Meeting: Camp Stanley EPA Meeting

Date: November 3, 2015

Sign-In Sheet:

Name		Company & Phone Number	Signature
Last	First		
LYSSY	GREG	USEPA 2145434415	
Ulrich	Glenn	Parsons	
Schoepflin	Shannon	Parsons	
Pearson	Scott	PARSONS	
Lindley	Adrian	Parsons	
Rice	Ken	Parsons	
Kraintz	Felicia	CSSA	
Burdey	Julie	Parsons	
Salazar	Jorge	TCEQ	

MEETING MINUTES

OVERVIEW			
CLIENT	Camp Stanley Storage Activity		
PROJECT	Contract G012		
MEETING DESCRIPTION			
SUBJECT	Regulatory Meeting	**LOCATION**	CSSA
MEETING DATE	11/03/2015	**REPORT AUTHOR**	Shannon Schoepflin
MEETING TIME	8:30 am Central	**REPORT DATE**	11/04/2015

ATTENDEES		
CSSA	**Regulators**	**PARSONS**
Felicia Kraintz James Cannizzo	Greg Lyssy, USEPA Jorge Salazar, TCEQ	Julie Burdey Scott Pearson Ken Rice Shannon Schoepflin Glenn Ulrich Adrien Lindley

TOPICS

Slide presentation is attached. Topics discussed included: long-term monitoring optimization (LTMO), groundwater data quality objectives (DQOs), in-situ chemical oxidation (ISCO) at AOC-65, the bioreactor at SWMU B-3, and the status of Administrative Order documents.

LTMO and DQOs Discussion Items

- First 5-year review report will be due in July 2020. It should include data through 2019. The LTMO schedule will be aligned to collect final "five-year" results in December 2019 event.
- Include in LTMO and DQO reports a plan for notifying neighbors when removing them from sampling program. Letters should include graph showing their results over time.
- Also include a plan for keeping list of owners. Check landowner with county appraisal district on a regular basis (every three years, or every year, or…).
- Tighten down what "as needed" reasons would be for keeping a well on the sampling list; give bullet list examples.
- Send Greg a copy of metals results with summary so he can evaluate reducing metals. Greg wants to review dropping two VOCs; since there is no reduction in cost he isn't sure of the benefit in reducing. Our original reasoning was simplification and consistency with risk assessment results.
- After above comments have been incorporated into the LTMO and DQO documents, send to EPA and TCEQ officially for comment.
- Revise/reduce the colors in Table 5.2 and map figures in Section 5 of the LTMO report.
- If a well owner outside of the 1.5-mile radius of CSSA requests a sample, that sampling, if done, would not be part of the DQO program.

AOC-65 and SWMU B-3 Discussion Items

- Adrien Lindley presented results on previous ISCO injections and discussed upcoming injections and remediation objectives for AOC-65.
- Glenn Ulrich discussed possible passive methods for delivering permanganate in the future (such as permanganate wax). Mr. Lyssy is interested in learning more about the passive delivery methods.
- Ken Rice presented an update on the SWMU B-3 bioreactor including maintenance issues, groundwater contribution by well, and the status of the solar panel array.
- Our next meeting will be held in summer 2016. At that time we will discuss the results of recent ISCO injection/monitoring.

Administrative Order Closure Documents

The remaining documents in the Administrative Order discussed at the meeting include the: Corrective Measures Implementation Program Plan (CMIPP), Corrective Measures Design (CMD) Report, Construction Quality Assurance Program Plan (CQAPP), and the Corrective Measures Implementation (CMI) Report. A hard copy of the both CMIPP and the CMD Report will be submitted to Mr. Lyssy and TCEQ this week.

