

Norwalk Tank Farm Update

Presented to the Norwalk Tank Farm
Restoration Advisory Board
August 23, 2018

Excelsior Dr

and St

Norwalk Blvd

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JACOBS

KINDER MORGAN

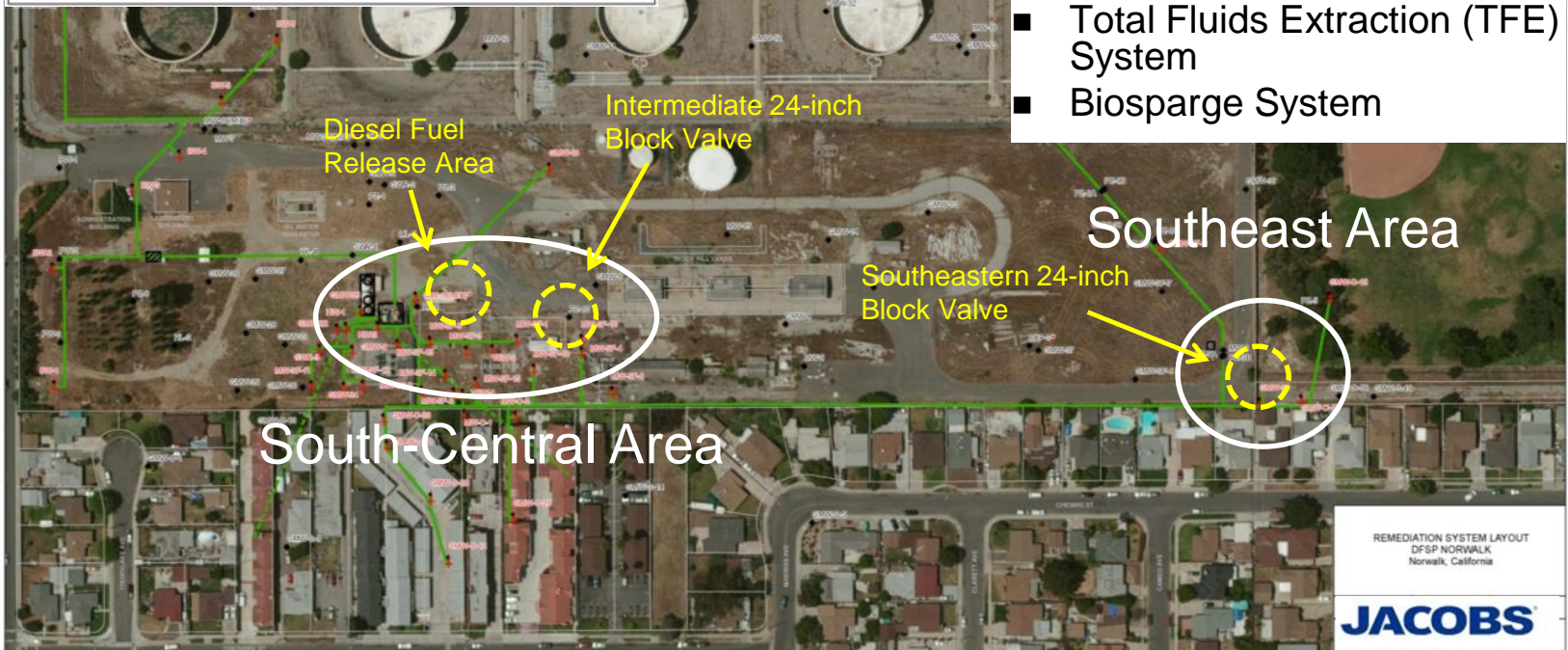


Agenda

- Kinder Morgan Update
 - Remediation System Overview
 - Remediation Systems Operations and Performance Summary
 - Ongoing Remediation and Investigation Activities
 - Summary of First-half 2018 Semiannual GW monitoring



Site Location and SFPP Remediation Areas



Remediation Systems Operations and Performance Summary

Remediation Systems Operations Summary

■ SVE and Biosparge Systems

– 1st Quarter 2018

- The SVE operated **83%** of the time (**97%** of the time excluding planned shutdowns – gauging, monitoring, maintenance).
- The biosparge system operated **74%** of the time (**86%** of the time excluding planned shutdowns).

– 2nd Quarter 2018

- The SVE operated **85%** of the time (**97.3%** of the time excluding planned shutdowns and power outages).
- The biosparge system operated **78%** of the time (**98%** of the time excluding planned shutdowns and power outages).

■ TFE/GWE System

– 1st Quarter 2018

- Operated **83%** of the time (**100%** of the time excluding planned shutdowns).

– 2nd Quarter 2018

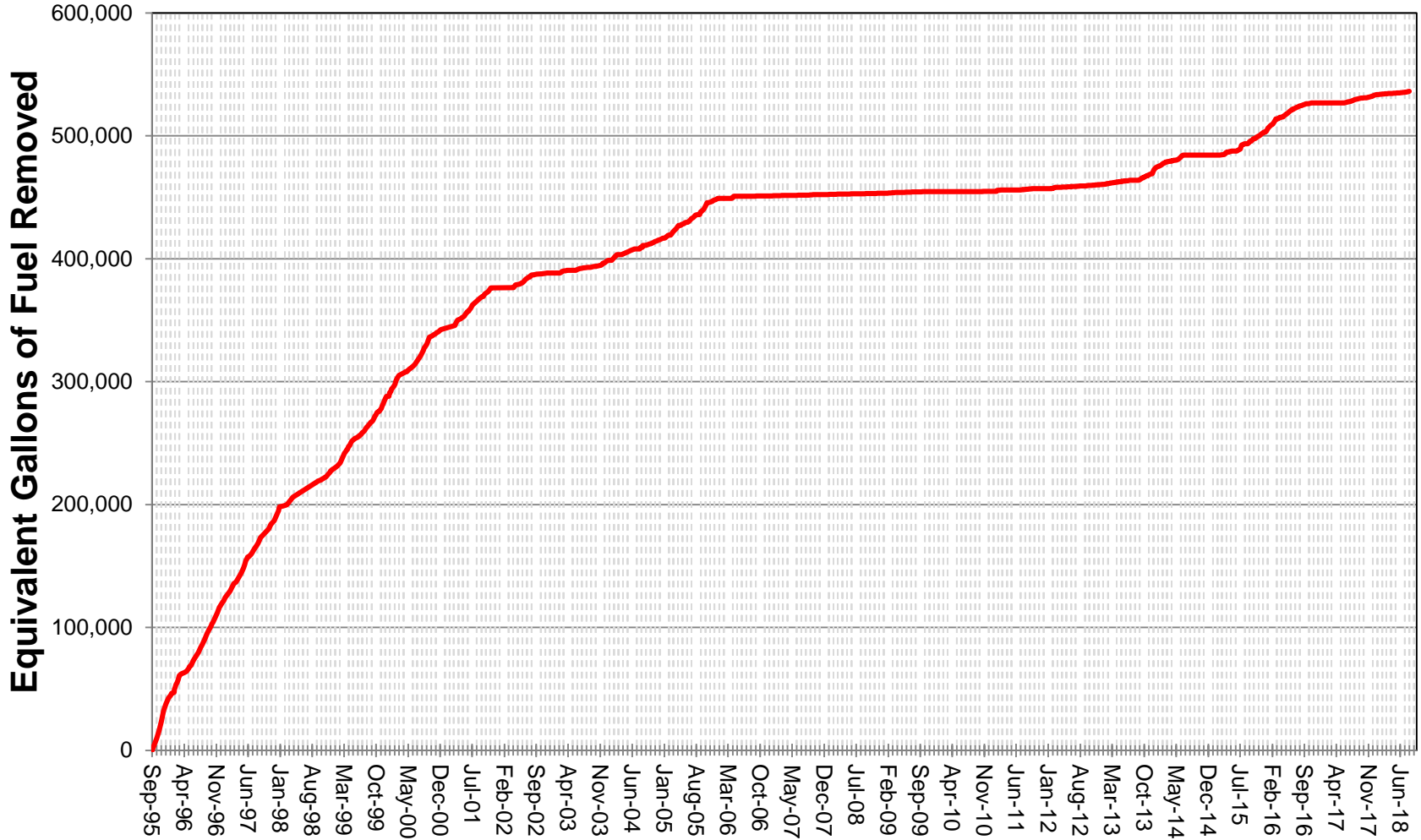
- Operated **85%** of the time (**100%** of the time excluding planned shutdowns and power outages)
- Shutdown was to facilitate gauging and sampling activities for the first semiannual groundwater sampling event.

