

Norwalk Tank Farm Update

Presented to the Norwalk Tank Farm
Restoration Advisory Board
February 23, 2017

Excelsior Dr

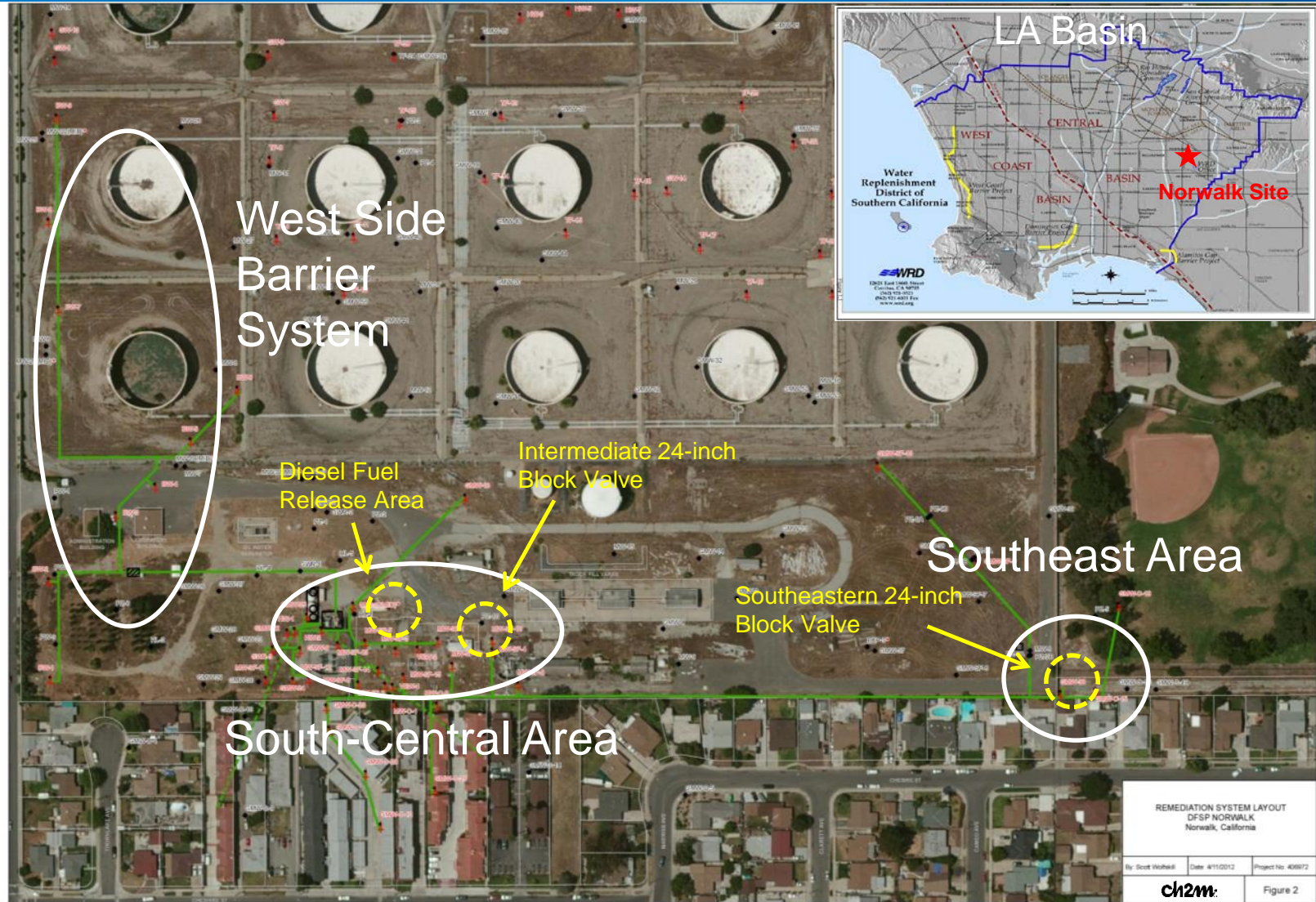


Agenda

- Kinder Morgan Update
 - Remediation Systems Operations Summary
 - Biosparge Pilot Testing Update
 - Planned Remediation Activities
 - SVE Demolition and New RTO Installation
 - Southeastern Area Biosparge Well
 - Pipeline Relocation Activities Update



Site Location and SFPP Remediation Areas



Remediation Systems Operations Summary

Remediation System Operations Summary

■ SVE and Biosparge Systems

– 3rd Quarter 2016

- Operated 87% of time (98% excluding planned shutdowns)

– 4th Quarter 2016

- Operated 27% of time (95% excluding planned shutdowns)
- Low uptime due to SVE demolition activities

■ TFE/GWE System

– 3rd Quarter 2016

- Operated 25% of time (100% excluding planned shutdowns)
- Low uptime due to installation of OWS/DAF system

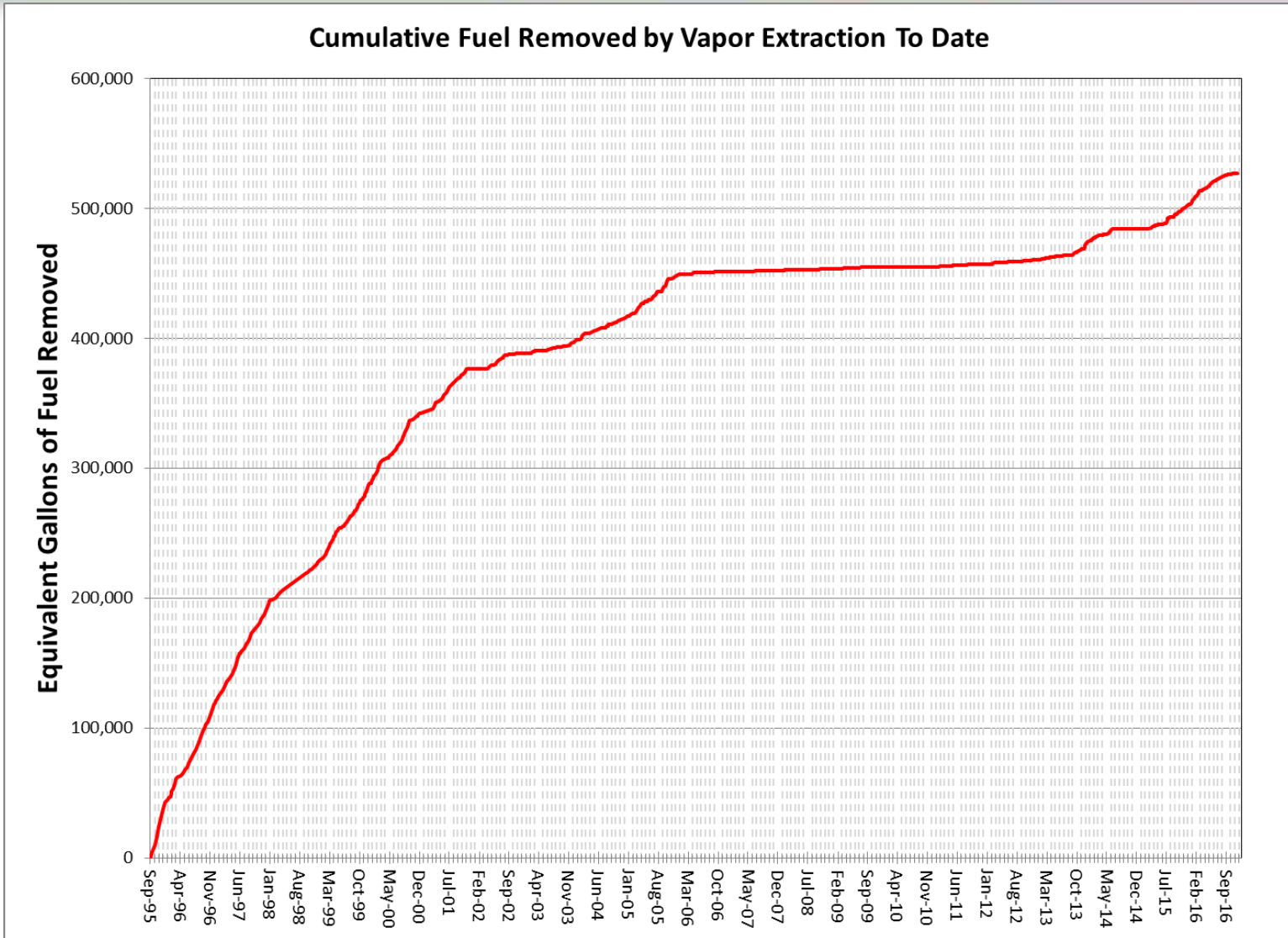
– 4th Quarter 2016

- Operated 57% of time (100% excluding planned shutdowns)
- Low uptime due to SVE demolition activities

