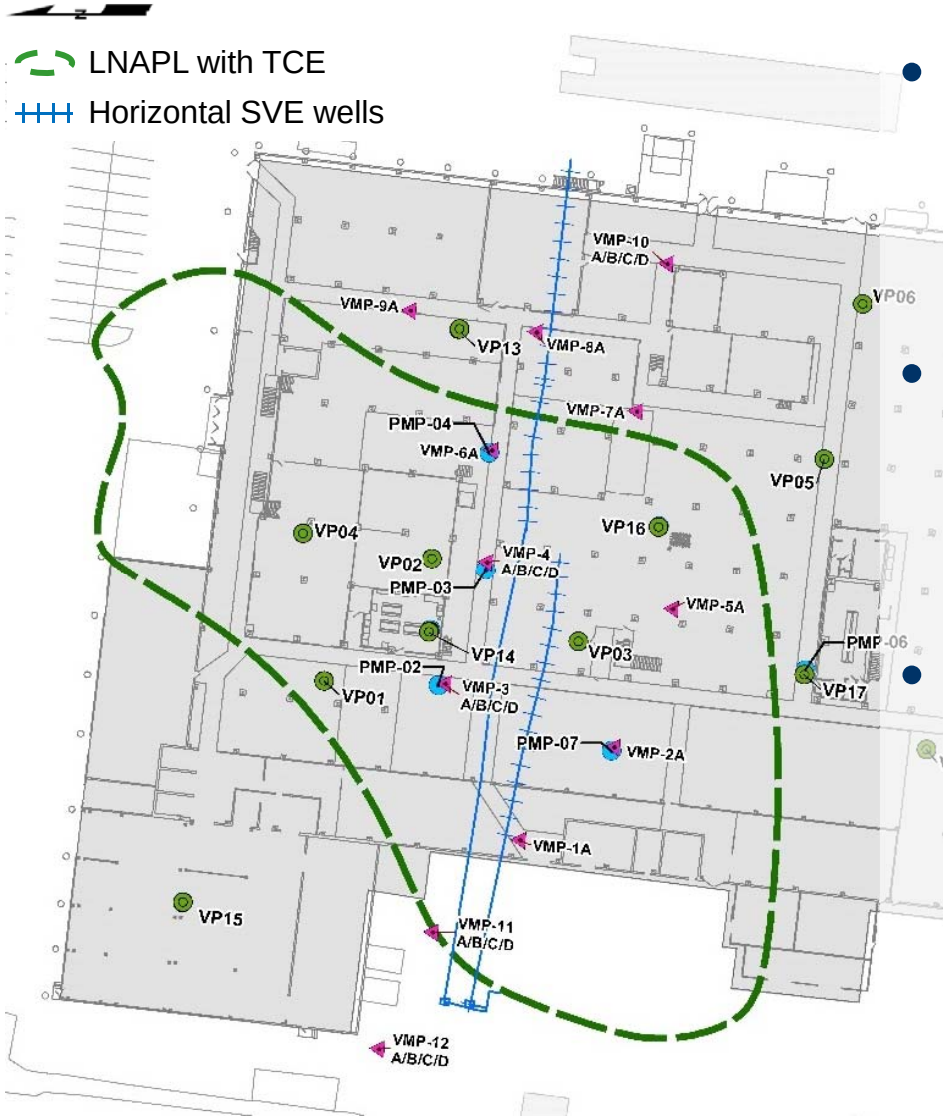
Sealant - Flexible, chemical-resistant self-leveling silicone concrete joint sealant (CSL315)

Building Slab Sealing

Sealed other vapor entry points

- Sealed the lunch room floor with Retro-Coat
- Sealed a void space between walls
- Sealed plumbing penetrations in restrooms