SVE System Performance Summary

- Equivalent Fuel Treated - SVE
 - Based on weekly monitoring of influent vapor concentration, vapor extraction flow rate, and hours of operation.
 - Conversion Factor = 6.6 lbs/gal
 - 1st Quarter 2018 – **1,337 gallons (8,821 pounds)**
 - 2nd Quarter 2018 – **733 gallons (4,841 pounds)**
 - Since 1995 – Approx. 535,229 gallons (3.53 million pounds)

SVE System Performance Summary

Cumulative Fuel Removed by Vapor Extraction To Date



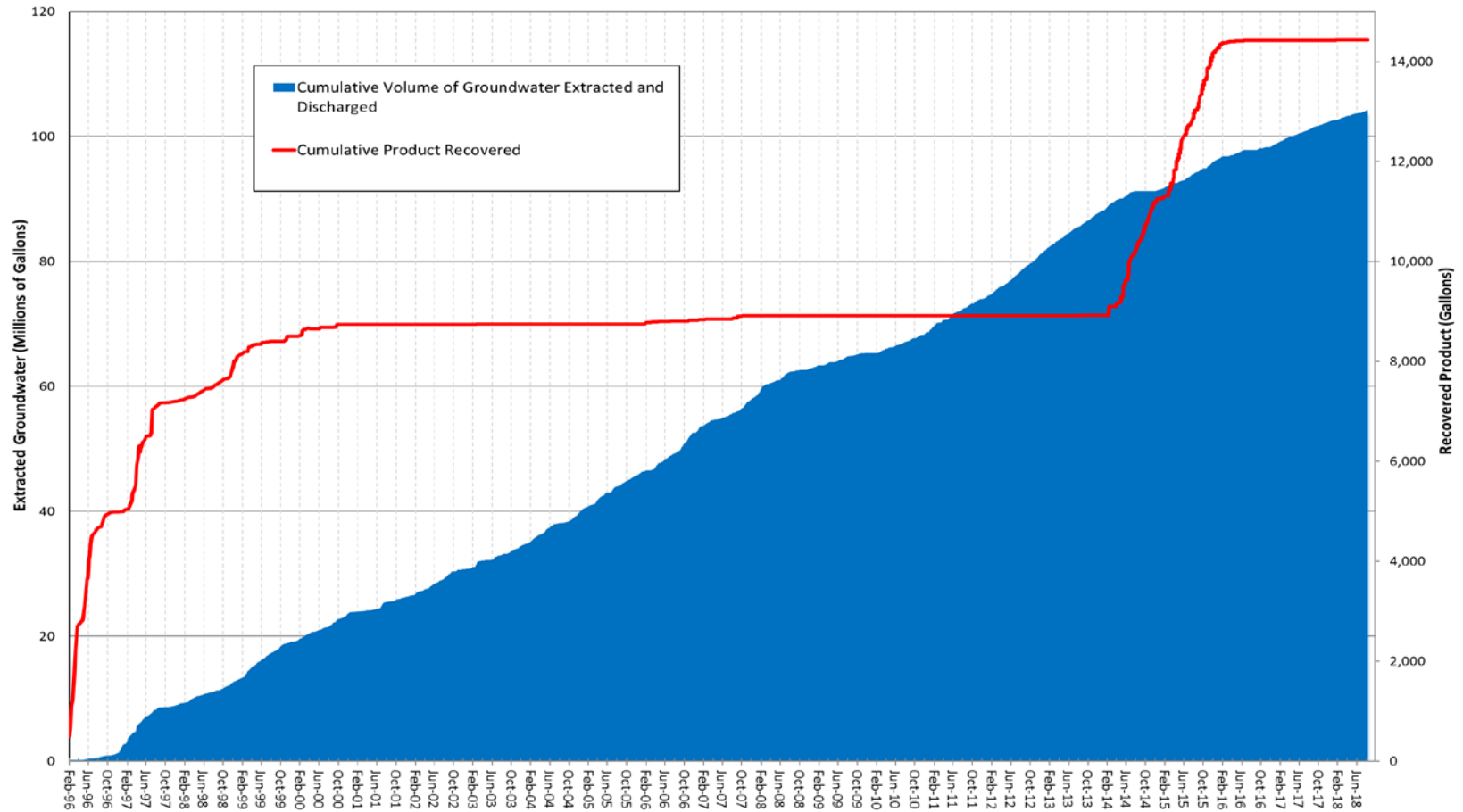
TFE/GWE System Performance Summary

- Groundwater Extracted and Equivalent Fuel Treated
 - Based on monthly monitoring of influent TPH concentration and volume of extracted groundwater.
 - Conversion Factor = 6.6 lbs/gal
 - 1st Quarter 2018
 - Groundwater Treated – **708,746 gallons**
 - Equivalent Fuel Treated – **1.7 gallons (11 pounds)**
 - 2nd Quarter 2018
 - Groundwater Treated – **508,344 gallons**
 - Equivalent Fuel Treated – **0.52 gallons (3.4 pounds)**
 - Lower mass removal due to decreased TPH concentration in groundwater influent (likely due to ongoing remediation efforts)
 - No Free Product Extracted during Q1 and Q2 2018 due to decline in measurable product in extraction wells.
 - Since 1995
 - South-Central and Southeast Areas– 103.8 million gallons
 - West Side Barrier – 26.9 million gallons

TFE System Performance Summary

- Free Product Extracted
 - 1st Quarter 2018
 - No free product accumulated in the product holding tank
 - 2nd Quarter 2018
 - No free product accumulated in the product holding tank
 - Less product recovered likely due to decline in measurable product in extraction wells as a result of ongoing remediation activities
 - Since 1995 – 14,426 gallons product extracted

TFE/GWE System Operations Summary



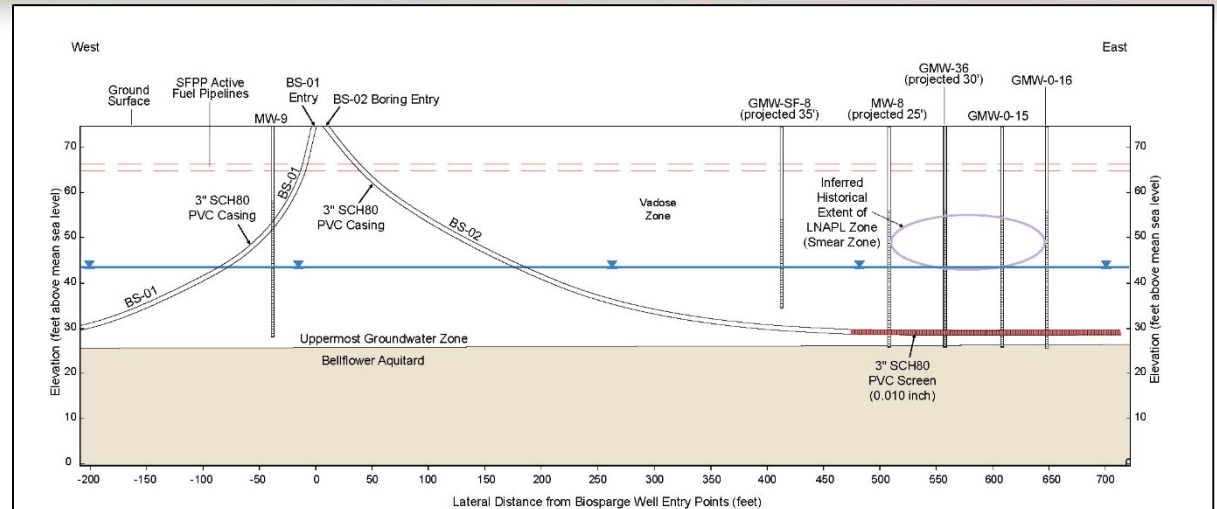
Ongoing Remediation and Investigation Activities