SVE System Operations Summary

- Equivalent Fuel Treated - SVE
 - Based on weekly monitoring of influent vapor concentration, vapor extraction flow rate, and hours of operation.
 - Pounds / 6.6 lbs/gal = gallons
 - 3rd Quarter 2016 – 4,606 gallons (30,403 pounds)
 - 4th Quarter 2016 – 640 gallons (4,225 pounds)
 - Low mass removal due to downtime from SVE demolition
 - Since 1995 – Approx. 526,800 gallons (3.47 million pounds)

SVE System Operations Summary



TFE/GWE System Operations Summary

■ Groundwater Extracted

– 3rd Quarter 2016

- South-Central and Southeast Areas – 217,956 gallons
- West Side Barrier – none (shutdown in third quarter 2008)

– 4th Quarter 2016

- South-Central and Southeast Areas – 586,485 gallons
- West Side Barrier – none (shutdown in third quarter 2008)

– Since 1995

- South-Central and Southeast Areas – 71.7 million gallons
- West Side Barrier – 26.9 million gallons

TFE/GWE System Operations Summary

■ Equivalent Fuel Treated – TFE/GWE

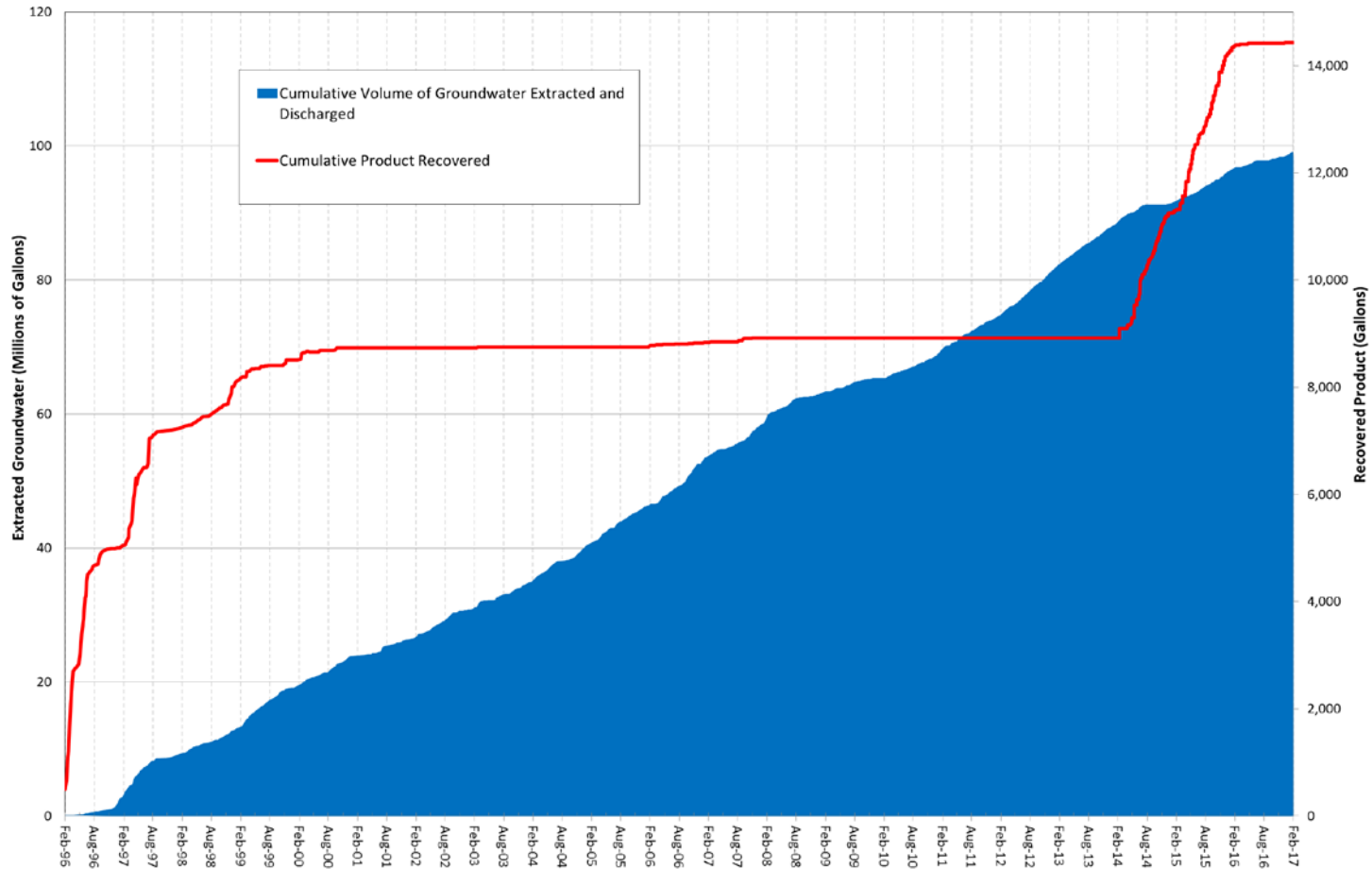
- Based on monthly monitoring of influent TPH concentration and volume of extracted groundwater.
- Pounds / 6.6 lbs/gal = gallons
- 3rd Quarter 2016 – 1 gallon (7 pounds)
- 4th Quarter 2016 – 7 gallons (44 pounds)
- Lower mass removal due to downtime from OWS system install and SVE demolition, and decreased TPH concentration in groundwater influent (due to biosparge activities)

TFE System Operations Summary

■ Free Product Extracted

- 3rd Quarter 2016
 - No free product observed to accumulate in the product holding tank
- 4th Quarter 2016
 - No free product observed to accumulate in the product holding tank
 - 4 gallons of product bailed from GMW-O-18
- Less product recovered due to decline in measurable product in extraction wells as a result of biosparge activities
- Since 1995 – 14,425 gallons product extracted

TFE/GWE System Operations Summary



Confirmation of Pipeline Integrity

- Because of the apparent increase in product thickness in GMW-O-18 (~5 feet) the following activities were performed to confirm that a new fuel release had not occurred:
 - Pressure testing of active pipelines
 - All pipelines passed the pressure tests (i.e., no pressure drop) and were put back online
 - Laboratory analysis of product sample
 - Similar to previous analytical from GMW-36
 - Bailed 4 gallons from GMW-O-18 and gauged nearby monitor wells for product
 - Product did not recover after 24 hrs; no product observed in PZ-5, GMW-O-16, and GMW-O-19
- Increase in measurable product a result of dropping water levels and TFE downtime in this well due to presence of a stuck pump