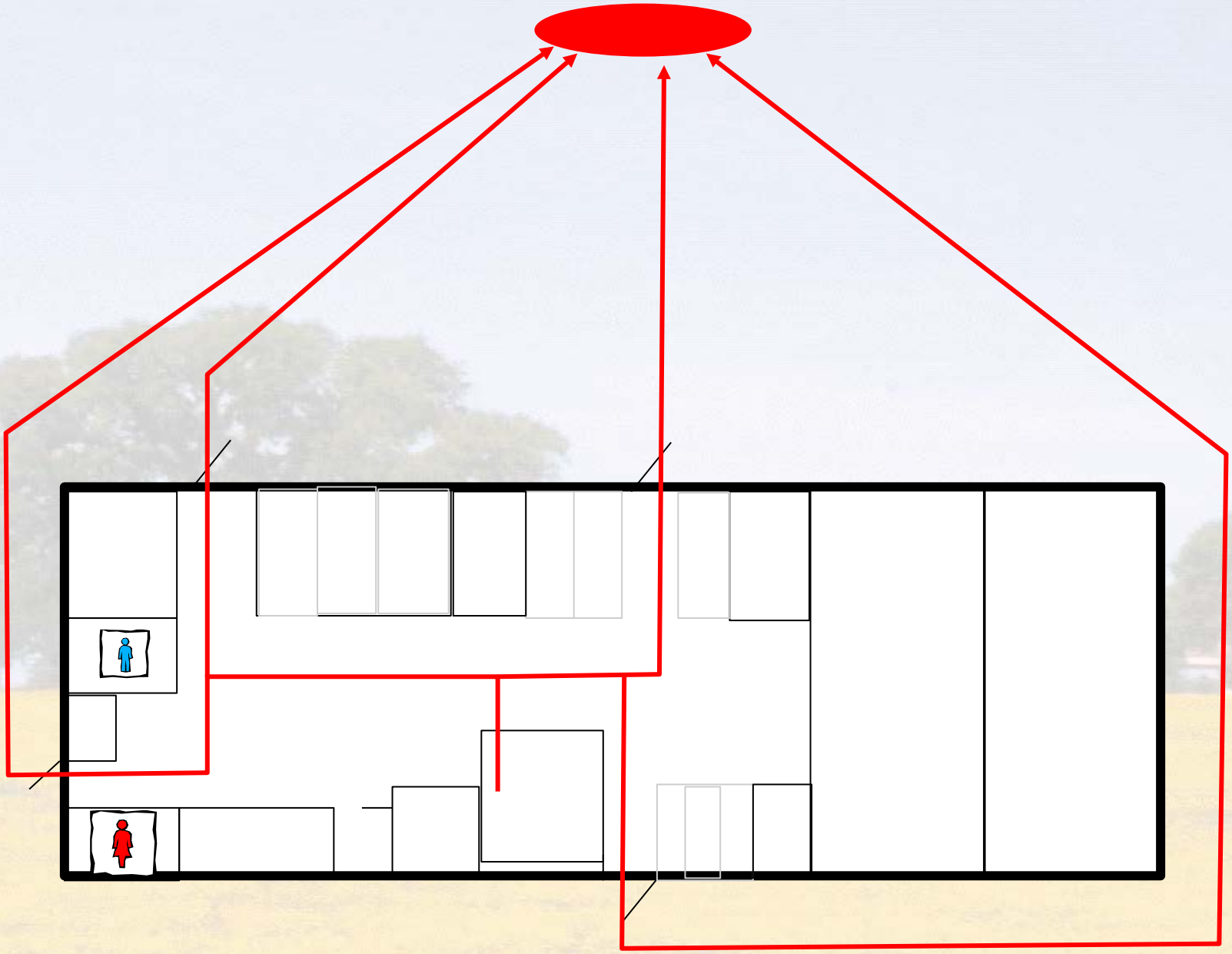
MINUTES DISTRIBUTION

Greg Lyssy, Jorge Salazar, Felicia Kraintz, Julie Burdey, Brenda Shirley

Camp Stanley Storage Activity Status Update

November 3, 2015

INTRODUCTIONS AND WELCOME



Emergency Evacuation & Restrooms

Agenda

Introduction

Groundwater Monitoring Program

- LTMO Update
- DQO Update

Corrective Measures Updates

- AOC-65 ISCO
- SWMU B-3 Bioreactor

Closure Path for EPA Order

Adjourn

Long-Term Monitoring Optimization (LTMO) Process Background

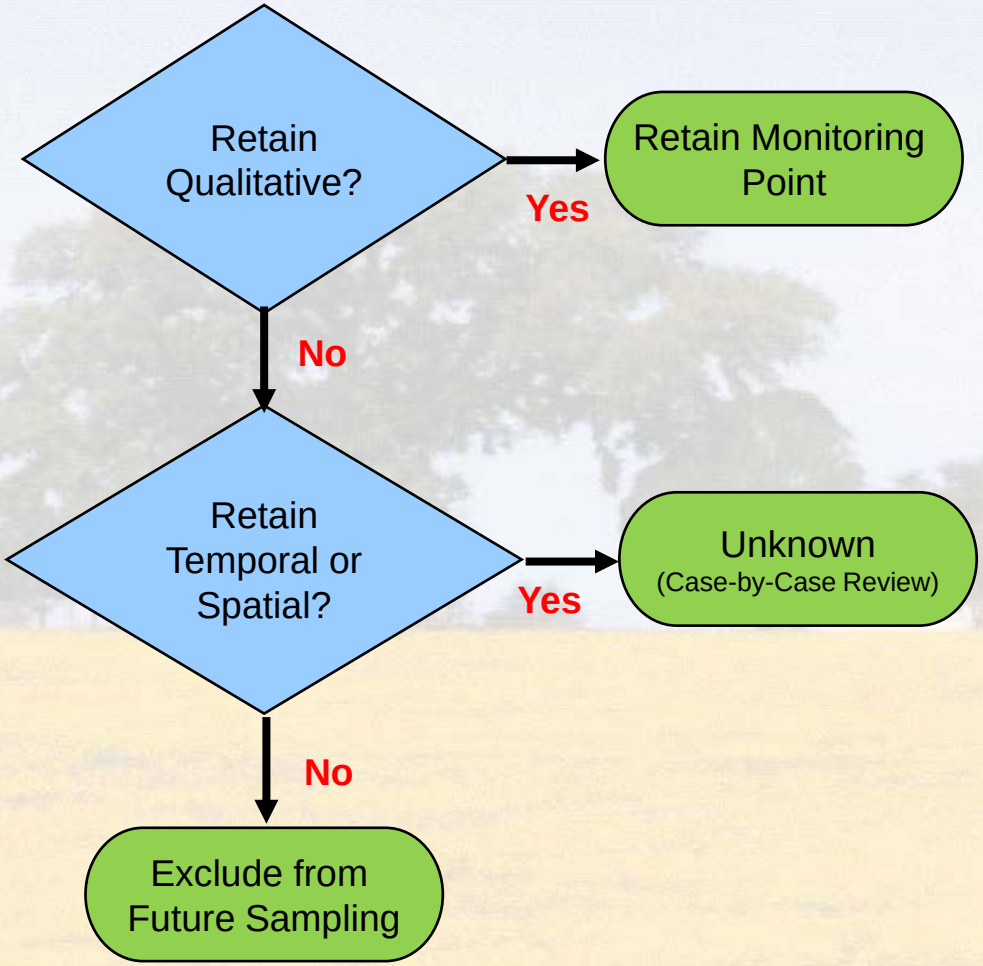
- The 3-Tiered Monitoring Optimization (3TMO) Approach included:
  1. A qualitative evaluation of the monitoring program
  2. A statistical evaluation of temporal trends in contaminant concentrations
  3. A qualitative analysis of the spatial importance of monitoring locations

- Initial Evaluation (2005)
  - Validated analytical data from 1992 through December 2004 were to perform a Three-Tiered LTMO evaluation.
  - 84 wells were recommended for less frequent sampling
  - Westbay wells: 528 to 88 sampling events per year (88% reduction)
  - Only on-post LTMO reductions were approved by USEPA and TCEQ

LTMO Process Background (continued)