Southeastern Area Biosparge System

Horizontal Biosparge Well BS-02 was installed in Q4 2017

Well Casing and Screen

- SCH 80 PVC 4-inch diameter well
- Open slot design (no sand pack required); slot width 0.010 inches
- Screen depth of 45 feet bgs
- 500 feet of riser casing; 250 feet of screen



Southeastern Area Biosparge System

- A 175-HP Kaeser compressor will be installed in Sep/Oct 2018 to provide air for both the south-central and the southeast biosparge wells.
- Rotary screw compressor enclosed in a 12-foot by 25-foot transportable container.
- The compressor is able to deliver up to 883 CFM of air.
 - Max 600 CFM into BS-01 at the south-central area
 - Max 240 CFM into BS-02 at the southeast area
- Other activities
 - Delivery to site
 - Electrical upgrades
 - Underground trenching for pipe connections
 - Acceptance testing
- Installation schedule = 2 weeks



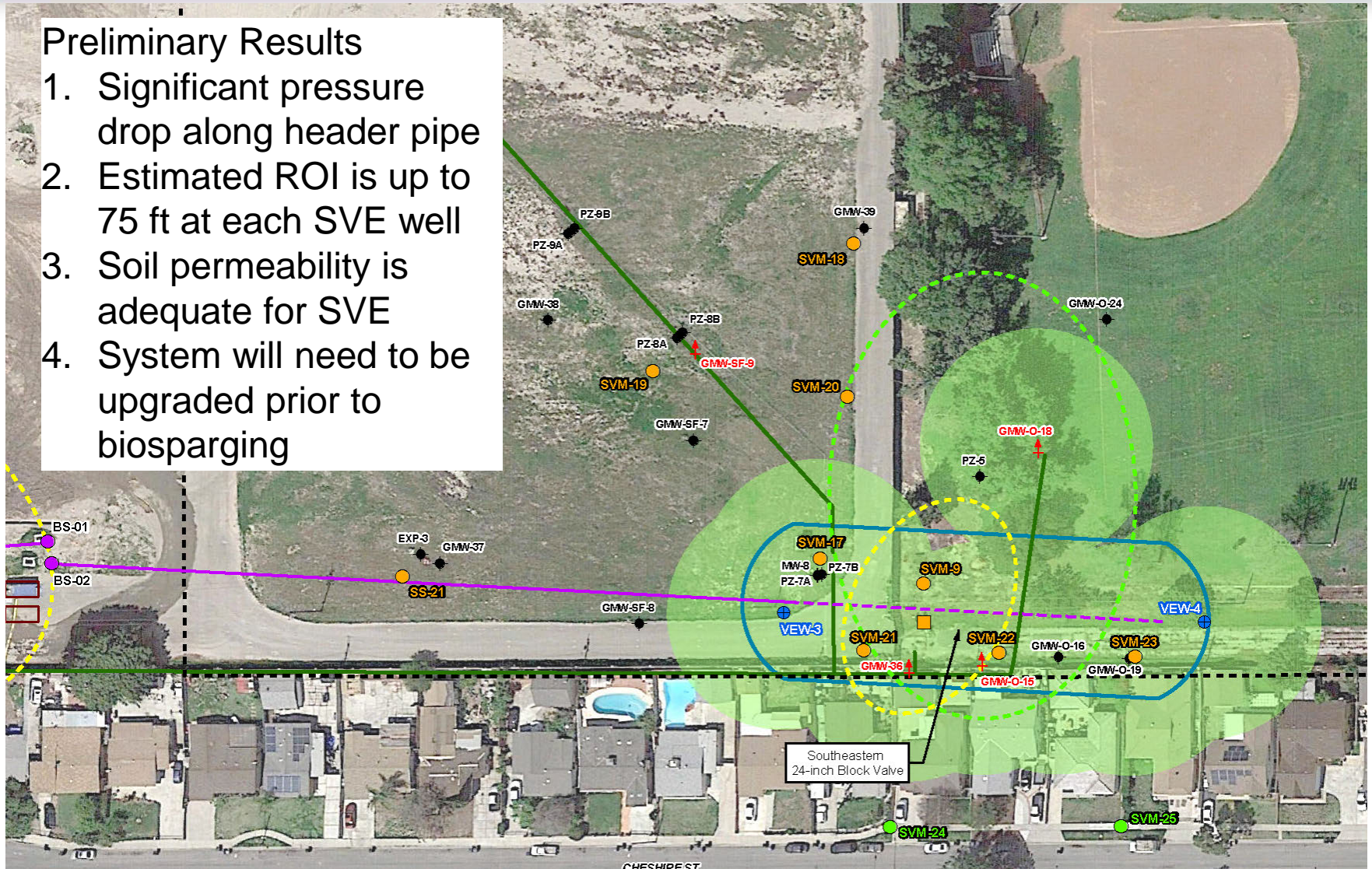
Southeastern Area SVE System Upgrades

- Prior to turning on the new biosparge system, need to verify that the existing SVE system provides sufficient capture of vapors
- We performed a capture zone test in June 2018
 - Test performed with SVE system running
 - Isolated and monitored pressure/flow at 3 existing SVE wells and vacuum-pressure at nearby monitoring points
 - Measure pressure drop in 1,250 ft header pipe from SVE wells to the blower
 - Collected data is reduced and run through a spreadsheet model to calculate soil permeability and capture zone for each SVE well.
- The results will be provided in an Addendum to the Southeastern Biosparge Well Installation Work Plan – to be issued in September.

Southeastern Area SVE System Upgrades

Preliminary Results

1. Significant pressure drop along header pipe
2. Estimated ROI is up to 75 ft at each SVE well
3. Soil permeability is adequate for SVE
4. System will need to be upgraded prior to biosparging

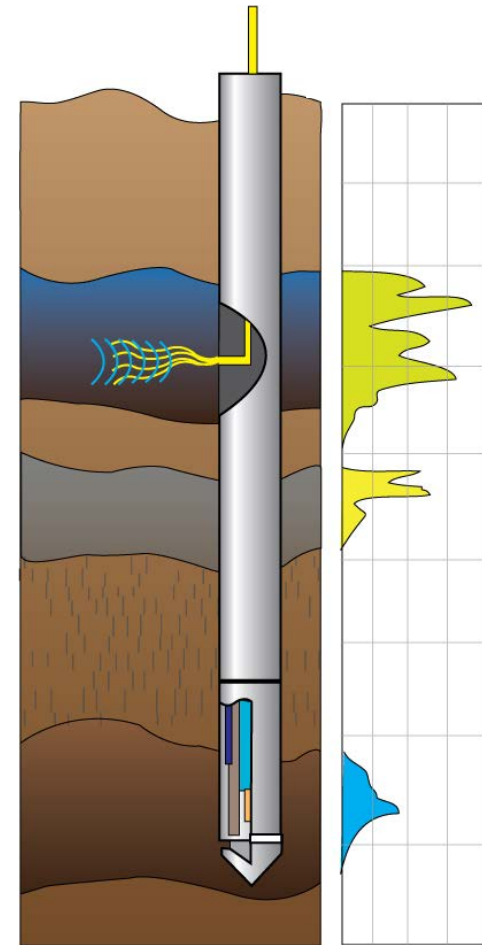


Southeastern Area SVE System Upgrades

- For adequate vapor capture during sparging in the southeastern area, the following upgrades to the SVE system will be performed:
 - Convert existing monitoring wells to SVE:
 - GMW-O-16, GMW-O-19, and MW-8
 - Install up to three new 4-inch SVE wells (screened from 12 feet to 27 feet bgs)
 - Install a new 6-inch HDPE SVE Conveyance line (approximately 1,250 feet) from the southeastern area to the blower/RTO located in the south-central area.
- Install two new offsite vapor monitoring probes (probes set at 5 and 10 feet bgs) on Cheshire Street.