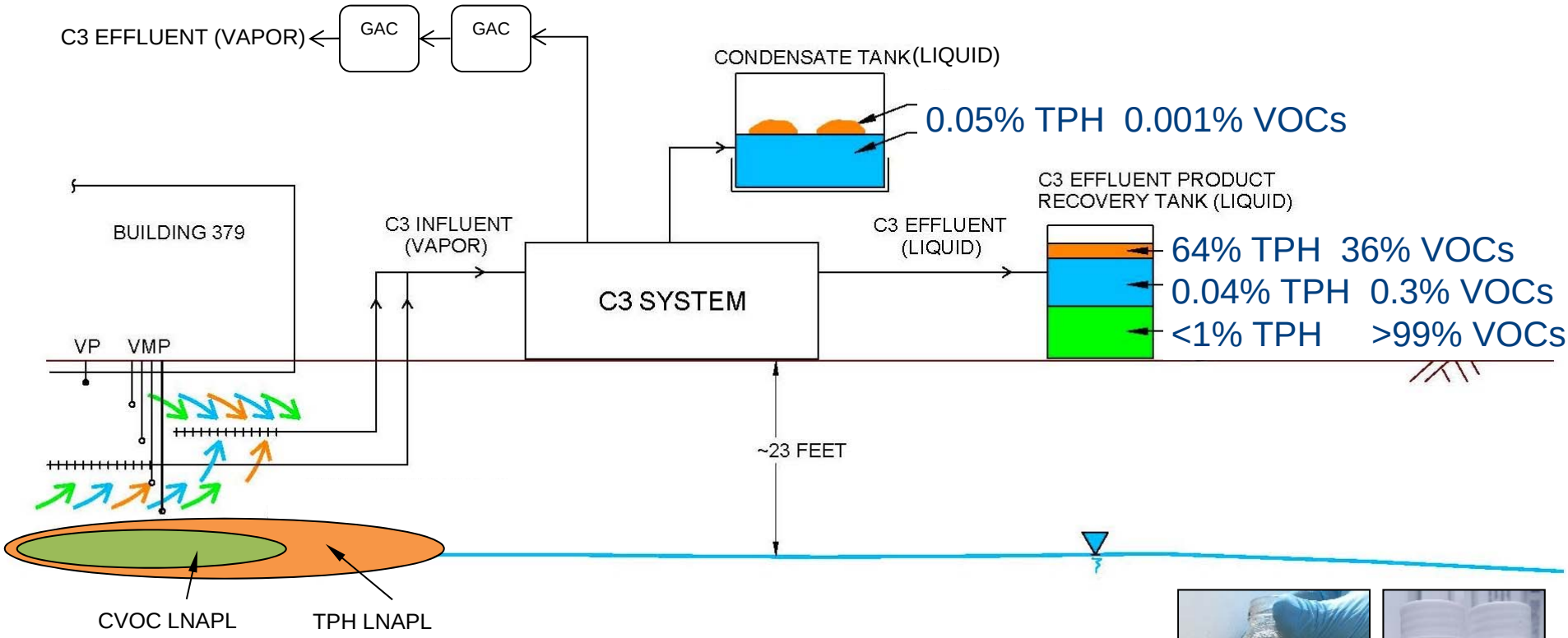
Horizontal SVE Pilot Test



- **2 Horizontal SVE Wells**
  ~10 ft bgs
  140’ well screens
- **C3 Vapor Treatment**
  cooling, compression, and condensation
- **Performance Monitoring**
  - sub-slab VPs
  - multi-depth soil gas VMPs
  - pressure monitoring PMPs

Horizontal SVE Pilot Test

Horizontal SVE Pilot Test

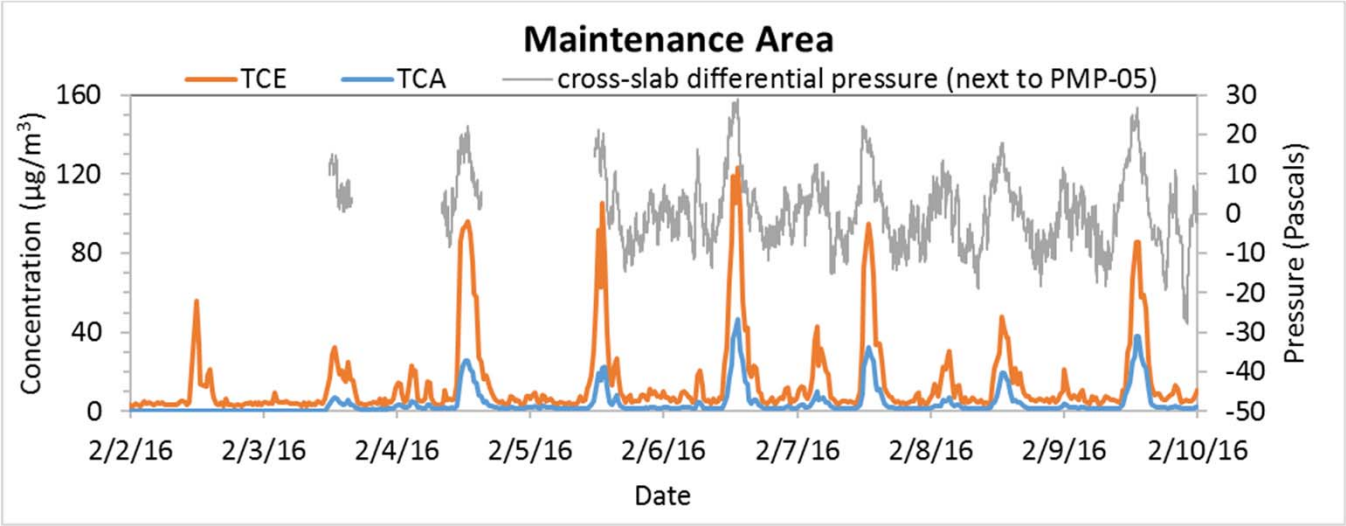


C3 – Cooling, Compression, and Condensation (Vapor Treatment System)