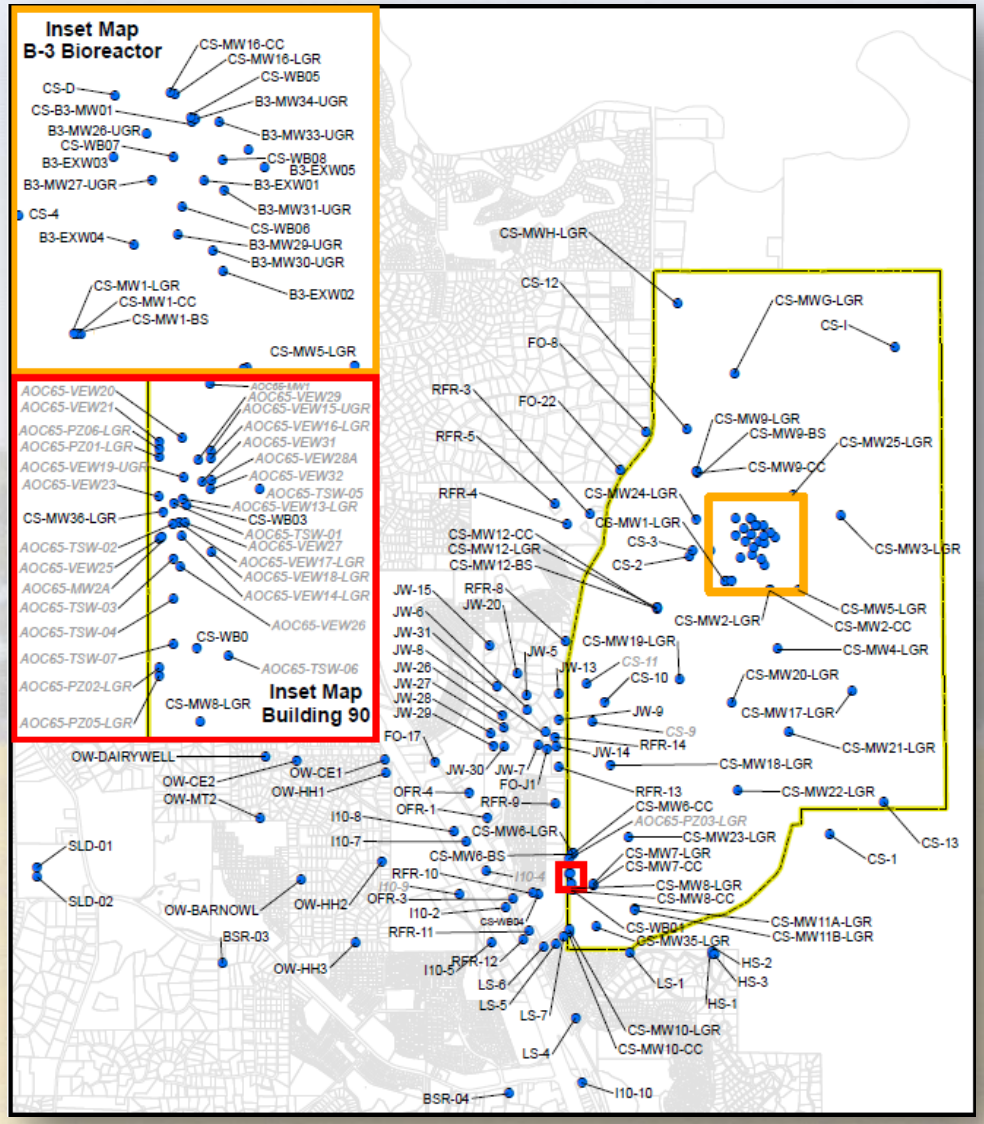
- LTMO Update (2010)
  - 209 to 152 (27% reduction) sampling events per year
    - On-Post: 100 to 76 events (24% reduction)
    - Off-Post: 109 to 76 events (30% reduction)
  - Westbay Wells: 85 to 69 sampling events per year (19% reduction)
  - All LTMO reductions approved by USEPA and TCEQ

3TMO Process



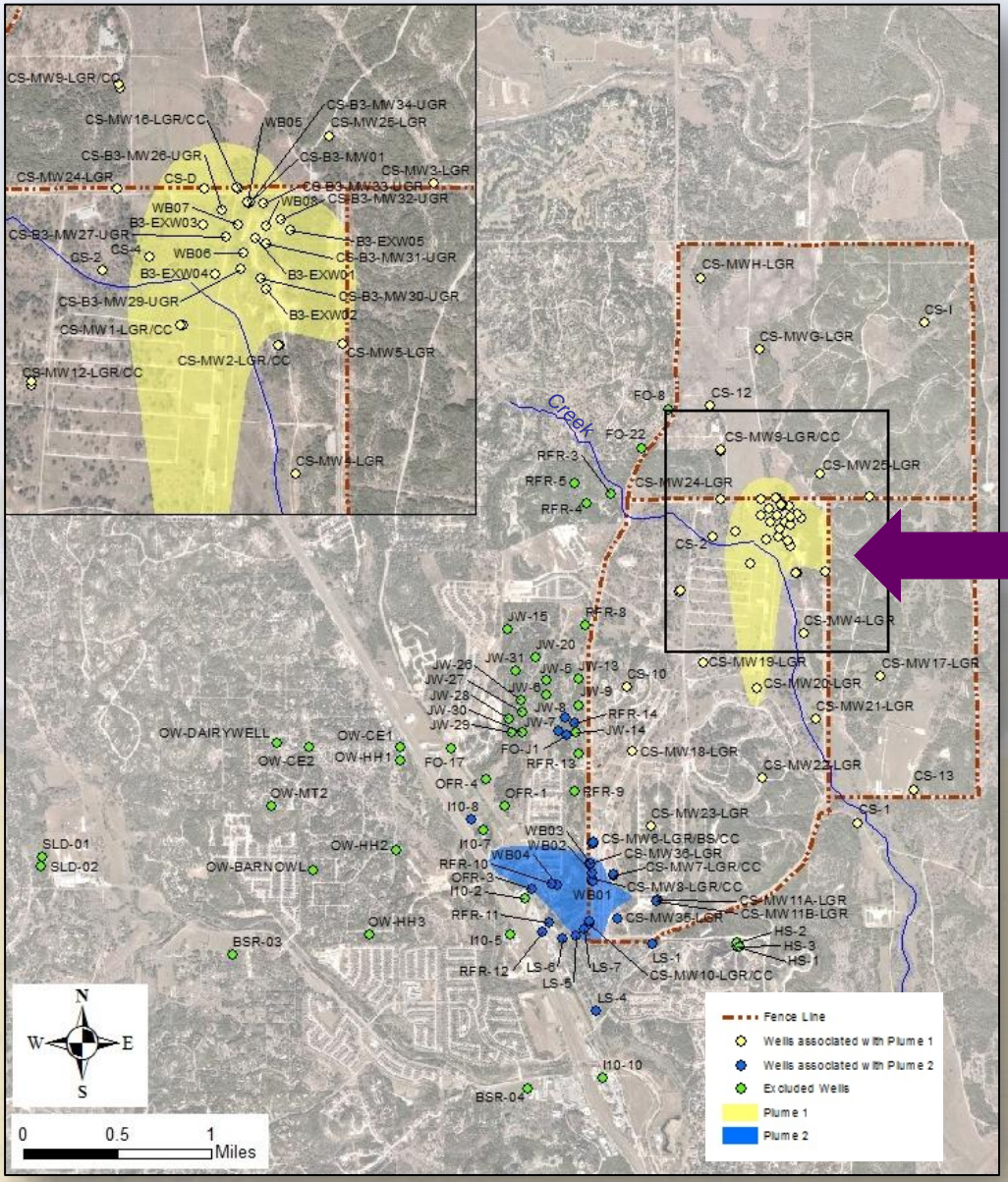
- Combine 3 Analyses to Determine Final Distribution and Frequency Recommendation
- Qualitatively Verified & Quantitatively Refined