LNAPL Comparative Study: South-central Area

- Purpose: to evaluate changes in the extent and characteristics of LNAPL after more than 2 years of biosparging.
- Hypothesis: Comparison of baseline data (i.e., collected before 2011/2012) and 2-years post-sparging (2018) data will demonstrate significant reduction in LNAPL extent and mobility
- Field/Lab Methods: CPT, LIF/UVOST, Geotechnical (UV photographs, grain-size, pore fluid saturation, and product mobility) and Analytical sampling
 - Used CPT/LIF at 4 locations down to 50 ft
 - Collected lab samples from highest LIF response depth intervals
 - Field observation, logging lithology and screening with PID



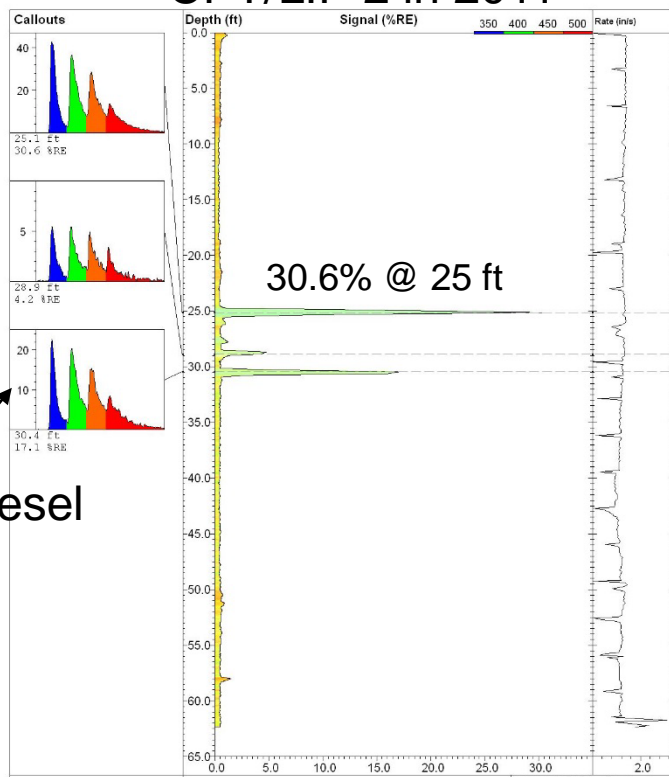
LNAPL Comparative Study: South-central Area



LNAPL Comparative Study: South-central Area

- Preliminary Results: >50% decrease in max LIF response across the board, suggests significant reduction in extent of LNAPL.

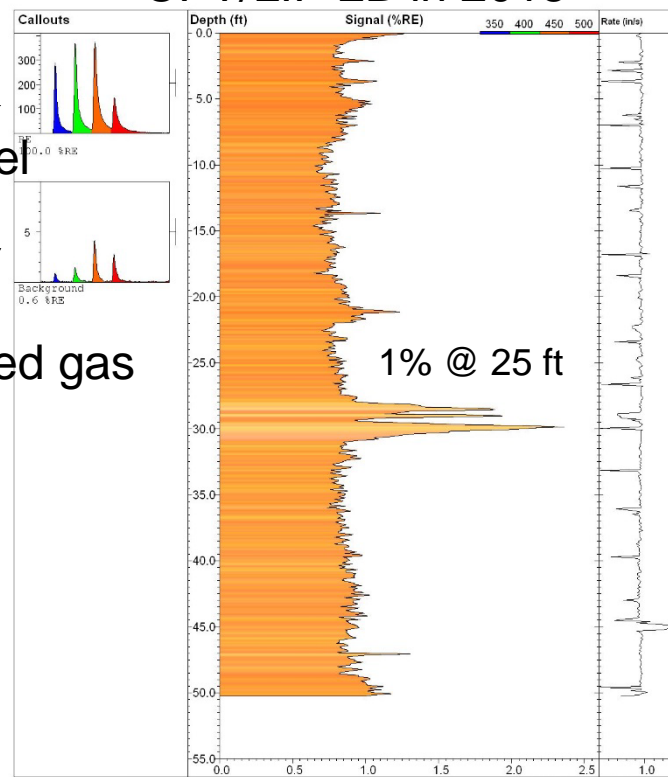
CPT/LIF-2 in 2011



gas/diesel

Weathered gas

CPT/LIF-2B in 2018



LNAPL Comparative Study: South-central Area

- Preliminary Findings (Qualitative – Baseline vs 2018):
 - Reduced LIF Response
 - Reduced Visible LNAPL in Core Photographs
 - Reduced LNAPL Pore Saturation
 - LNAPL is not Mobile
 - Lower Concentration of Petroleum Hydrocarbons in Soil
- Other Lines of Evidence that corroborate these findings:
 - 2018 CSM Update
 - Dissolved phase trends
 - Less LNAPL in wells (Diagnostic Gauge Plots and other Statistical Tools)
 - LNAPL is in residual phase, not mobile or migrating
- Technical Memorandum forthcoming – September 2018

Summary of First-half 2018 Semiannual Groundwater Monitoring

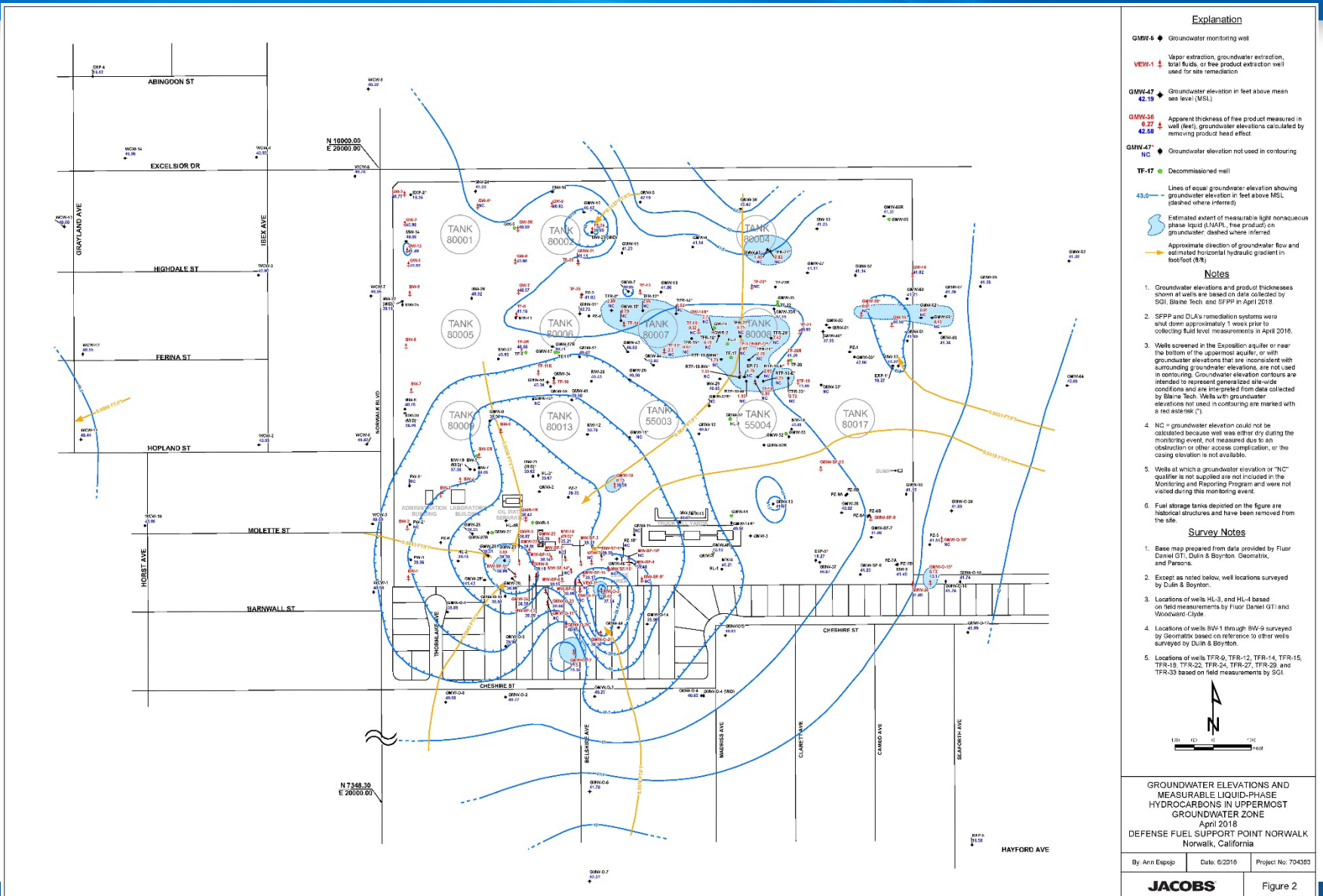
First Semiannual 2018 Groundwater Monitoring Report