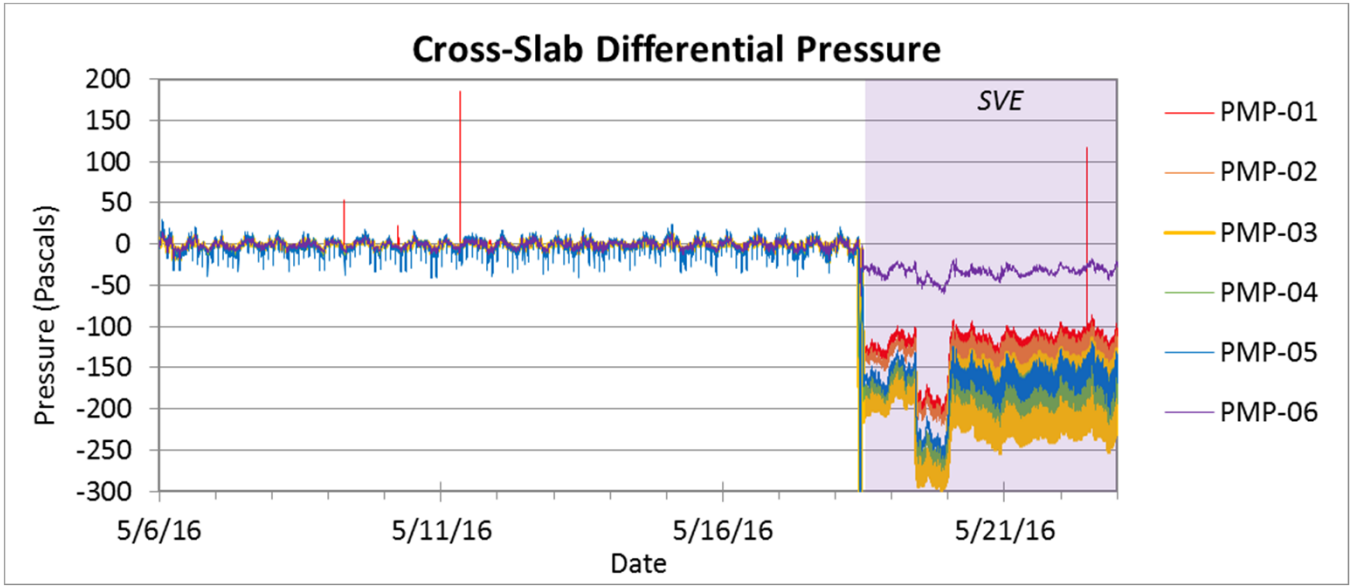
Horizontal SVE Pilot Test

Continuous Real-Time Monitoring:

Before SVE

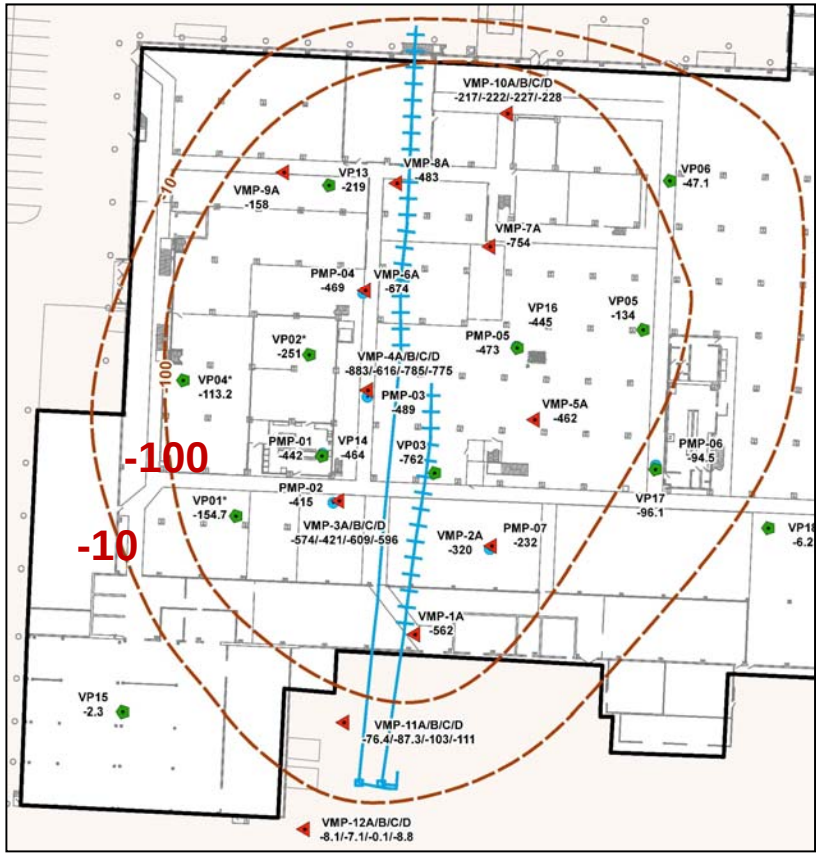


Before & After SVE Start-Up

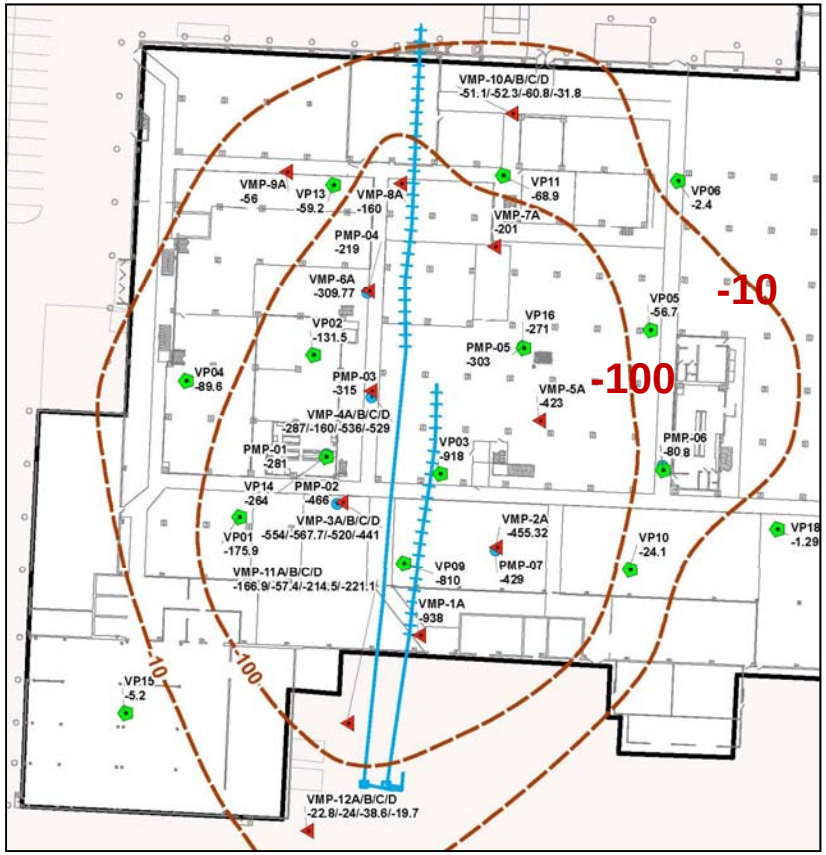


Horizontal SVE Pilot Test

Vacuum Isocontours (Pa)



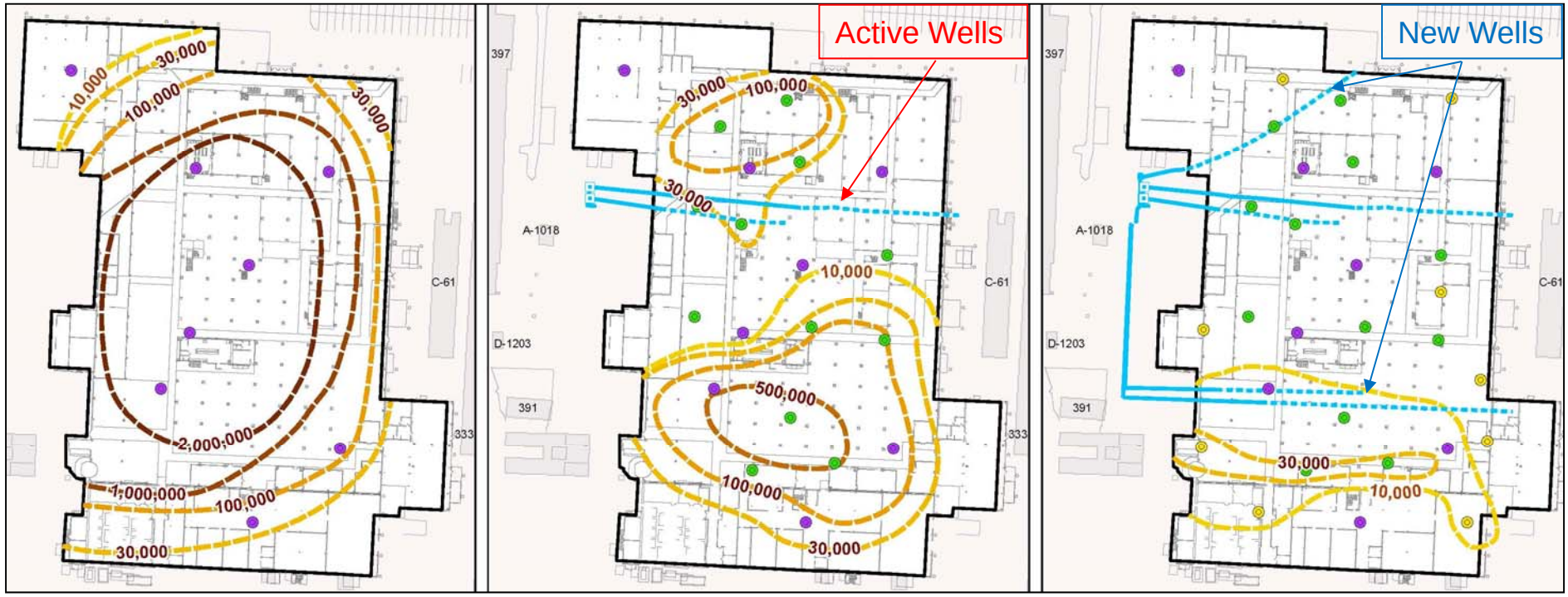
Both wells extracting
(September 2016)