2015 LTM Program Evaluation



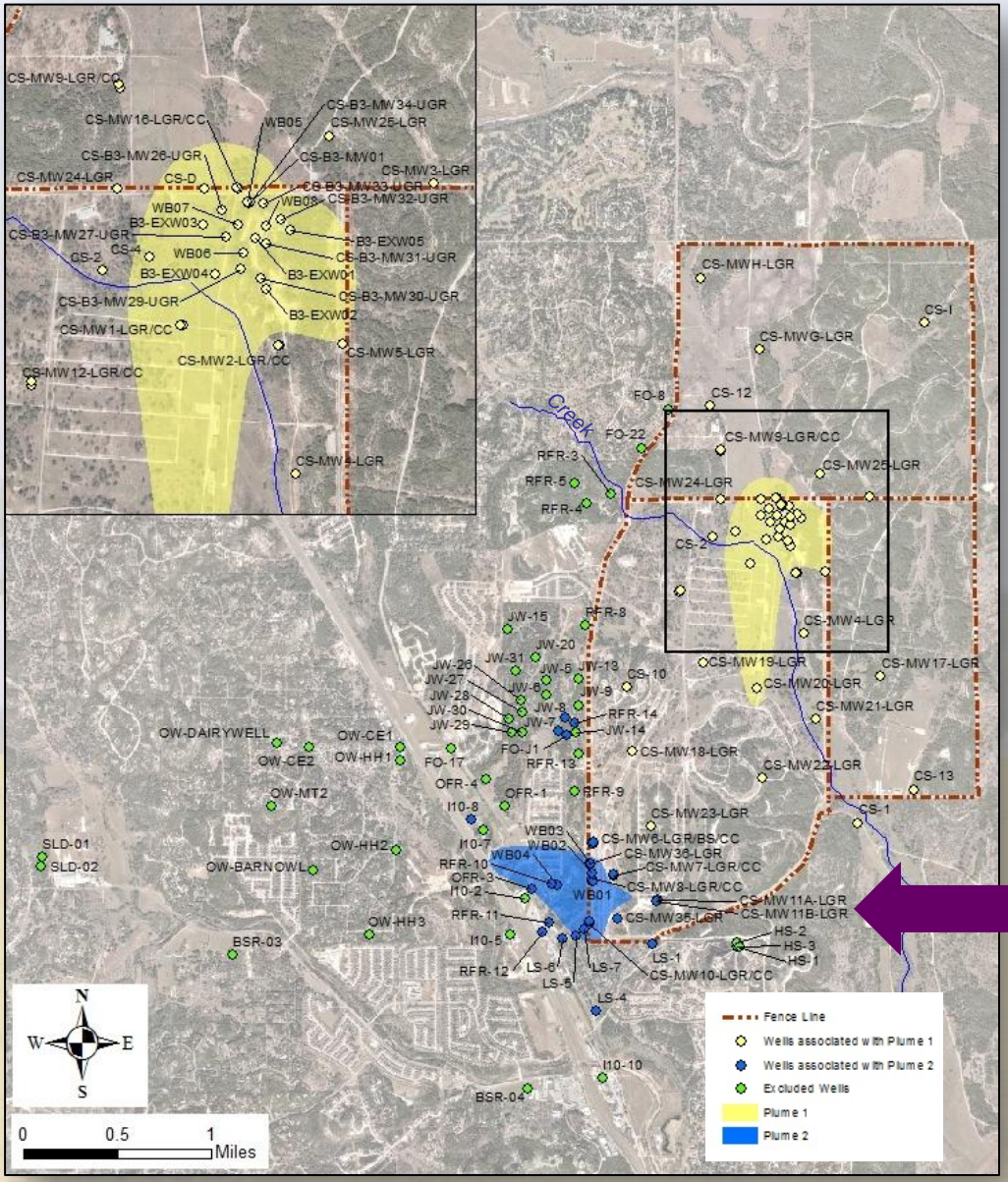
- 196 current sampling locations evaluated:
  - 64 On-Post Wells
  - 59 Off-Post Wells
  - 73 distinct sampling intervals in 8 Westbay Wells
- Monitoring network was “split” between Plume 1 and Plume 2:
  - Different source areas
  - Different sampling frequencies based on different remedial strategies and objectives
  - Plume 1 is only within CSSA; Plume 2 affects private wells
  - Incorporate bioreactor and ISCO monitoring into the LTM program

Plume 1 LTMO Evaluation Summary



- Introduces a 15/30-month schedule for most on-post MWs
- Incorporates bioreactor monitoring with LTMO on a 9-month schedule
- Reduction in sampling of 43%
- 73 monitoring locations versus current 77, excluding
  - MW-28 (consistently dry)
  - MW1-BS, MW9-BS, and MW12-BS (screened in the Bexar Shale)
- 400 well sampling events over a 5-year period vs current 696

Plume 2 LTMO Evaluation Summary



- Introduces a 15/30-month schedule for on/off-post wells
- Maintains quarterly schedule for select on/off-post wells based on DQOs
- Reduction in sampling of 54%
- 73 monitoring locations versus current 117, excluding
  - MW6-BS (screened in the Bexar Shale)
  - 43 off-post wells due to ND history, distance from plume, plugging, and/or redundancy
- 352 well sampling events over a 5-year period vs current 772