- Site-wide monitoring in April/May 2018 – both KMEP and DLA
- Well Gauging (Blaine Tech and SGI)
 - 179 wells gauged
- Well Sampling (Blaine Tech and SGI)
 - Low-flow sampling methods (submersible pumps)
 - 114 wells sampled (split samples collected in EXP-1, EXP-2, and EXP-3)
 - SFPP and DLA remediation systems remained offline during gauging activities

First Semiannual 2018 Groundwater Monitoring Report

- **Uppermost Aquifer Groundwater Elevations and Flow**
 - Groundwater elevations decreased over most of the site
 - Groundwater flow primarily converging toward groundwater depressions in the south-central, north-central, and eastern areas
 - Horizontal hydraulic gradients of 0.0019 to 0.0137 ft/ft
- **Exposition Aquifer Groundwater Elevations and Flow**
 - Groundwater elevations increased between 0.02 and 0.43 ft relative to April 2017
 - Horizontal hydraulic gradient was approximately 0.00006 ft/ft to the east-southeast in the central and northwestern portions of the gauging area, and 0.0004 ft/ft to the northwest in the eastern and southeastern offsite areas (similar to October 2017)

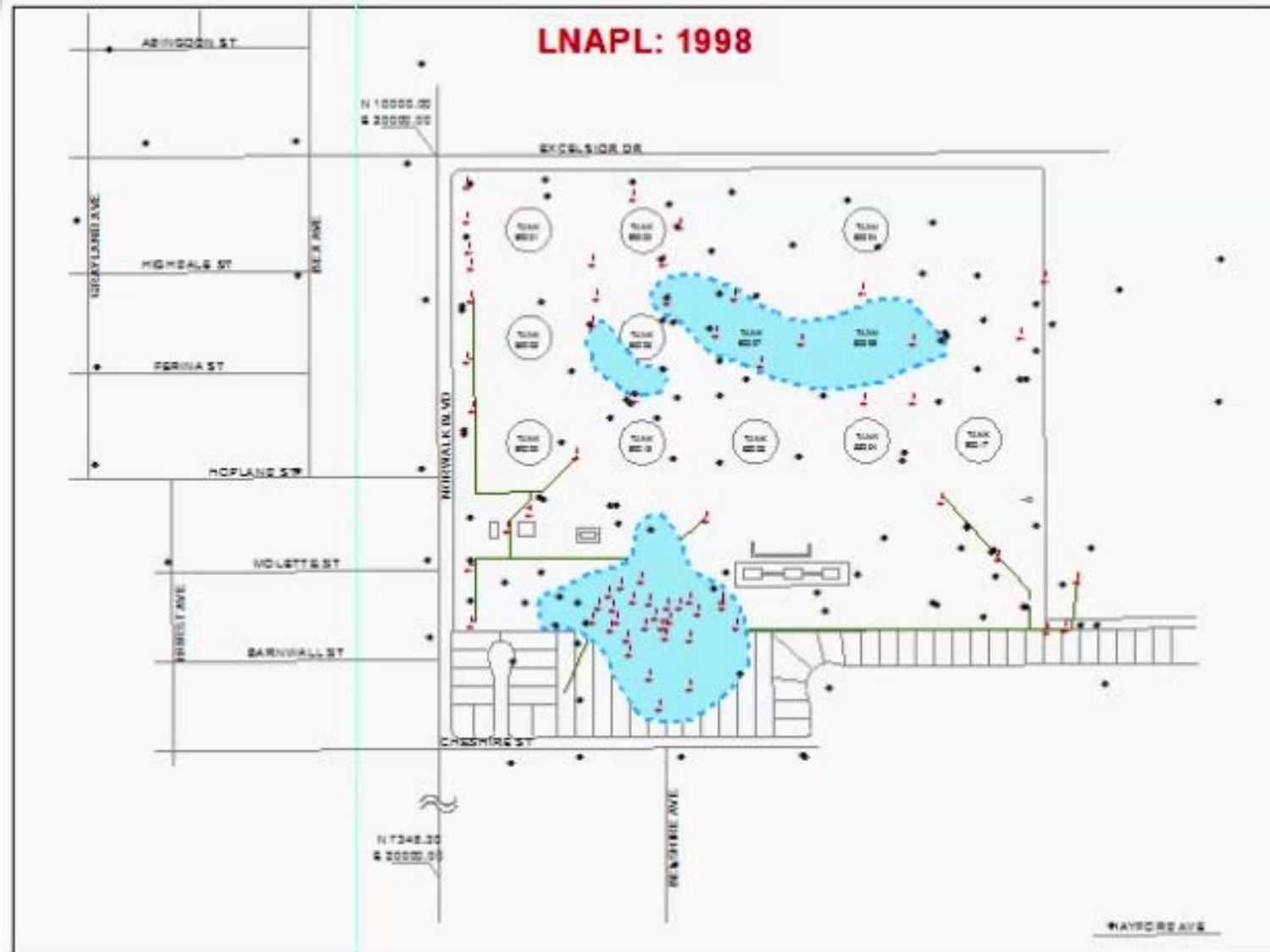
Groundwater Elevations - Water Table



First Semiannual 2018 Groundwater Monitoring Report – Free Product

- Free Product measured in 31 of the 179 wells that were gauged.
 - North-central area: EP-73, GMW-18, GMW-45, GW-14R, TF-15, TF-16, TF-17R/EP-72, TF-18, TFR-9, TFR-12, TFR-14, TFR-15, TFR-18, TFR-22, TFR-24, TFR-27, TFR-29, TFR-33, RTF-18-E, RTF-18-N, RTF-18-NNW, RTF-18-NW, and RTF-18-W
 - Eastern area: GMW-58, GMW-62, and GMW-68
 - South-central area: GMW-10, GMW-23, GMW-O-12, and MW-O-2
 - Southeastern area: GMW-O-15
 - Thicknesses ranged from 0.01 foot in GMW-58 and GMW-62 to 7.42 feet in TFR-29
- Increase in product areal extent is primarily the result of product measured in many newly installed wells in the north-central area.
- Overall increase in product thickness is likely attributable to low precipitation and lower groundwater elevations in 2018.