Only the short well extracting
(February 2017)

Horizontal SVE Pilot Test

TCE Concentration Isocontours (µg/m³) in Sub-Slab Soil Gas

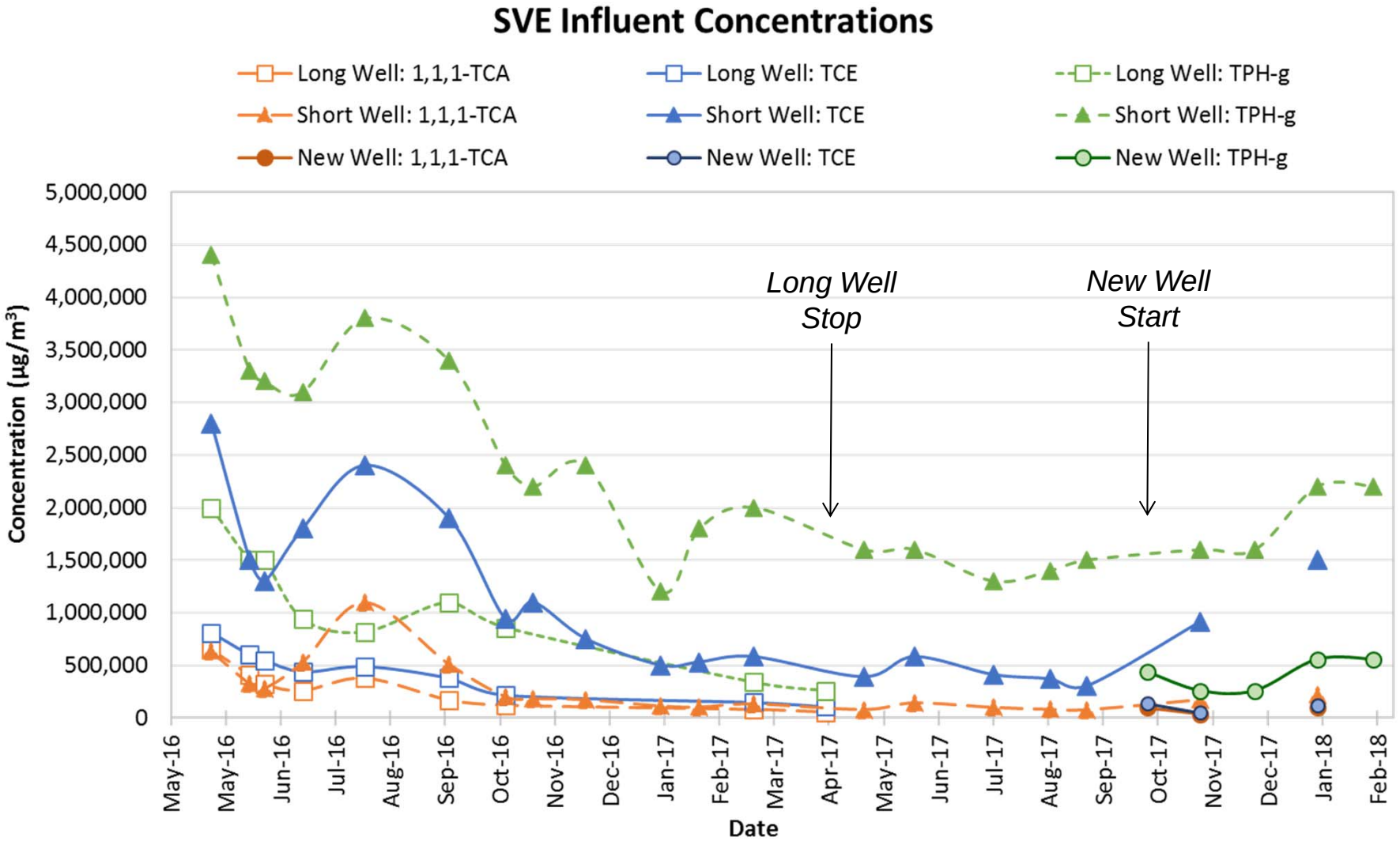


before start of SVE (April 2016)