LTMO Recommendations

	Plume 1 Sampling Events Over 5-Year Period		Plume 2 Sampling Events Over 5-Year Period	
Frequency	**Current Program**	**Optimized Program**	**Current Program**	**Optimized Program**
Every 30 months	0	40	0	36
Every 18 months	21	0	42	0
Every 15 months	0	28	0	196
Every 9 months	84	252	558	0
As needed	As needed	0	0	0
Quarterly (every 3 months)	80	80	120	120
Semi-annual (every 6 months)	420	0	0	0
Semi-annual + snapshot	91	0	52	0
Total	**696**	**400**	**772**	**352**
Reduction over 5 Years:		**43%**		**54%**

- These reductions in sampling frequency will continue to achieve monitoring objectives, and be protective of human health and the environment.
- Both Plumes 1 and 2 have been intensely monitored for many years, and the conceptual site models are well-defined.
- Human health risks in the area are low. Off-post wells with concentrations > 90% of the MCL are equipped with GAC.
- Most temporal trends for PCE are not increasing, indicating that the plumes are primarily stable or diminishing.

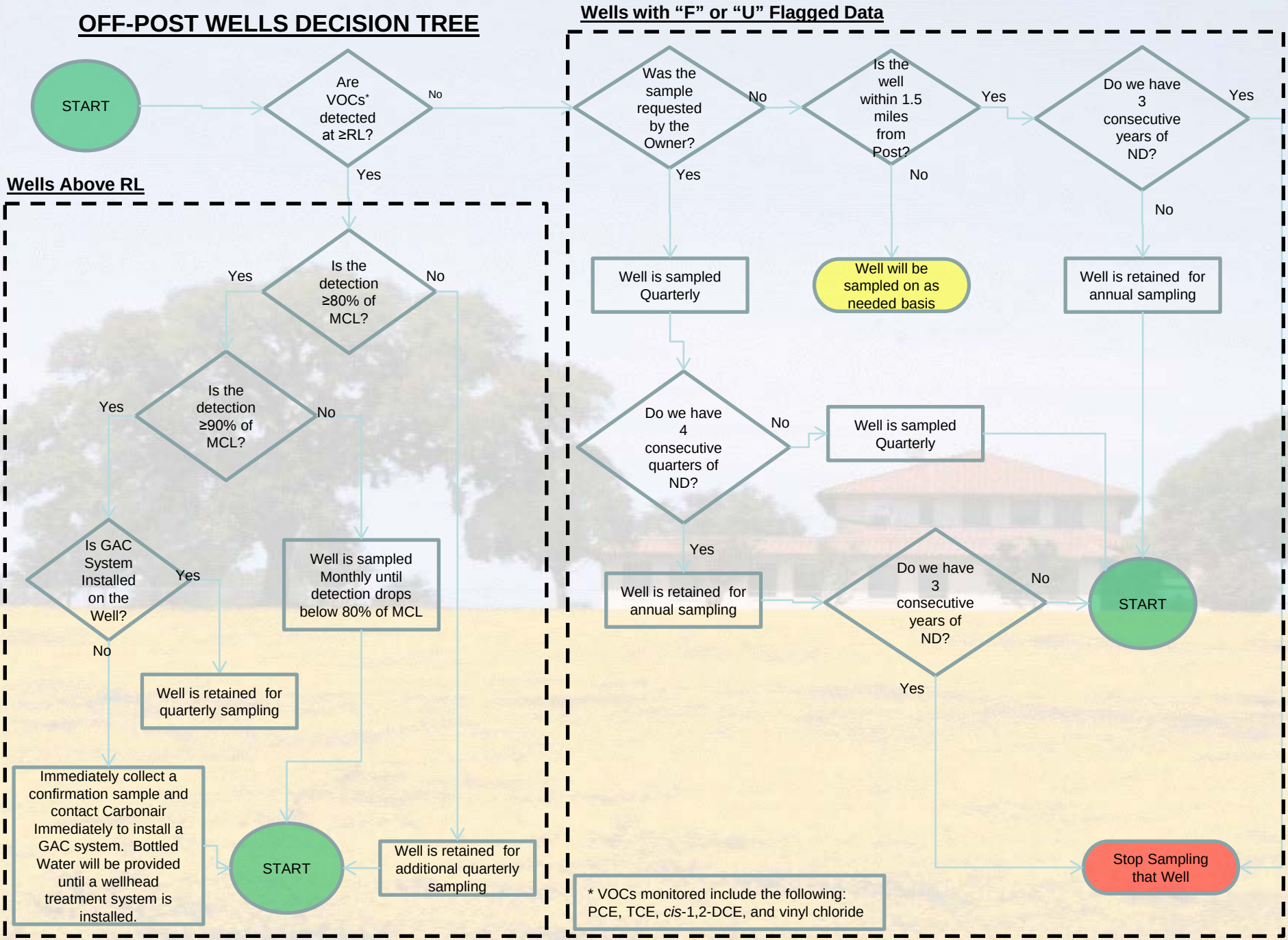
LTMO Recommendations
Sampling Scheme over Five-Year Period

	5-Year Calendar	Year 1				Year 2				Year 3				Year 4				Year 5			
	Sampling Month	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
Plume 1	Every 30 months										20										20
	Every 15 months					7					7					7					7
	Every 9 months (Bioreactor)			42			42			42			42			42			42		
	Quarterly (PWS Wells)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Plume 2	Every 30 months										18										18
	Every 15 months					49					49					49					49
	Every 9 months (DQO Elimination)			43			43			43			43			?			?		
	Quarterly (GAC Wells)	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
	Total Groundwater Samples Collected	10	10	95	10	66	95	10	10	95	104	10	95	10	10	108	10	10	52	10	104

2015 Groundwater DQO Update

- Previously, there was no pathway for a well to be dropped from the sampling program beyond an “as needed” basis.
- New off-post decision tree provides for a monitoring point to be dropped from the program if it is greater than 1.5 miles from the CSSA boundary, or has 3 years of ND results.