LNAPL Extent – 1998 to 2018



First Semiannual 2018 Groundwater Monitoring Report – Dissolved Contaminants

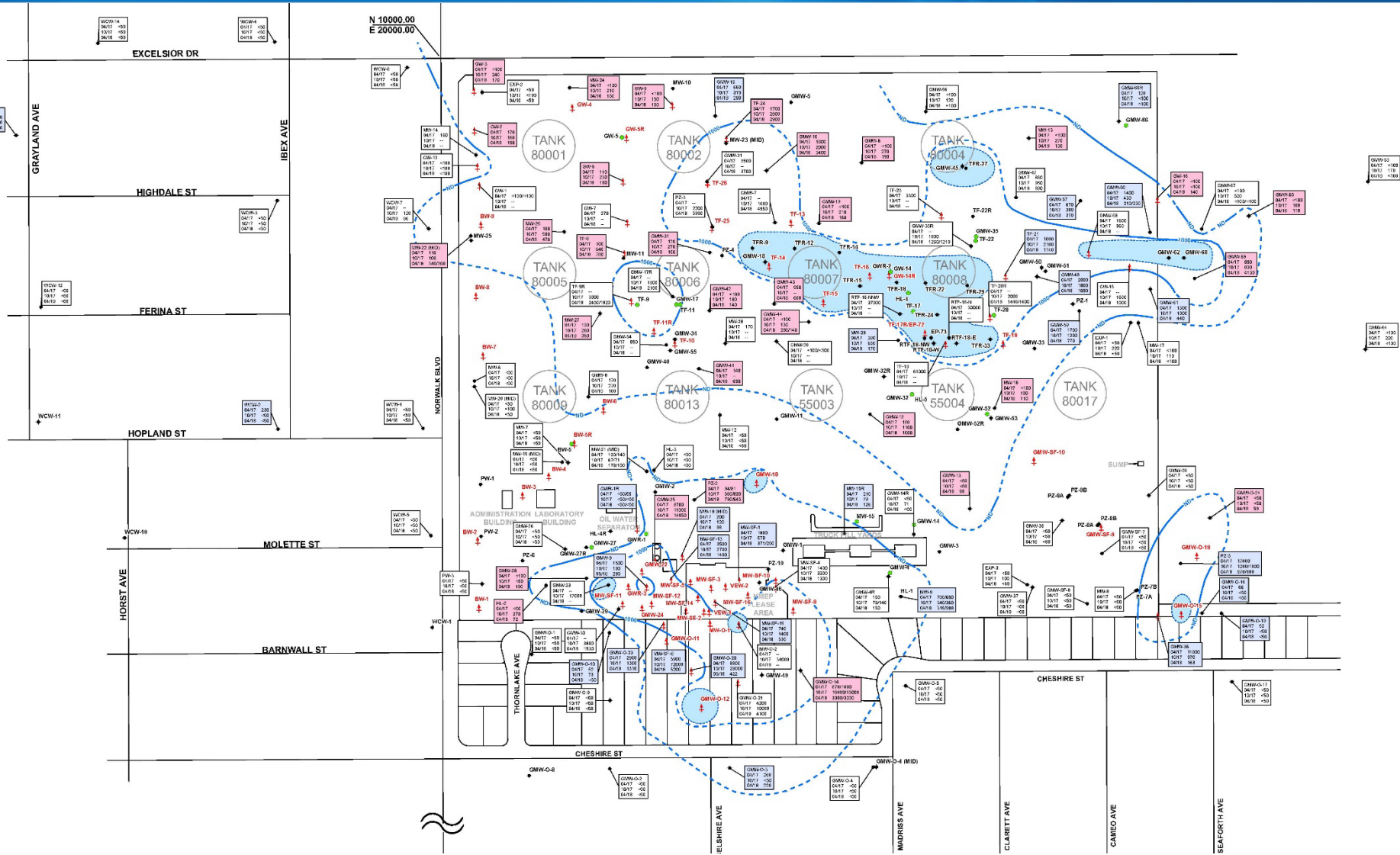
■ Uppermost Aquifer Wells

- In most areas, the lateral extents of TPH, benzene, 1,2-DCA, MTBE, and TBA have been reduced from the historical maximum and appear to be consistent with previous monitoring events
- Reduction and consistency of plumes is a result of hydraulic containment by the treatment systems and attenuation mechanisms
- Free product accumulation across the site has, on average, increased relative to the 2017 events, due to low precipitation and lower groundwater elevations in 2018
- Low level detections of MTBE and 1,2-DCA and plume extents in the western area do not warrant restarting the WSB treatment system.

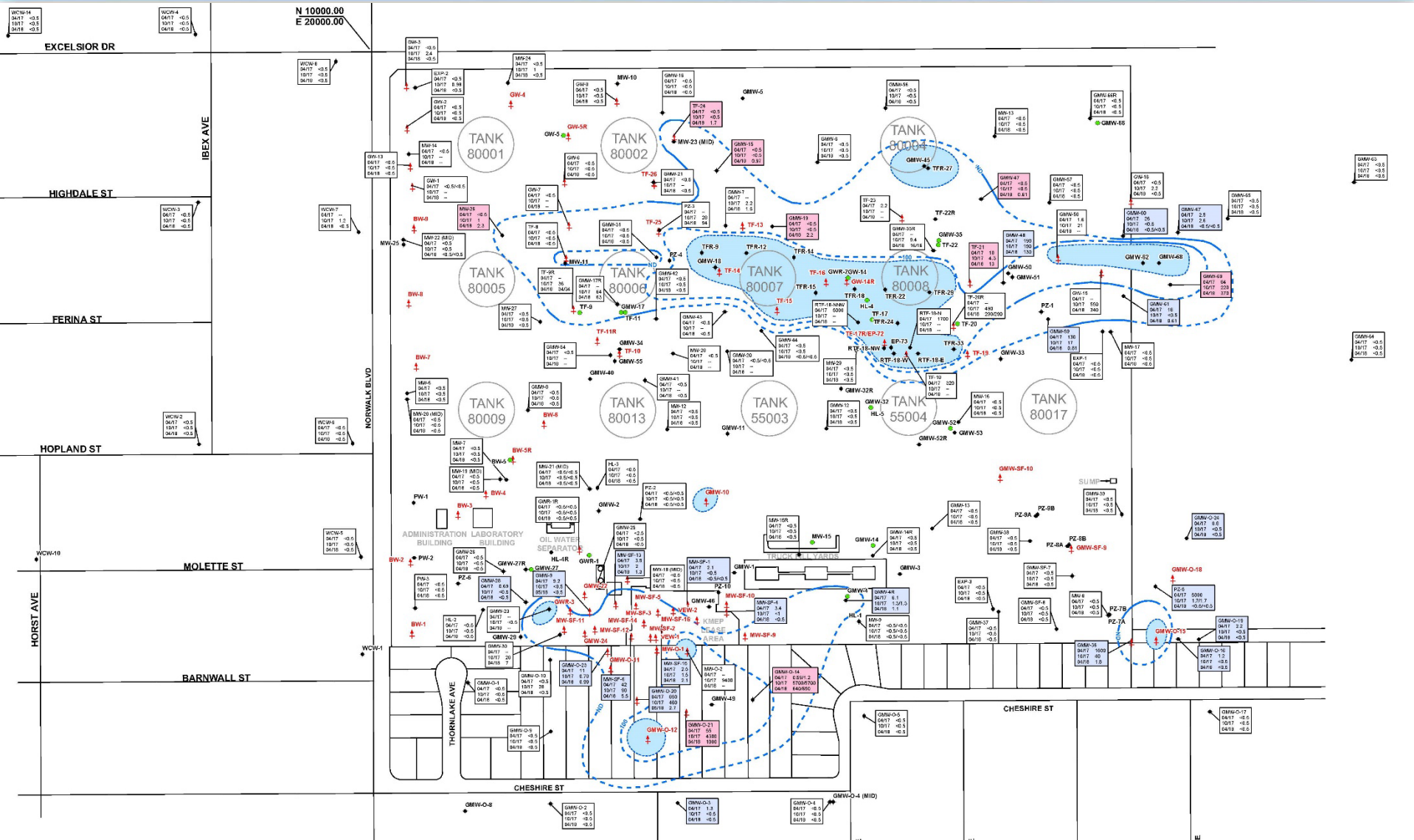
First Semiannual 2018 Groundwater Monitoring Report