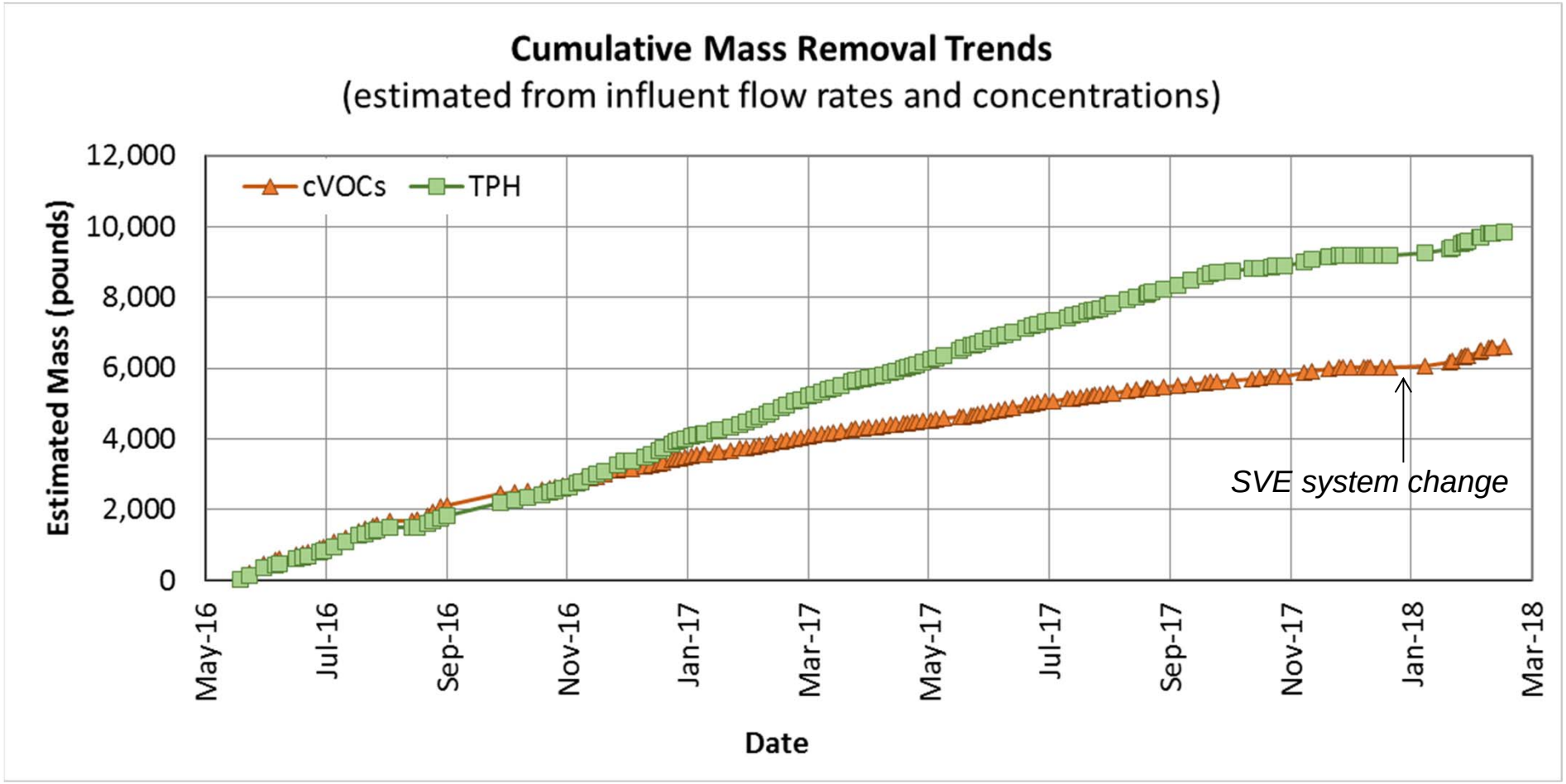
3 months after start of SVE (August 2016)

15 months after start of SVE (July 2017)