OFF-POST WELLS DECISION TREE



2015 Groundwater DQO Update

- Reduce on/off-post short-list VOCs from **six** compounds to **four** (drop 1,1-DCE/*trans*-1,2-DCE and retain PCE/TCE/VC/*cis*-1,2-DCE), in accordance with baseline risk assessment COCs.
- Reduce on-post metals from **four** to **two** (drop cadmium/chromium and retain lead/mercury), in accordance with baseline risk assessment COCs.
- Reduce drinking water wells to on-post short list of **four** VOCs, and lead and mercury only.
- New DQOs will adopt the revised LTMO schedule upon approval.

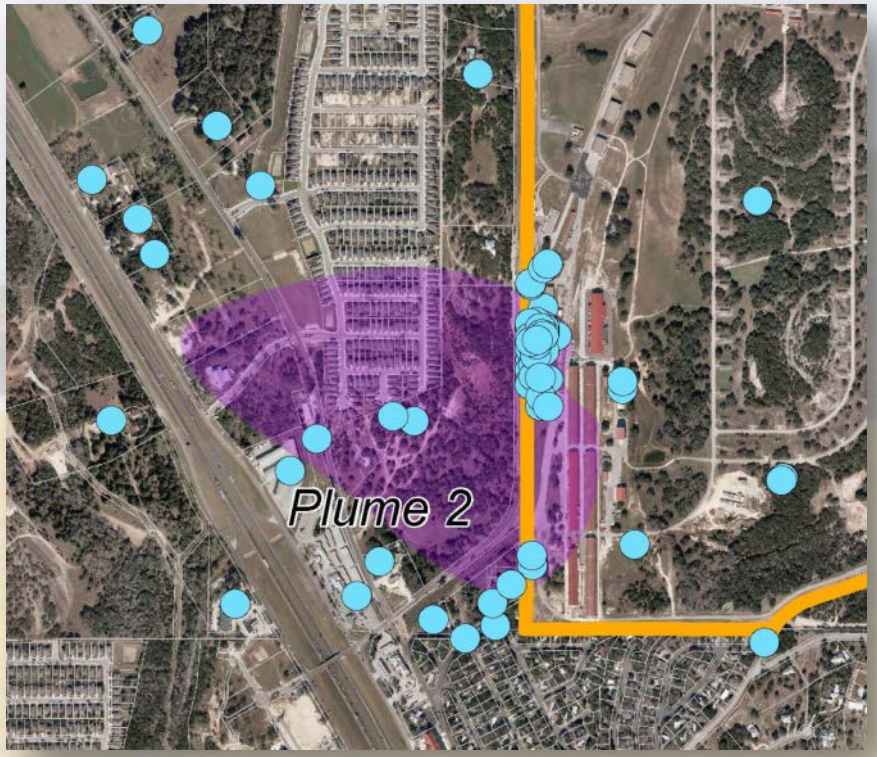
SUMMARY

- Advance copies of the updated DQO and LTMO recommendations for on- and off-post were submitted to EPA in October 2015.
- CSSA would like to implement LTMO recommendations in the March 2016 sampling event.
- Comments/Discussion?

CORRECTIVE MEASURES UPDATES: AOC-65

Background

- Very high (NAPL) concentrations in shallow subsurface (UGR)
- Dissolved phase in deeper LGR
- Fractured bedrock
- Variable groundwater depth
- May be multiple “hot spots” of PCE



Previous efforts

Source Removal Action (2002)

- Excavation of shallow soils along drainage ditch and road

SVE System (2002-2012)

- Initially effective but soon reached equilibrium and diminishing returns
- Optimized several times by adding or removing VEWs, blowers, steam enhanced extraction

Interim Removal Action (2012)

- Removed 100 cy of material to create a 320-ft-long trench
- Created infiltration gallery

AOC-65 Source Area Treatment

- Important to maximize contact time of injected oxidants with subsurface contaminated zones
- Phased approach initiated in 2012
- Variables that factor into effectiveness at AOC-65:
  - Volume of ISCO solution injected
  - Location of injection and transmissivity (faults and fractures) to source
  - Persistence of solution
  - Depth to groundwater at time of injection

ISCO Persulfate Injections

Phase I (2012)

- Bench/lab scale and small scale test
- 10 tons of persulfate ~ 10,000 gal activated with sodium hydroxide
- TSW-01 results indicated western migration of COCs

Phase II (2013)

- IIWs installed to the west to create persulfate “curtain”
- Medium- to large-scale injection, 22 tons of persulfate

Phase III (2014)

- Large-scale injection, 66 tons of persulfate
- Delivery via trench galleries, IIWs, and SIW-01

ISCO Injections

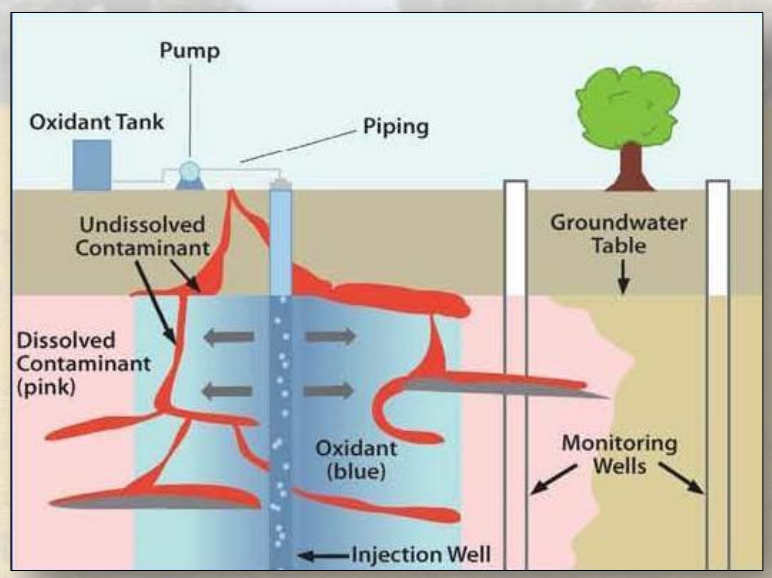
Injection Phase (date)	Volume and Type	Injection Location
Phase I (2012)	~15,000 gallons 20% sodium persulfate	Infiltration trench and SIW-01
Phase II (2013)	~34,000 gallons 20% sodium persulfate	Infiltration trench, SIW-01, IIWs
Phase III (2014)	~106,000 gallons 20% sodium persulfate	Infiltration trench, SIW-01, IIWs
Phase IVa and b (2015)	~3,500 gallons 0.45% and ~7,000 gallons 0.9% sodium permanganate	Newly constructed infiltration cells (3 exterior, 2 vault)