Biosparge Pilot Test Update

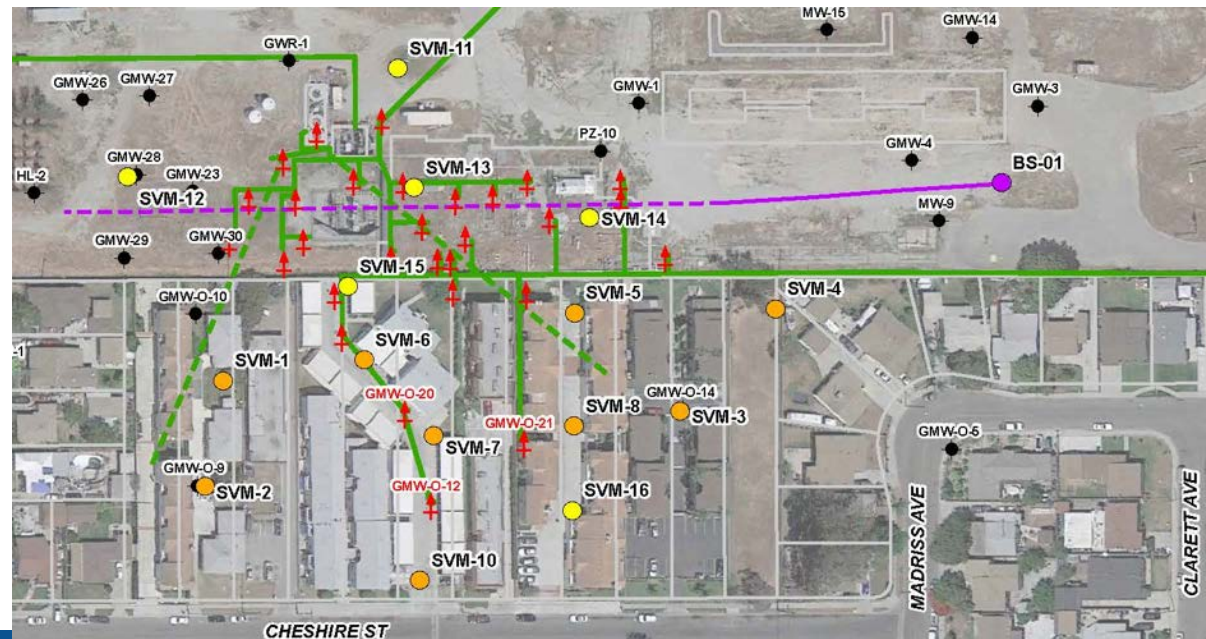
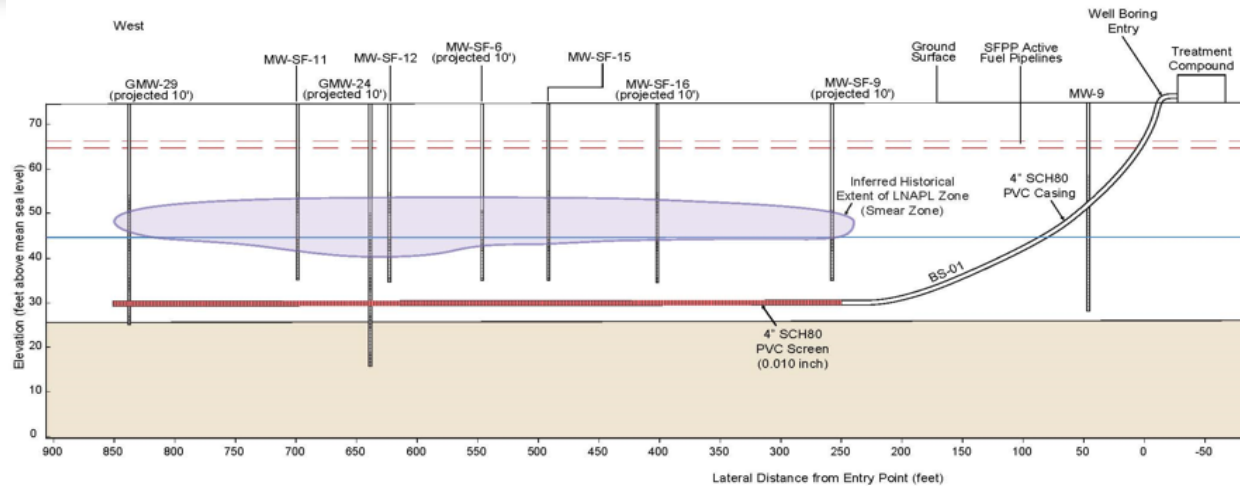
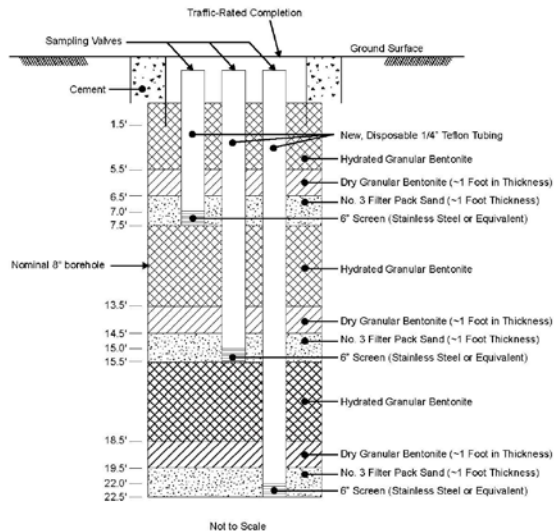
Horizontal Well and SVP Layout and Design

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
- 250 feet of riser casing; 600 feet of screen

Soil Vapor Monitoring Probe Network

- SVM-1 through SVM-16
- Double or Triple Nested (7, 15, 22 feet bgs)



Biosparge Compressor System



Air Compressor



Manifold



Digital Display



Compressed Air Tank

Kaiser 100 HP Rotary Screw Air Compressor (max rate of 494 scfm at 125 psi)

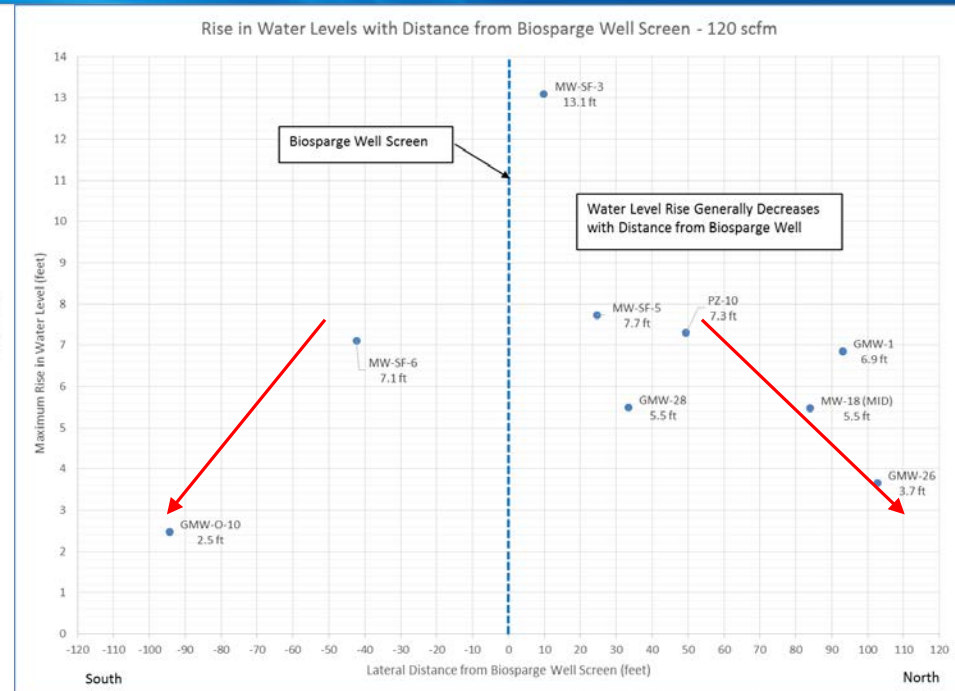
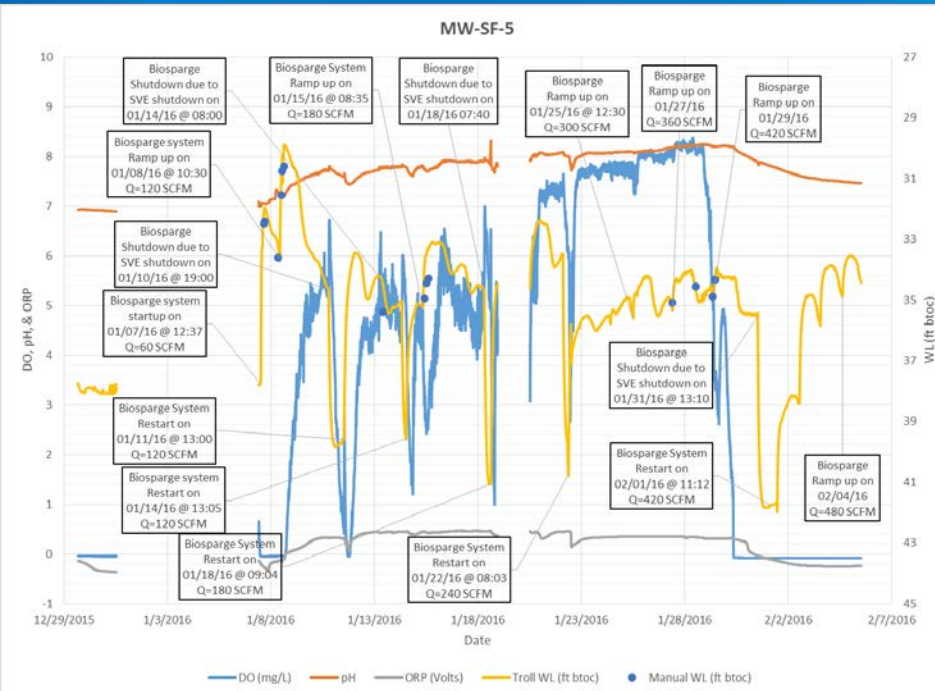