- Exposition Aquifer wells sampled:
 - EXP-1, -2, and -3 sampled twice by DLA and SFPP
 - EXP-4 sampled once by SFPP
 - EXP-5 sampled once by SFPP
- All analytical results were Non Detect (ND), except for the following:
 - 1,2-DCA was detected at EXP-3
- This type of low-level detection occasionally occurs in the EXP wells. SFPP and DLA Energy will continue to monitor the EXP wells and closely watch for any future potential detections.

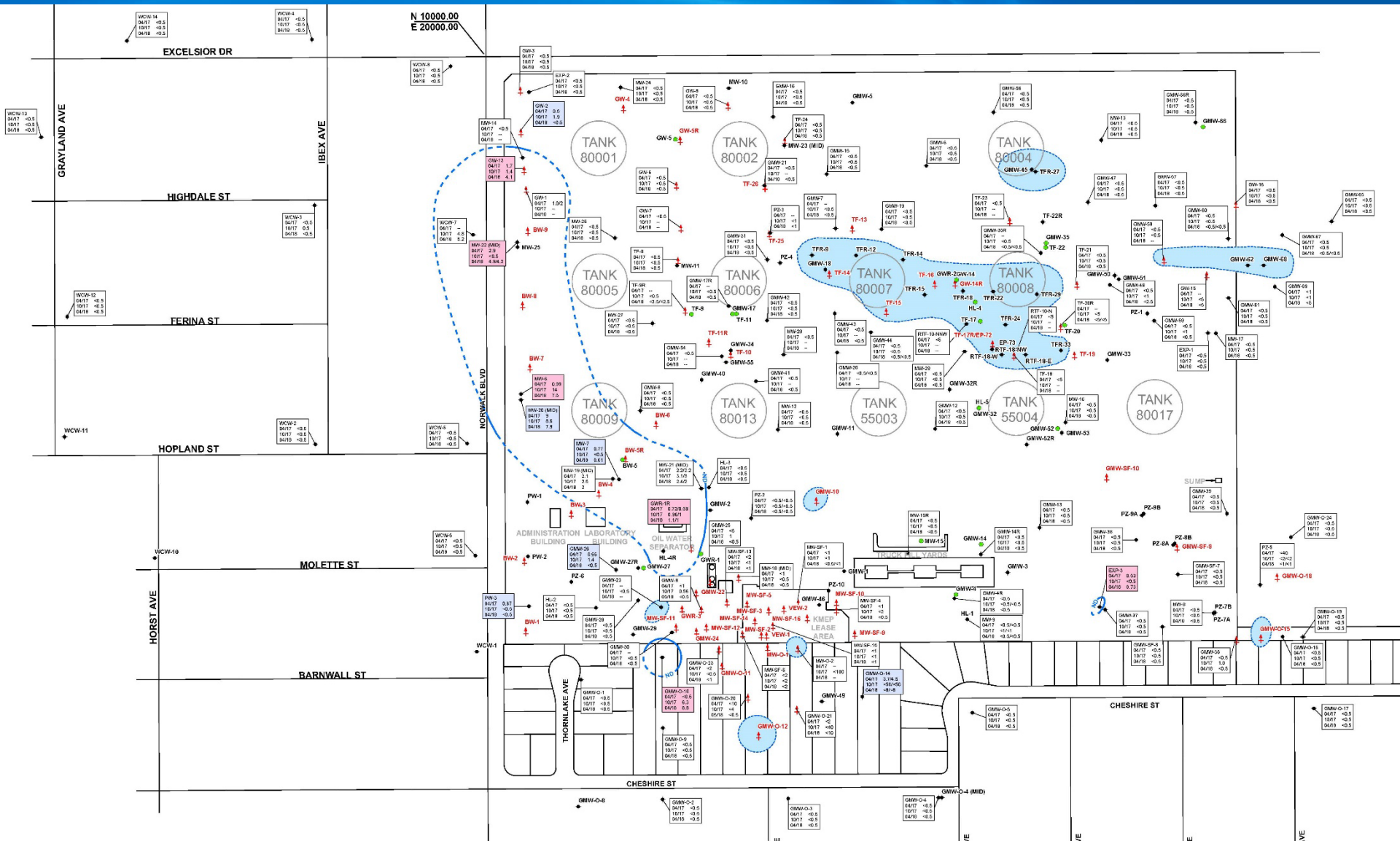
TPH



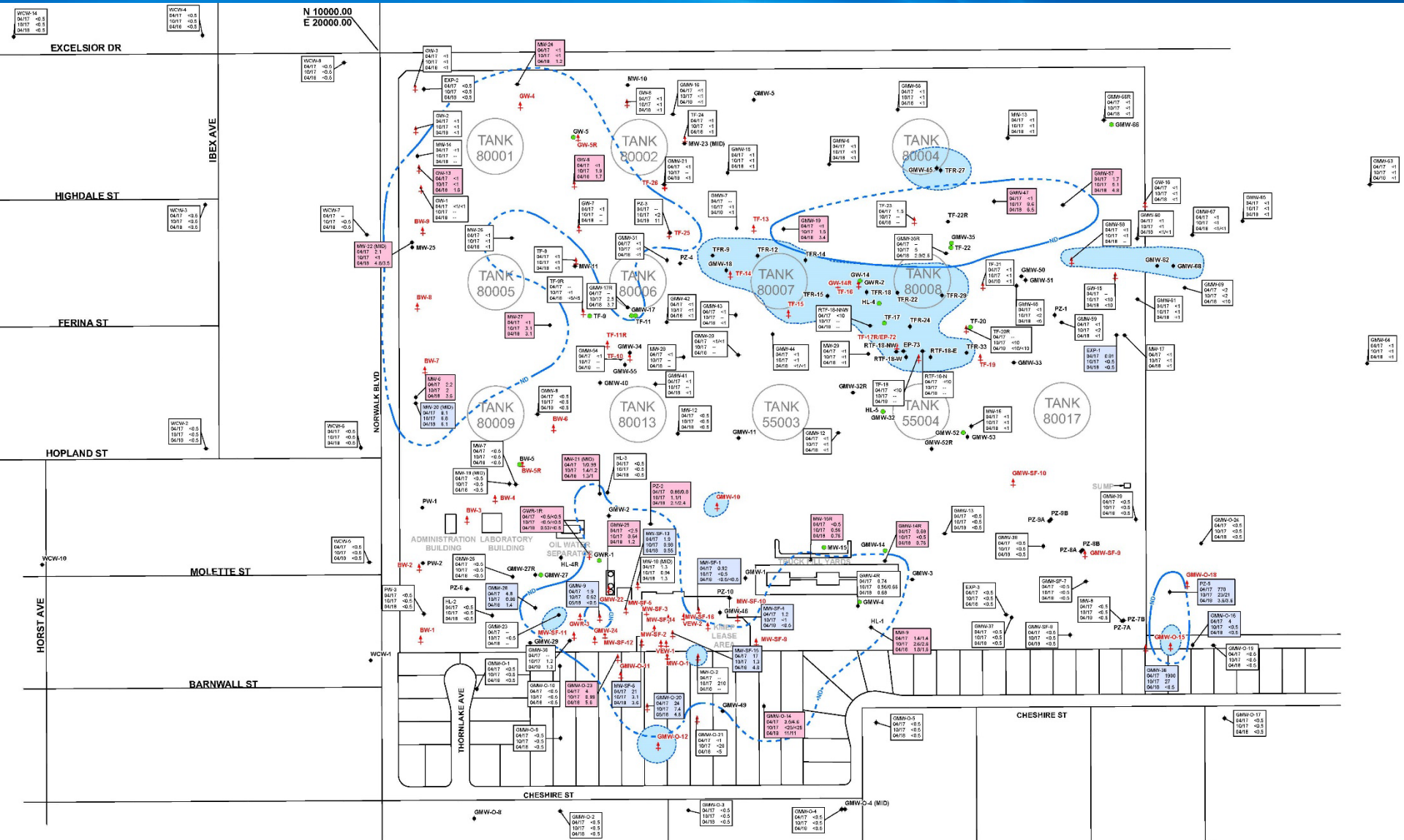