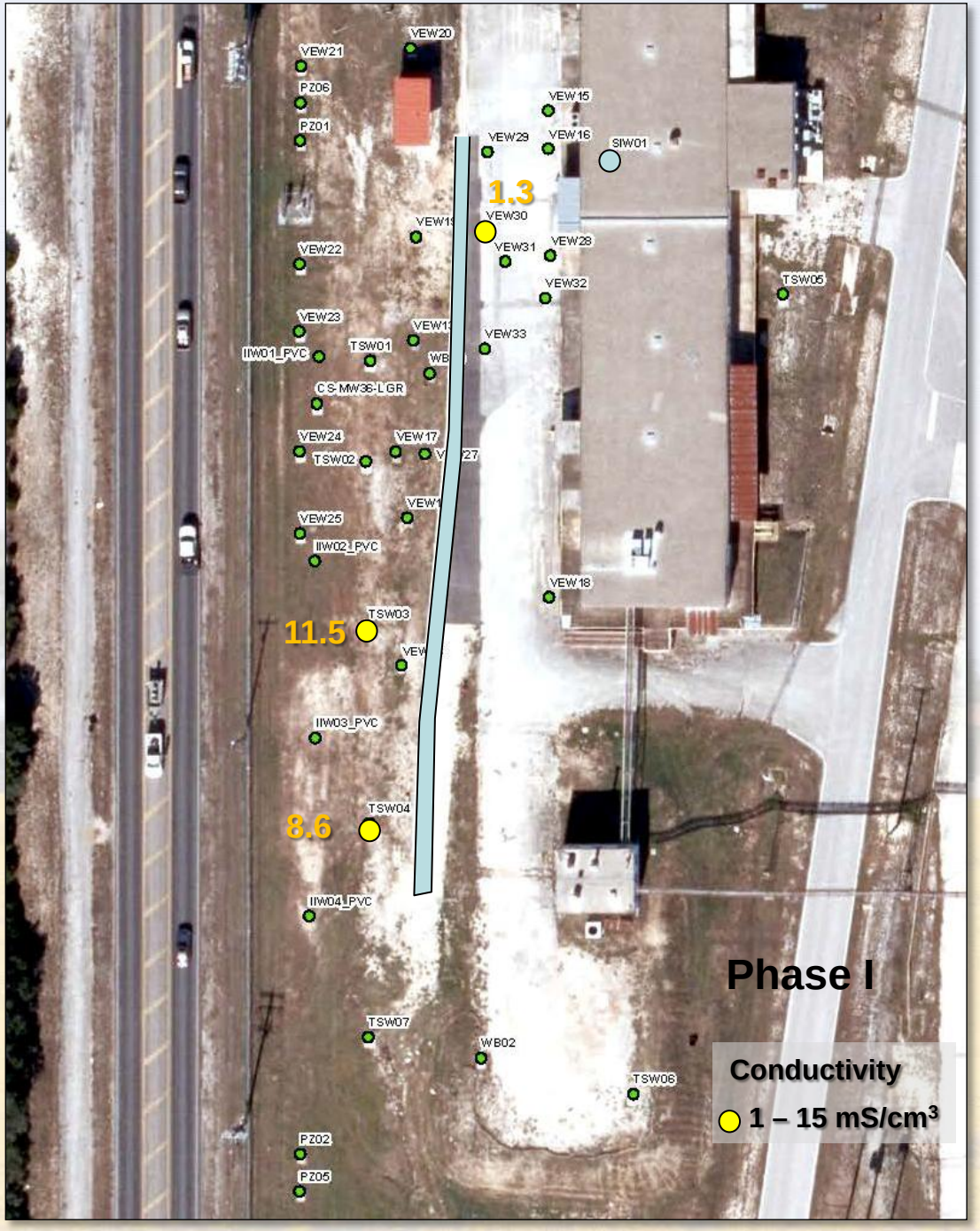
ISCO Objectives

Phase I: Test viability of ISCO, specifically with the application of persulfate in trench galleries and SIW-01

Phase II: Increase injection volume and test IIW applicability

Phase III: Large volume to affect the greatest area possible; see the limits of the application via large trench, IIWs, and SIW-01.