Enclosure (8 x 20')

Objectives and Approach

- Estimate Zone of Influence
 - In-Situ Trolls (DO and WLs)
 - SF6 Tracer Test
- Evaluate VI Risk in Offsite Area
 - Weekly/Monthly PID Monitoring
 - Monthly Mobile Laboratory Analysis
 - VOCs, TPH-gas, Fixed Gases
- Evaluate Effectiveness of Mass Removal
 - Routine Gauging Events
 - Routine Lab Analysis for TPH, VOCs

In-Situ Troll and Manual Water Level Data

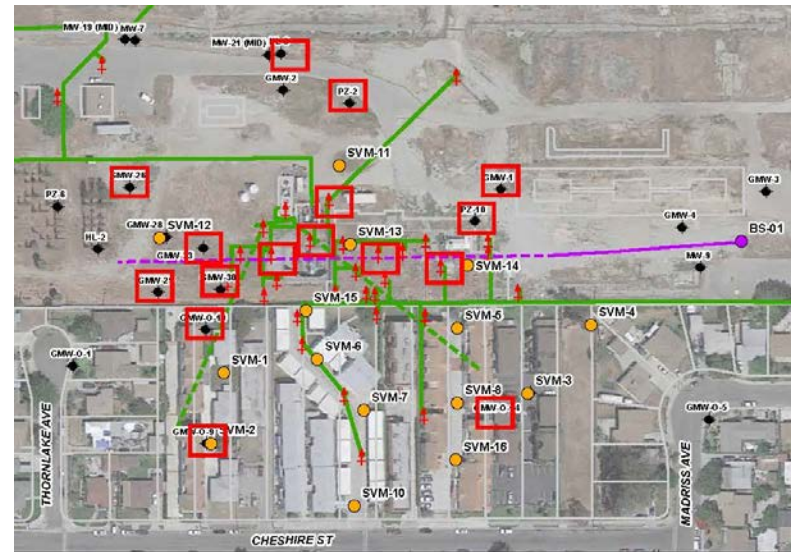


In-Situ Trolls installed in 6 wells

- Good WL data recovery
- Optical DO sensors unreliable

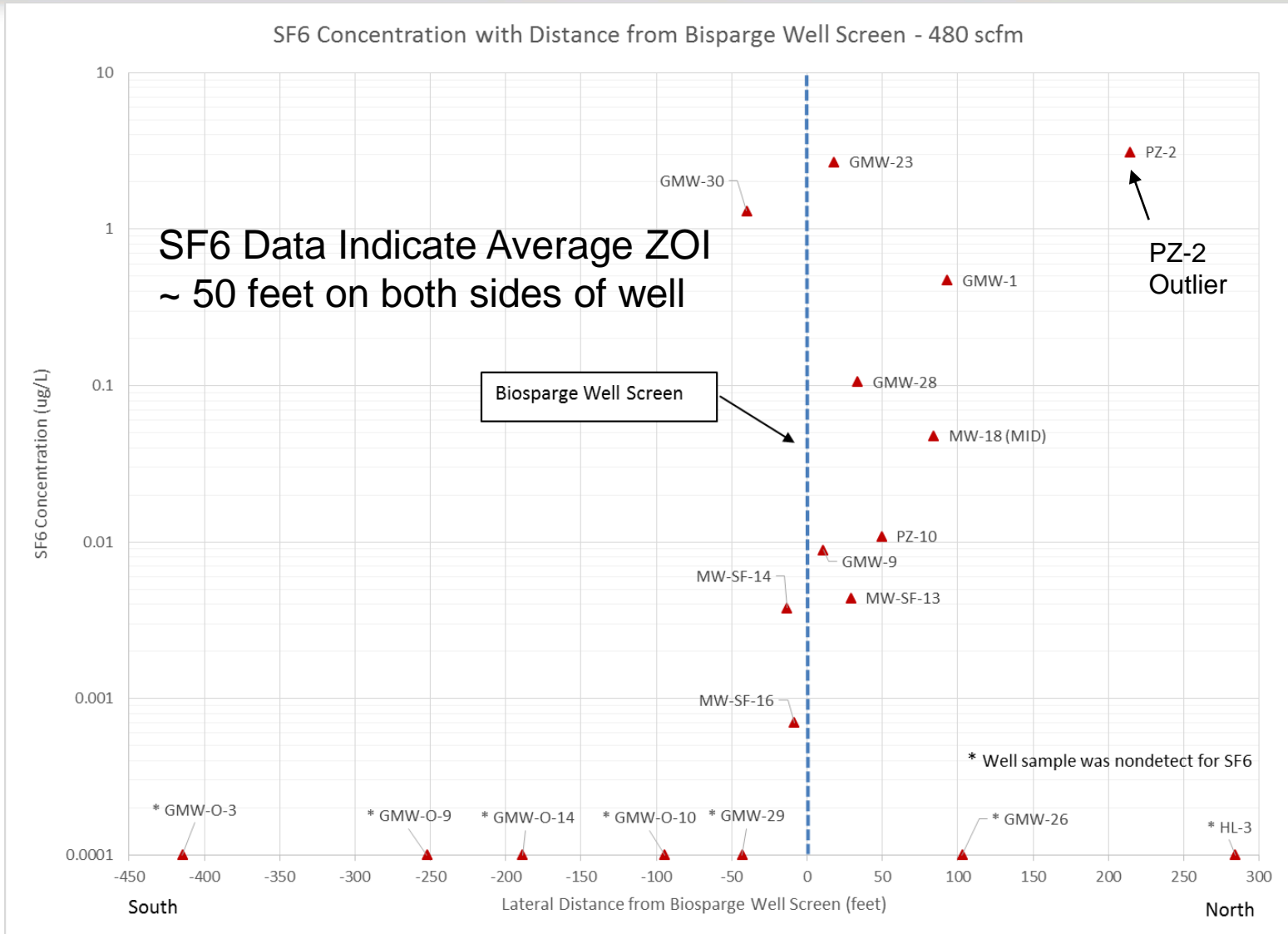
- Maximum WL rise of 13 feet occurred during 2nd day of ramp up at 120 scfm
- Maximum WL collapse of 4 feet after shutdowns
- WL rise generally declines with lateral distance from biosparge well