Horizontal SVE Pilot Test

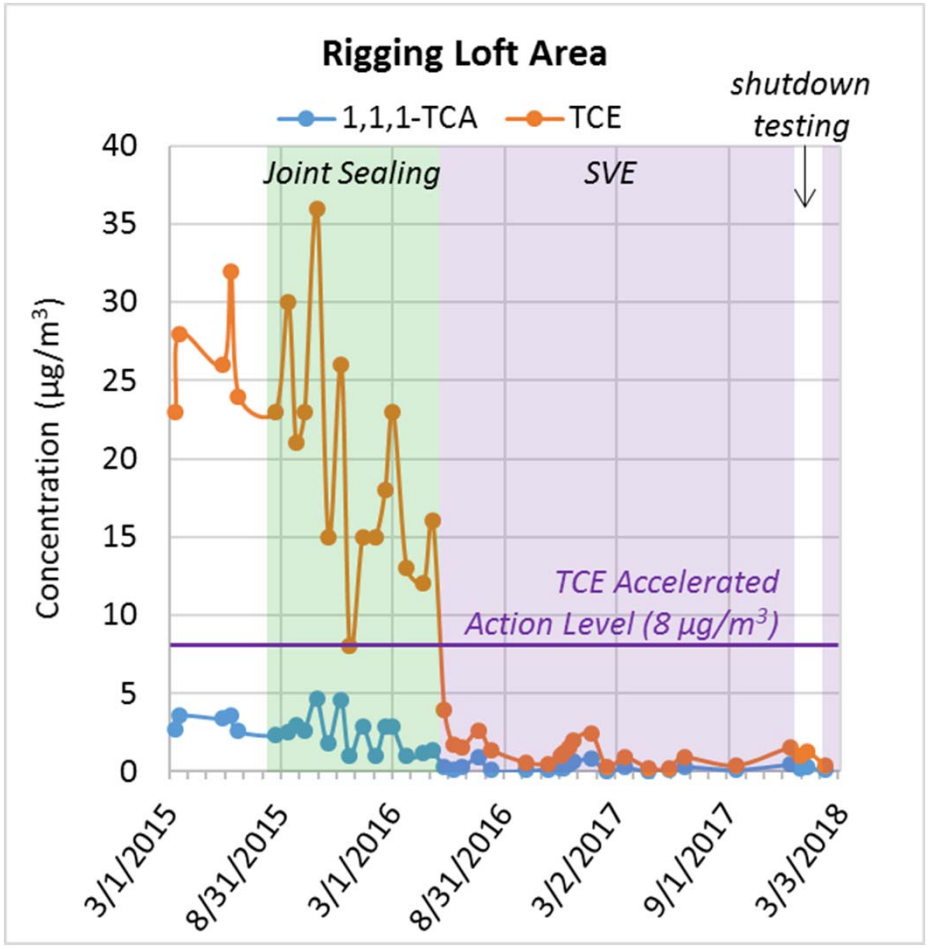


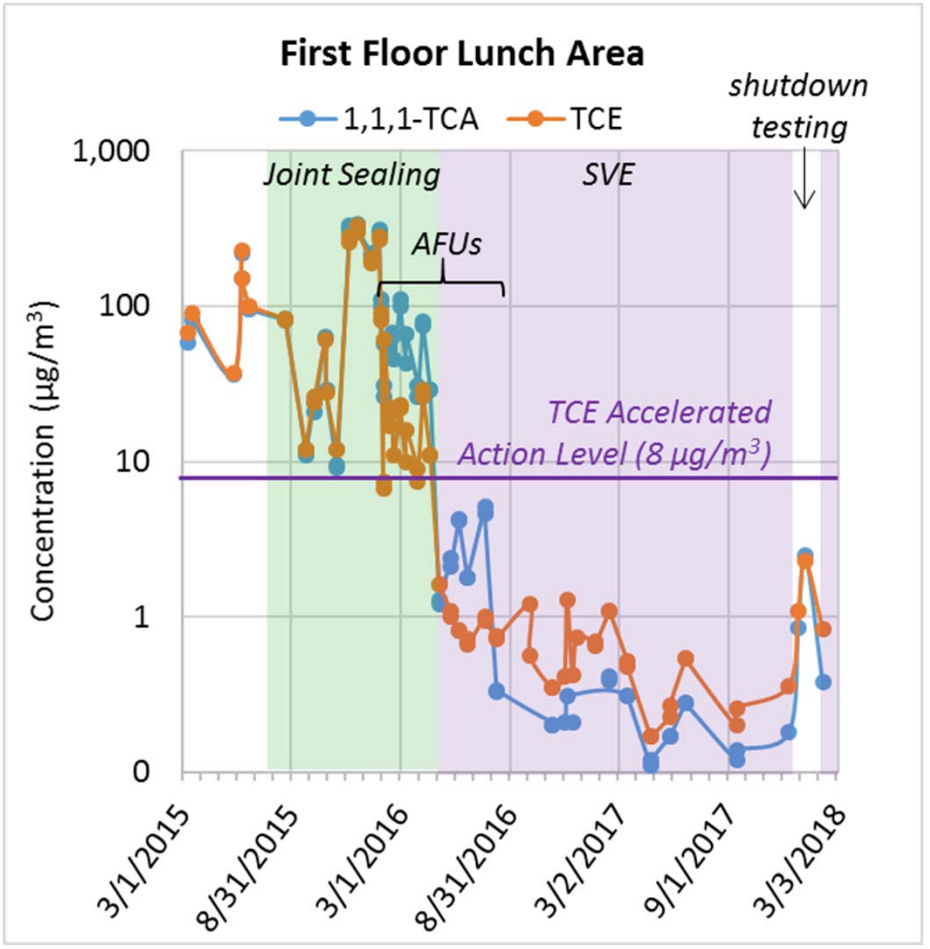
Horizontal SVE Pilot Test



>16,000 pounds (>2,000 gallons) of chlorinated VOCs and TPH collected over 21 months of operation