Benzene



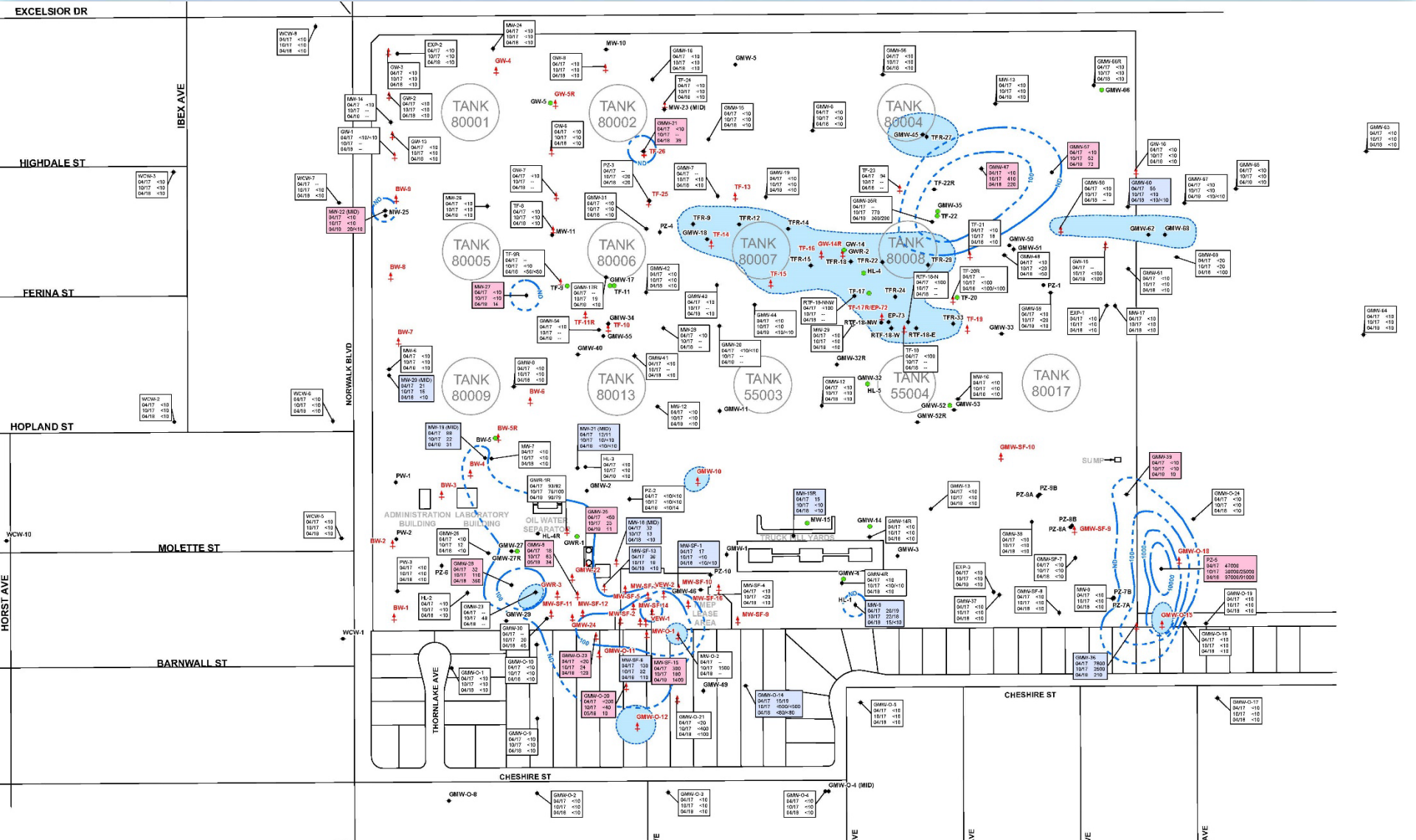
1,2-DCA



MTBE

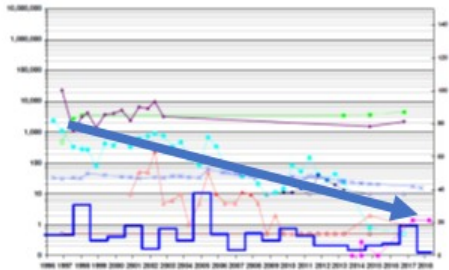


TBA

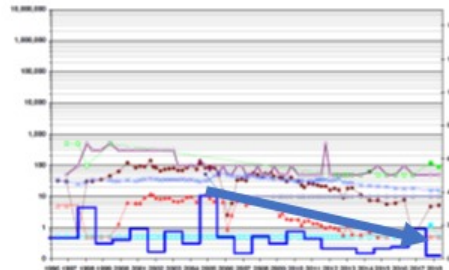


Time Series – Dissolved Benzene

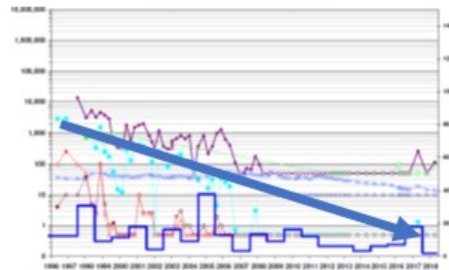
Tank Farm – GMW-45



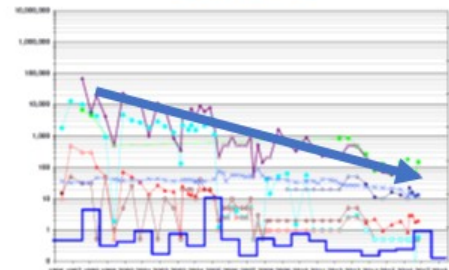
West – WCW-7



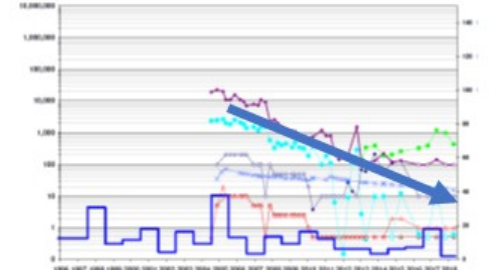
South Central – GMW-O-3



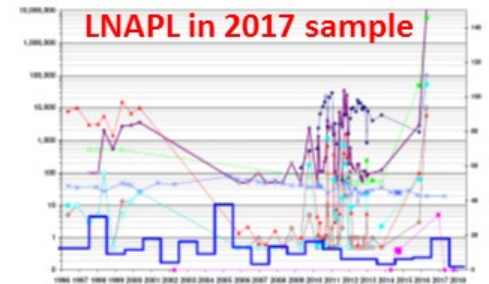
Truck Rack – GMW-1



Northeast – GMW-61



Southeast – GMW-O-18



Questions