SF6 Tracer Test



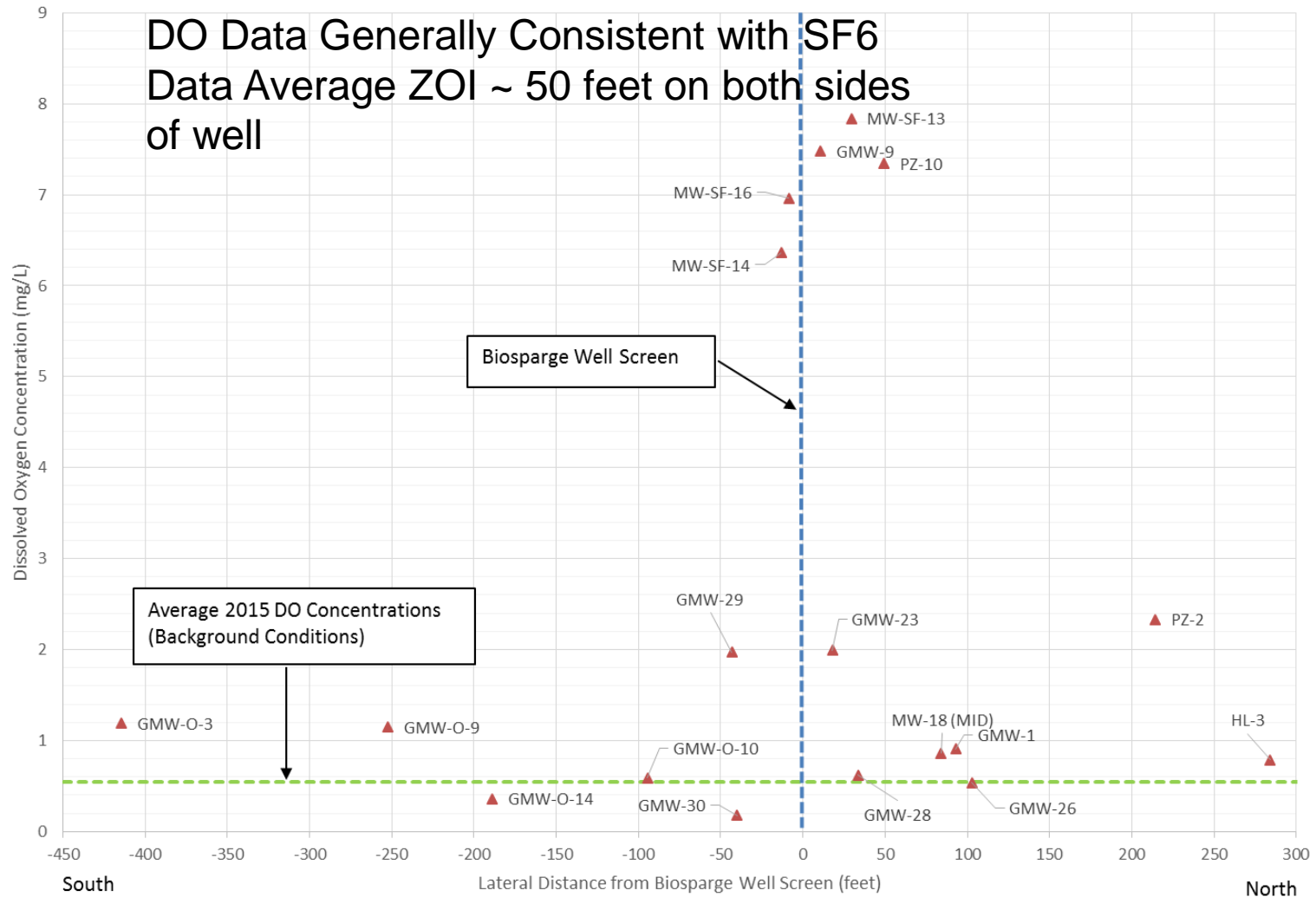
- Waited ~4 weeks after ramping up from 0.1 scfm to 0.8 scfm flow
- Inject SF6 gas in biosparge well for 8 to 12 hours
- Sample groundwater from select wells following day for SF6 analysis
- Collect dissolved oxygen and other field parameters during sampling
- Observe wells for “bubbling”

SF6 Tracer Results

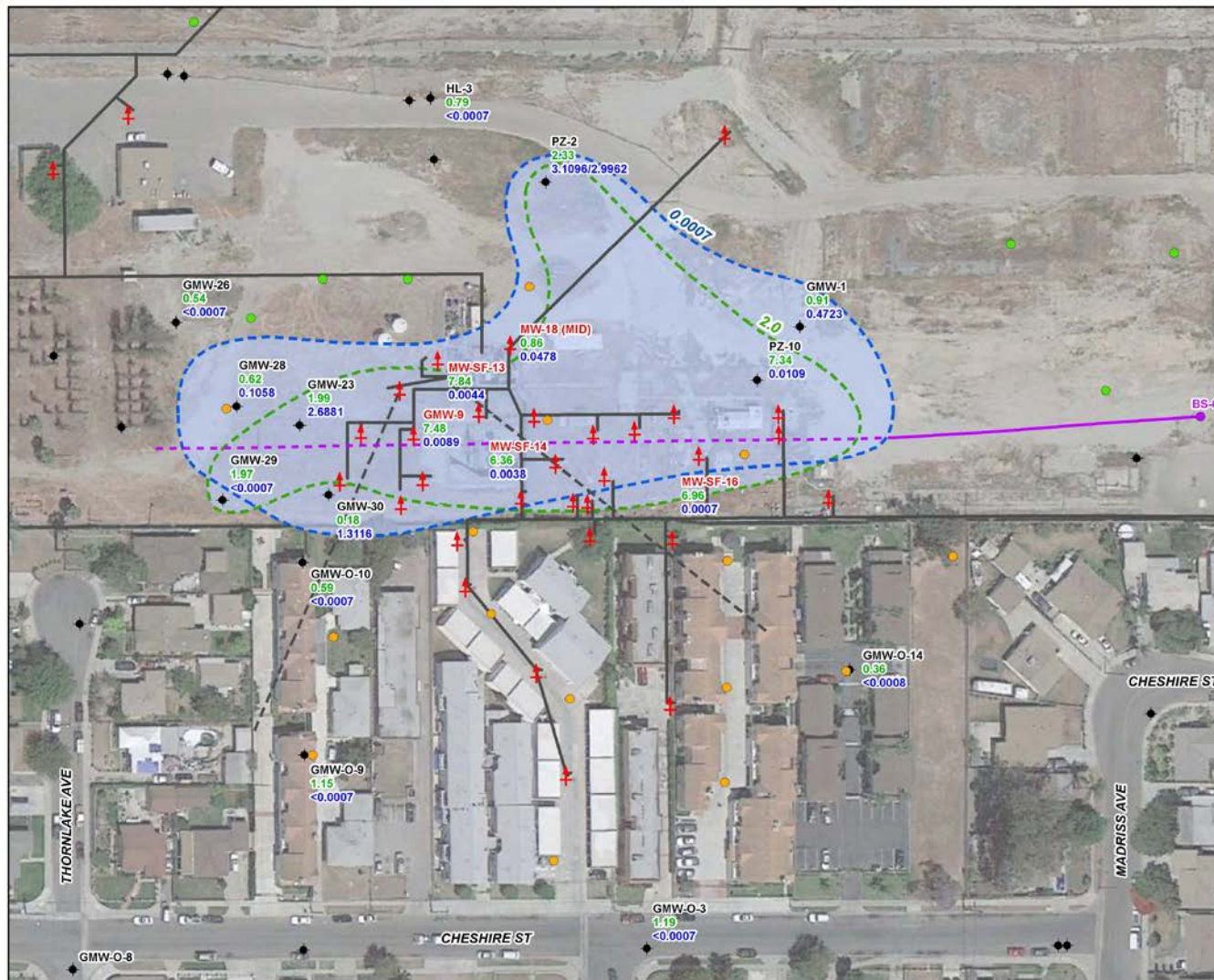


Field DO Results

DO Concentration with Distance from Biosparge Well Screen - 480 scfm



SF6 and Field DO Isoconcentrations



- Legend**
- Horizontal Biosparge Well Entry Point
 - Destroyed Well
 - Soil Vapor Monitoring Probes
 - Monitoring Well
 - ⊕ Remediation Well
 - Horizontal Biosparge Well (dashed line depicts approximate lateral extent of well screen)
 - KMEP Remediation Piping Layout (above ground and below ground)
 - Horizontal Vapor Extraction Well Piping
 - Dissolved Oxygen Isoconcentration (mg/L)
 - SF-6 Isoconcentration (µg/L)
 - Combined Extent of SF-6 and DO Concentrations

Well Data

GMW-1 - Well ID
 0.91 - DO Result (mg/L)
 0.4723 - SF-6 Result (µg/L)

Notes:

- SF-6 samples and DO data collected on February 17 and 18, 2016.
- SF-6 samples analyzed by CH2M Applied Sciences Laboratory.