Indoor Air Monitoring Results





Next Steps

Enhancements for Source Removal

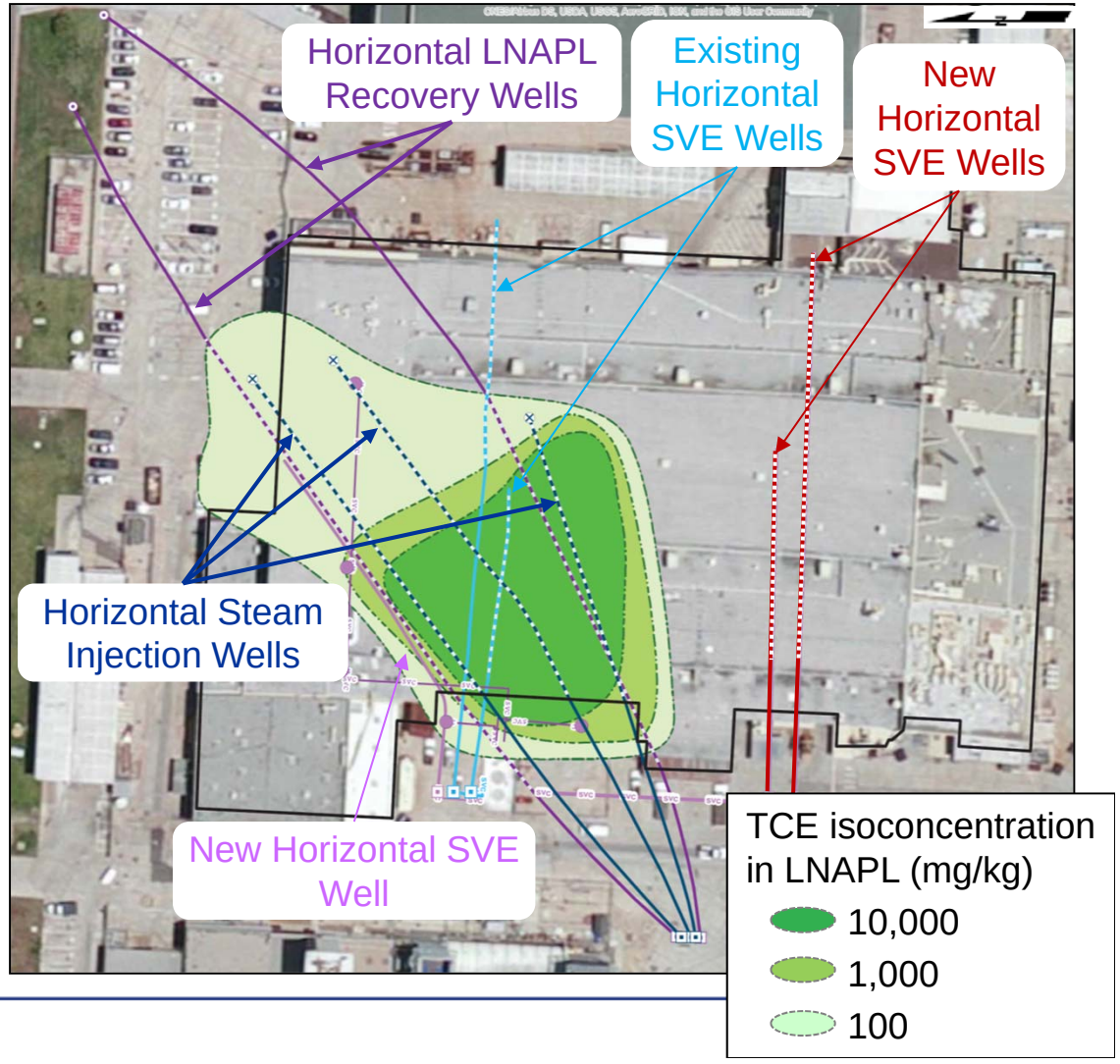
- Steam Injection
- LNAPL Recovery
- Expanded SVE

Installation

- Aug 2017 – Jan 2018

Expanded system start-up

- January 22, 2018



Lessons Learned

- **Real-Time Continuous Monitoring**
  - Provided valuable insight into the temporal variability of VI for this building
  - Supported decision-making during response planning and design
- **Slab and Preferential Pathway Sealing**
  - Required an iterative process, could not seal all pathways
  - Would not have been effective as a stand-alone measure
  - Enhanced the area of impact of the SVE system
- **Horizontal SVE**
  - Highly effective for inducing a vacuum over a large area underneath the building slab and removing mass

Questions ?

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