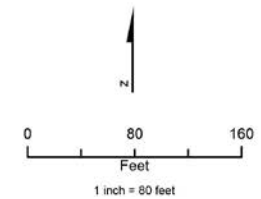
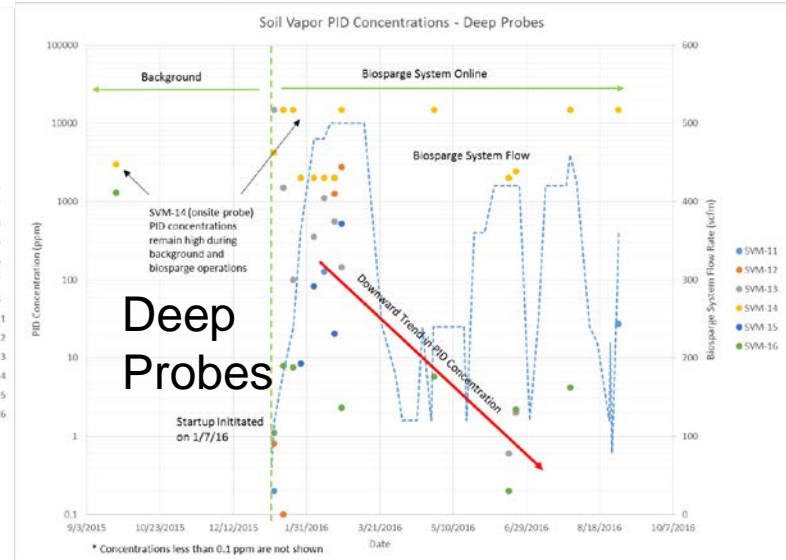
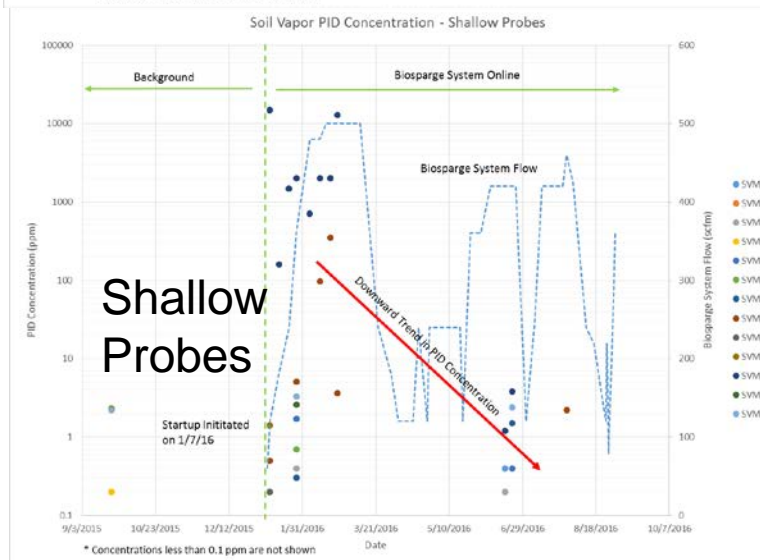
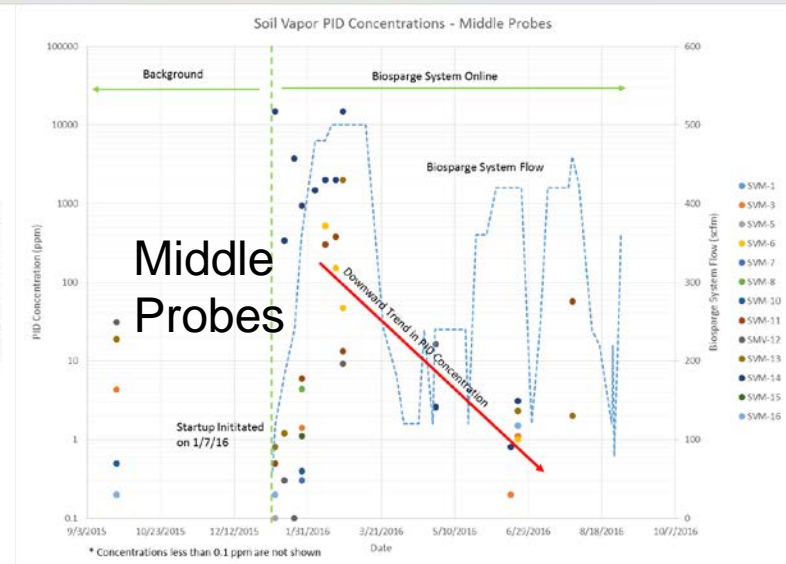
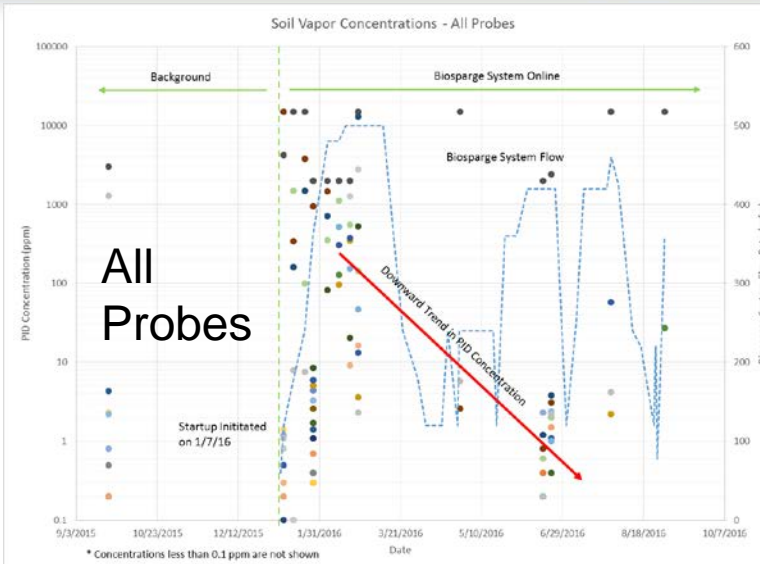


Figure 1
 Isoconcentrations of SF6 and DO in Groundwater
 SFPF Norwalk Pump Station
 Norwalk, California

Soil Vapor Monitoring Using Field PID

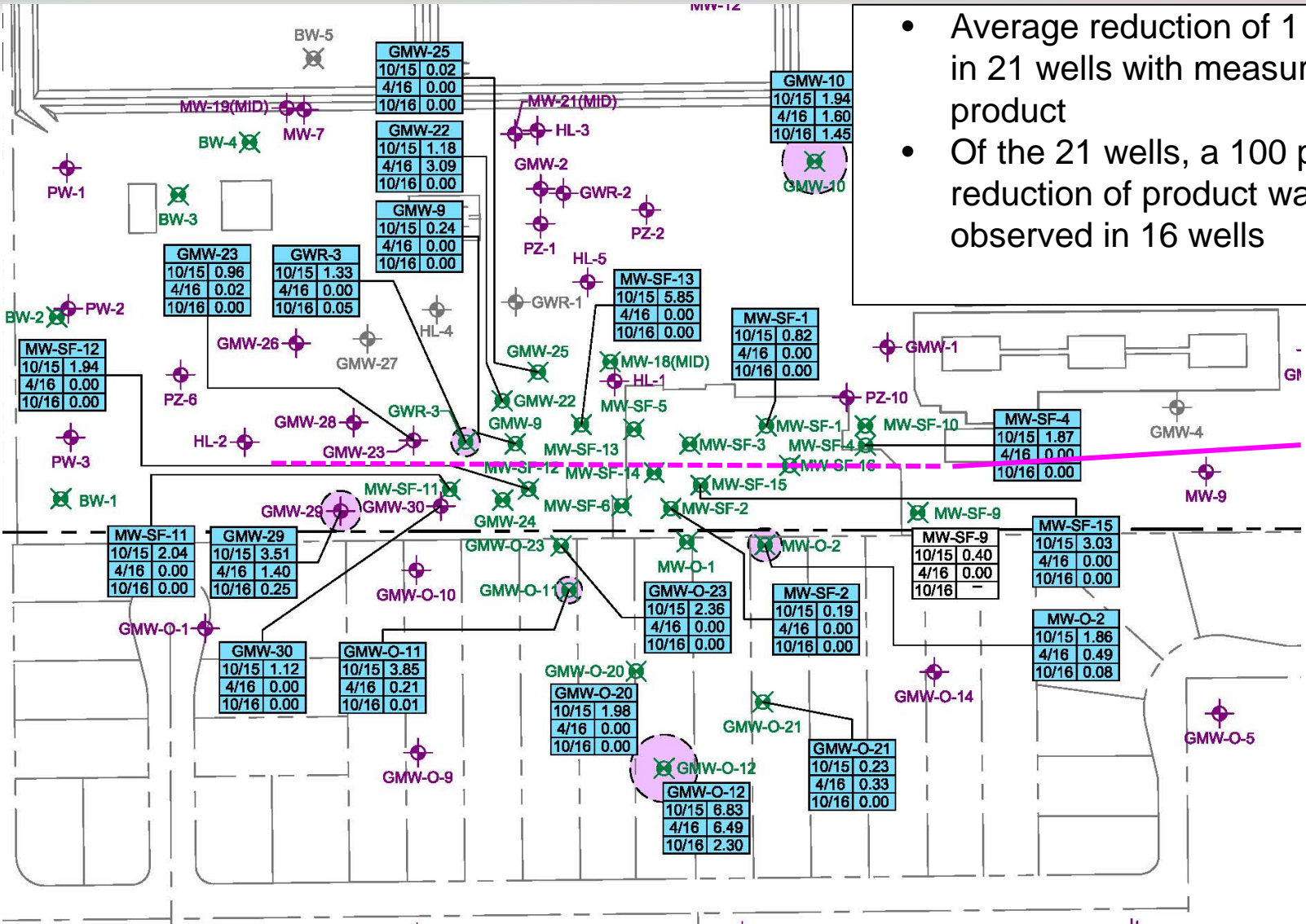


Soil Vapor Probe Mobile Laboratory Results

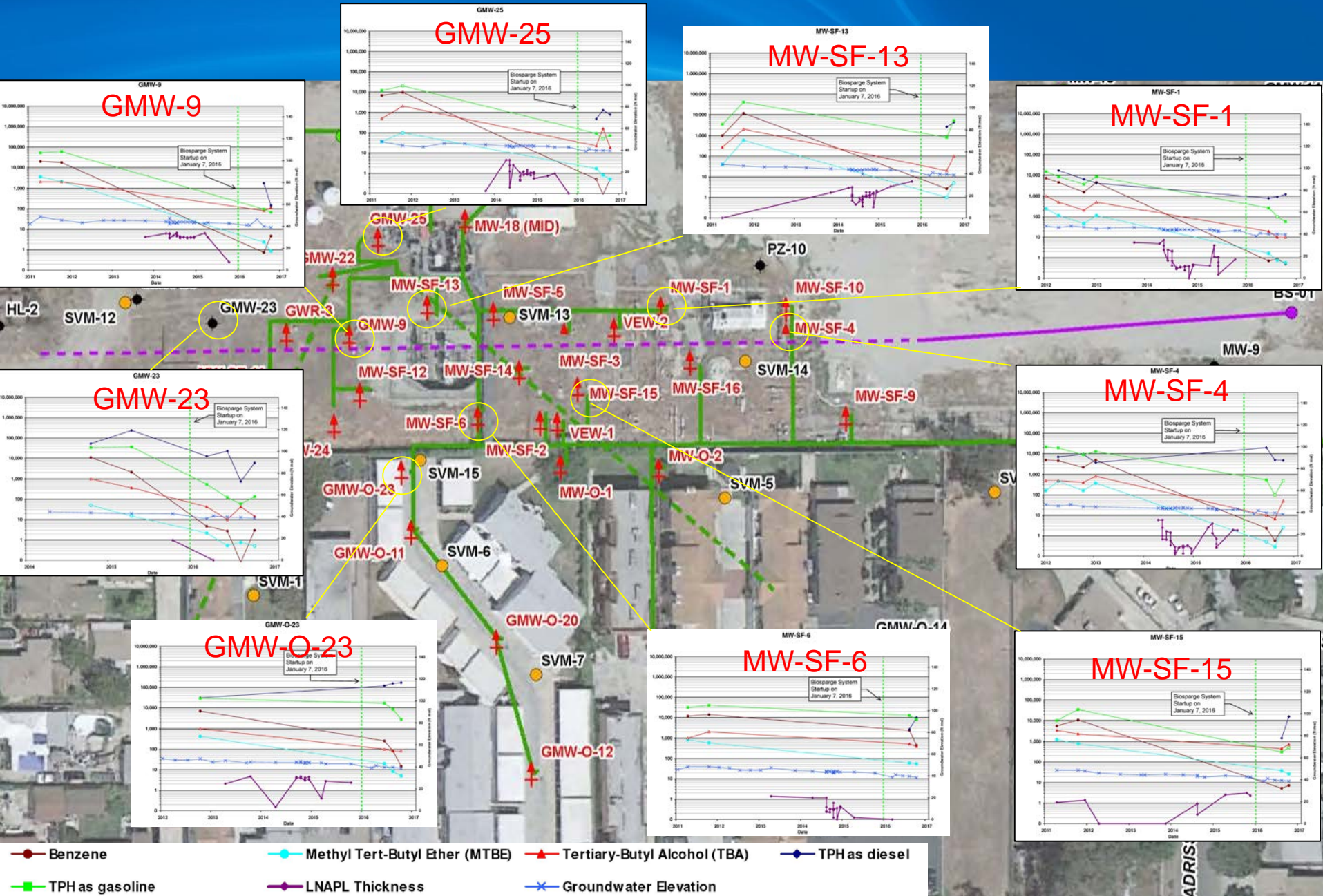
- Onsite and Offsite Probes Sampled in January, February, April, May, June, and August 2016 using Mobile Laboratory
 - Analyzed for VOCs, TPH-gas, and Fixed Gases
- Offsite Probes
 - RSLs in shallow (5 foot) and middle (15 foot) probes were not exceeded
 - RSLs exceeded in February at one location in the deepest (22 foot) probe depth; RSLs were not exceeded at this location subsequently
- Onsite Probes
 - In January/February, RSLs exceeded in three probes at one or more discrete depths
 - After February, VOCs and TPH-g nondetect in shallow and middle depths of all probes
 - RSLs continue to be exceeded in deepest (22 foot) depth of SVM-14
 - SVM-14 is located within ~10 lateral feet of well screen
 - Deepest probe is just above smear zone so high VOCs not unexpected

Reduction in Free Product

- Average reduction of 1 to 2 feet in 21 wells with measurable product
- Of the 21 wells, a 100 percent reduction of product was observed in 16 wells



Wells with Reduction in TPH and VOCs



Conclusions

- Tracer Testing
 - Data supports ZOI of ~50 feet on both sides of well
 - DO and SF6 reported in well PZ-2, located 200 feet away
- Soil Vapor Monitoring
 - Highest VOCs during first few months of operation
 - VI risk in shallow media highest in onsite area closest to the biosparge well screen
 - Offsite VI risk is minimal assuming continued operation of the SVE system
- Groundwater Monitoring
 - Average reduction in product thickness of 1 to 2 feet
 - 100 percent reduction in 16 of 21 wells monitored
 - Significant reduction in dissolved-phase hydrocarbons for wells primarily located within ~50 to 100 feet

Planned Remediation Activities

Old SVE Demolition



Old SVE Demolition



Old SVE Demolition



Old SVE Demolition



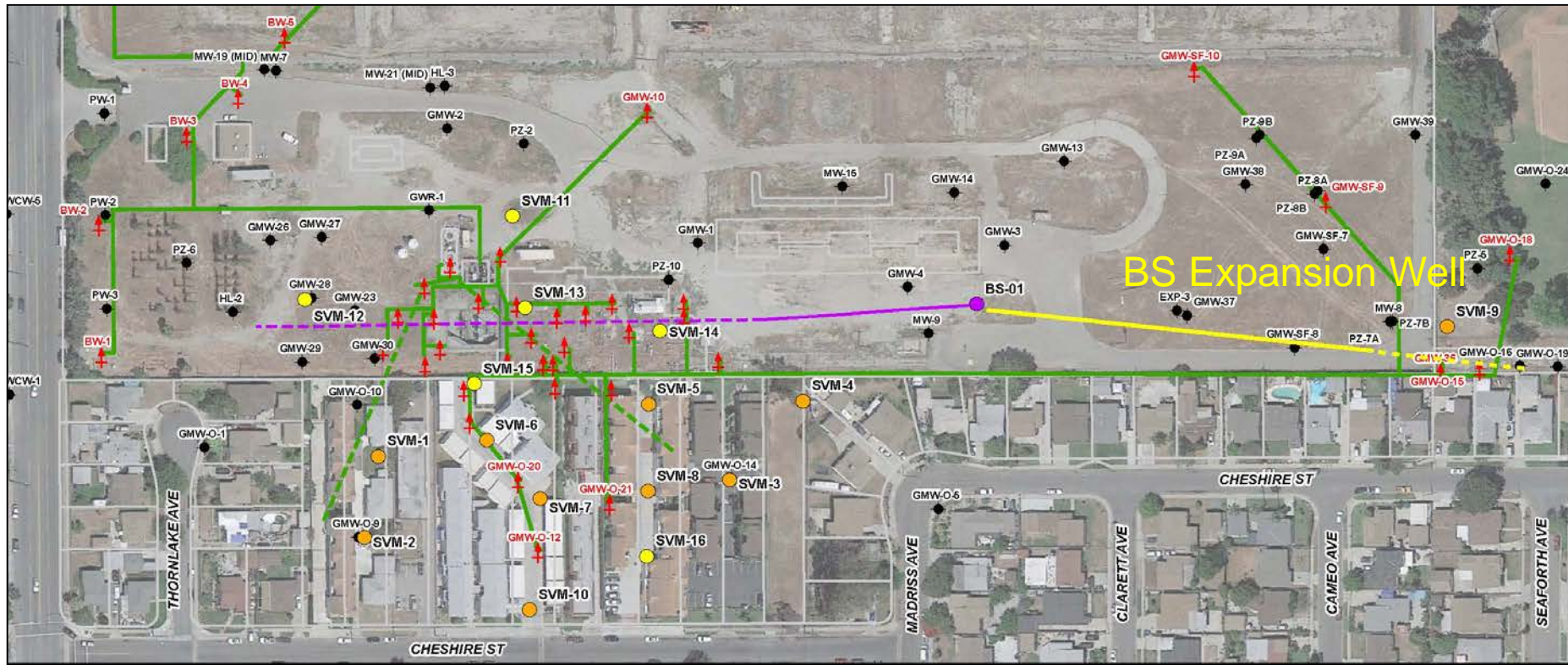
New RTO Unit



New RTO Unit



Biosparge Expansion Well



Biosparge Expansion Well in Southeastern Area (Q3 or Q4 2017)

- SCH 80 PVC 4-inch diameter well
- Screen depth of 45 feet bgs; open slot design (no sand pack required)
- 400 feet of riser casing; 200 feet of screen

Pipeline Relocation Activities

Pipeline Relocation – 8/15/16



Pipeline Relocation – 2/20/17



Questions

Backup Dissolved Phase Summary

TPH-g Reduction

Table 9
 TPH-g Reduction in Select South-central Area Wells
 SFPP Norwalk Pump
 Station
 Norwalk, California

Well	Type	Distance from BS Well Screen (feet)	Baseline		March-16		April-16		June-16		August-16		October-16	
			Date	TPH-g (mg/L)	TPH-g (mg/L)	Reduction (%)	TPH-g (mg/L)	Reduction (%)	TPH-g (mg/L)	Reduction (%)	TPH-g (mg/L)	Reduction (%)	TPH-g (mg/L)	Reduction (%)
MW-SF-4	SVE	8	01/15/13	13000	ns	---	ns	---	540	-96%	50	-100%	250	-98%
GMW-9	SVE/TFE	11	10/13/11	61000	ns	---	ns	---	ns	---	94	-100%	67	-100%
GMW-23	MW	18	04/23/15	37000	540	-99%	ns	---	120	-100%	59	-100%	130	-100%
MW-SF-15	SVE/TFE	25	10/14/11	35000	ns	---	ns	---	ns	---	300	-99%	250	-99%
MW-SF-1	SVE	26	01/15/13	8500	ns	---	ns	---	260	-97%	50	-99%	55	-99%
MW-SF-13	SVE/TFE	29	10/14/11	42000	ns	---	ns	---	ns	---	790	-98%	5300	-87%
GMW-28	MW	33	10/26/15	280	520	Increase	600	Increase	230	-18%	88	-69%	25	-91%
MW-SF-6	SVE/TFE	42	10/13/11	40000	ns	---	ns	---	ns	---	13000	-68%	8400	-79%
PZ-10	MW	49	10/26/15	340	ns	---	100	-71%	ns	---	ns	---	ns	---
GMW-O-23	SVE/TFE	76	10/19/12	29000	ns	---	ns	---	17000	-41%	8700	-70%	2800	-90%
GMW-1	MW	93	10/23/15	110	25	-77%	55	-50%	25	-77%	25	-77%	57	-48%
GMW-O-10	MW	94	10/26/15	160	91	-43%	910	Increase	87	-46%	25	-84%	25	-84%
GMW-O-20	SVE/TFE	185	10/19/12	36000	ns	---	ns	---	23000	-36%	13000	-64%	35000	-3%
GMW-O-14	MW	189	10/26/15	24000	21000	-13%	3200	-87%	13000	-46%	6000	-75%	30000	Increase
PZ-2	MW	214	10/27/15	210	1200	Increase	2300	Increase	790	Increase	590	Increase	410	Increase
Average TPH-g Reduction					---	-58%	---	-69%	---	-62%	---	-85%	---	-82%

Benzene Reduction

Table 11
Benzene Reduction in Select South-central Area Wells
SFPP Norwalk Pump
Station
Norwalk, California

Well	Type	Distance from BS Well Screen (feet)	Date	Baseline	March-16		April-16		June-16		August-16		October-16	
				Benzene (µg/L)	Benzene (µg/L)	Change (%)	Benzene (µg/L)	Change (%)	Benzene (µg/L)	Change (%)	Benzene (µg/L)	Change (%)	Benzene (µg/L)	Change (%)
MW-SF-4	SVE	8	01/15/13	5000	ns	---	ns	---	2.3	-100%	0.57	-100%	1.25	-100%
GMW-9	SVE/TFE	11	10/13/11	18000	ns	---	ns	---	ns	---	0.71	-100%	4.6	-100%
GMW-23	MW	18	04/23/15	2100	4.6	-100%	ns	---	2.7	-100%	0.08	-100%	2.9	-100%
MW-SF-15	SVE/TFE	25	10/14/11	11000	ns	---	ns	---	ns	---	5.2	-100%	7.1	-100%
MW-SF-1	SVE	26	01/15/13	4500	ns	---	ns	---	0.69	-100%	0.89	-100%	0.25	-100%
MW-SF-13	SVE/TFE	29	10/14/11	12000	ns	---	ns	---	ns	---	2.6	-100%	2.5	-100%
GMW-28	MW	33	10/26/15	3.3	230	Increase	370	Increase	3.5	Increase	0.43	-87%	0.25	-92%
MW-SF-6	SVE/TFE	42	10/13/11	14000	ns	---	ns	---	ns	---	2400	-83%	430	-97%
GMW-25	SVE/TFE	72	10/13/11	9700	ns	---	ns	---	0.25	-100%	0.09	-100%	0.25	-100%
GMW-O-23	SVE/TFE	76	10/19/12	7000	ns	---	ns	---	250	-96%	81	-99%	15	-100%
GMW-O-20	SVE/TFE	185	10/19/12	6100	ns	---	ns	---	6800	Increase	2600	-57%	2700	-56%
GMW-O-14	MW	189	10/26/15	12000	11000	Increase	1300	-89%	6300	-48%	3100	-74%	12000	0%
PZ-2	MW	214	10/27/15	1.2	150	Increase	110	Increase	77	Increase	62	Increase	3.5	Increase
Average Benzene Reduction					---	-100%	---	-89%	---	-91%	---	-92%	---	-87%