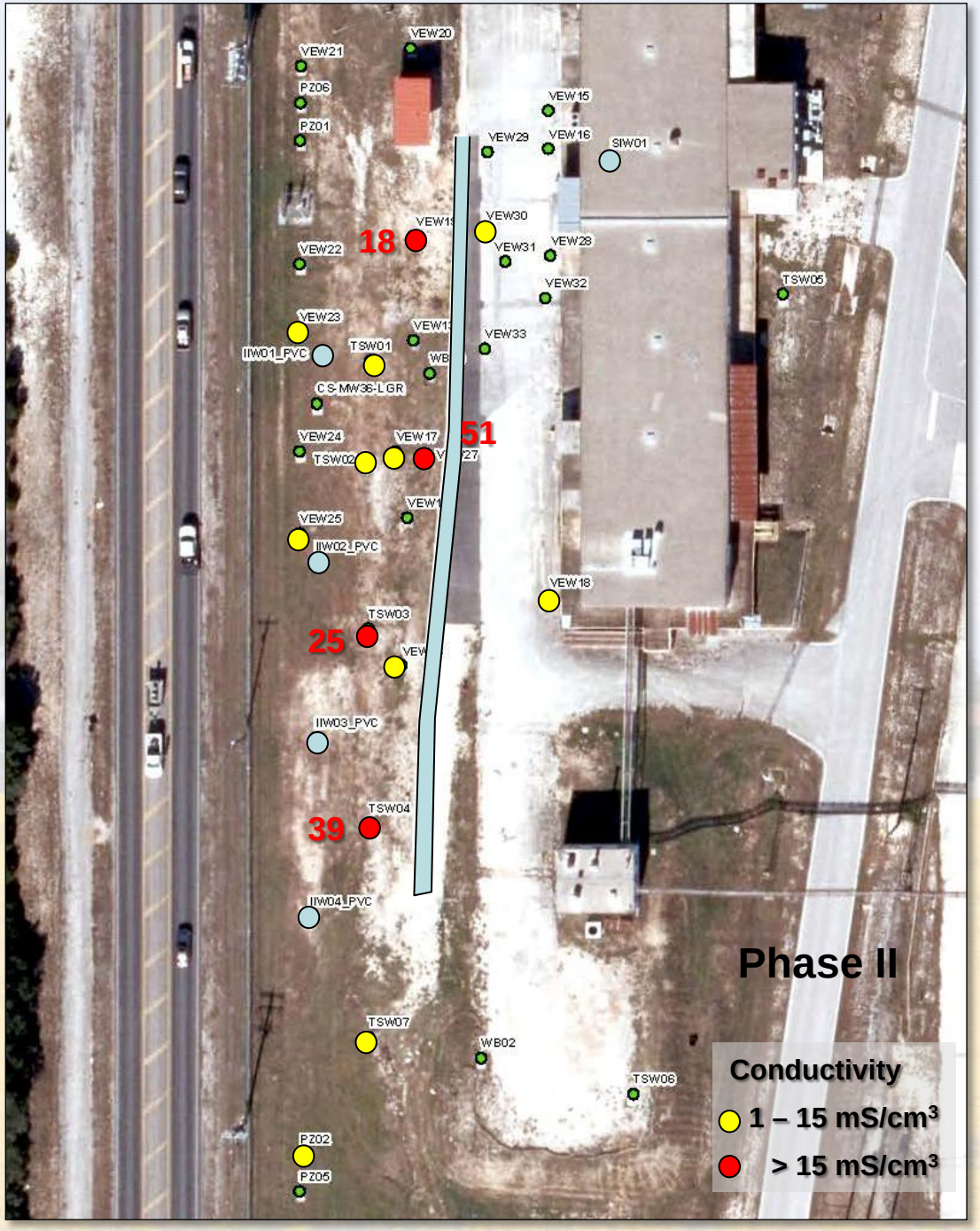
Distribution of ISCO Solution

- Persulfate decomposition and oxidation of VOCs leads to increased groundwater conductivities.
- Groundwater conductivity is an indicator of injected solution distribution.
- Pre-injection baseline monitoring indicate typical groundwater conductivities of < 1 mS/cm^3

Phase I

- Few areas of higher conductivity observed following low volume Phase I injection.

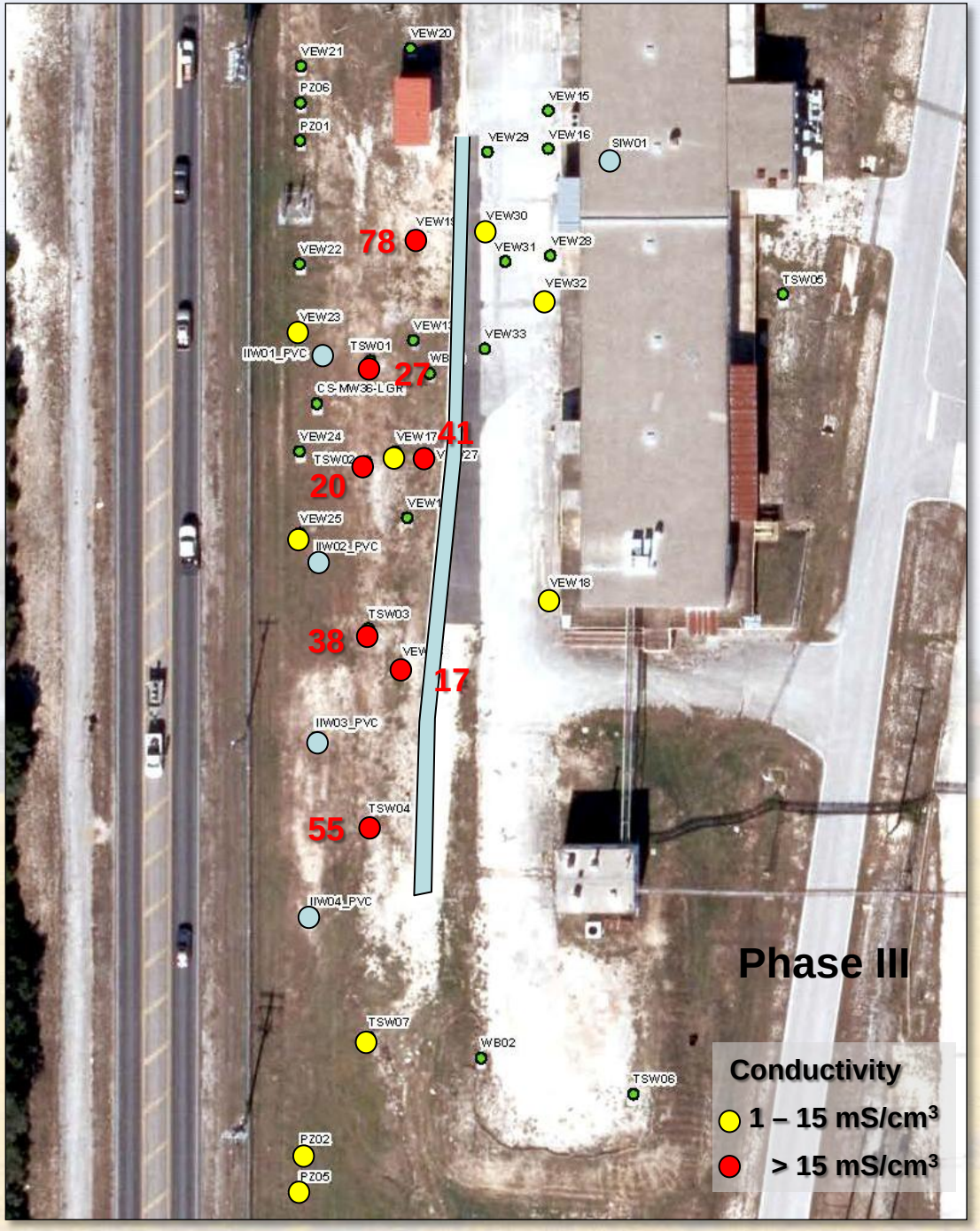
Distribution of ISCO Solution



Phase II

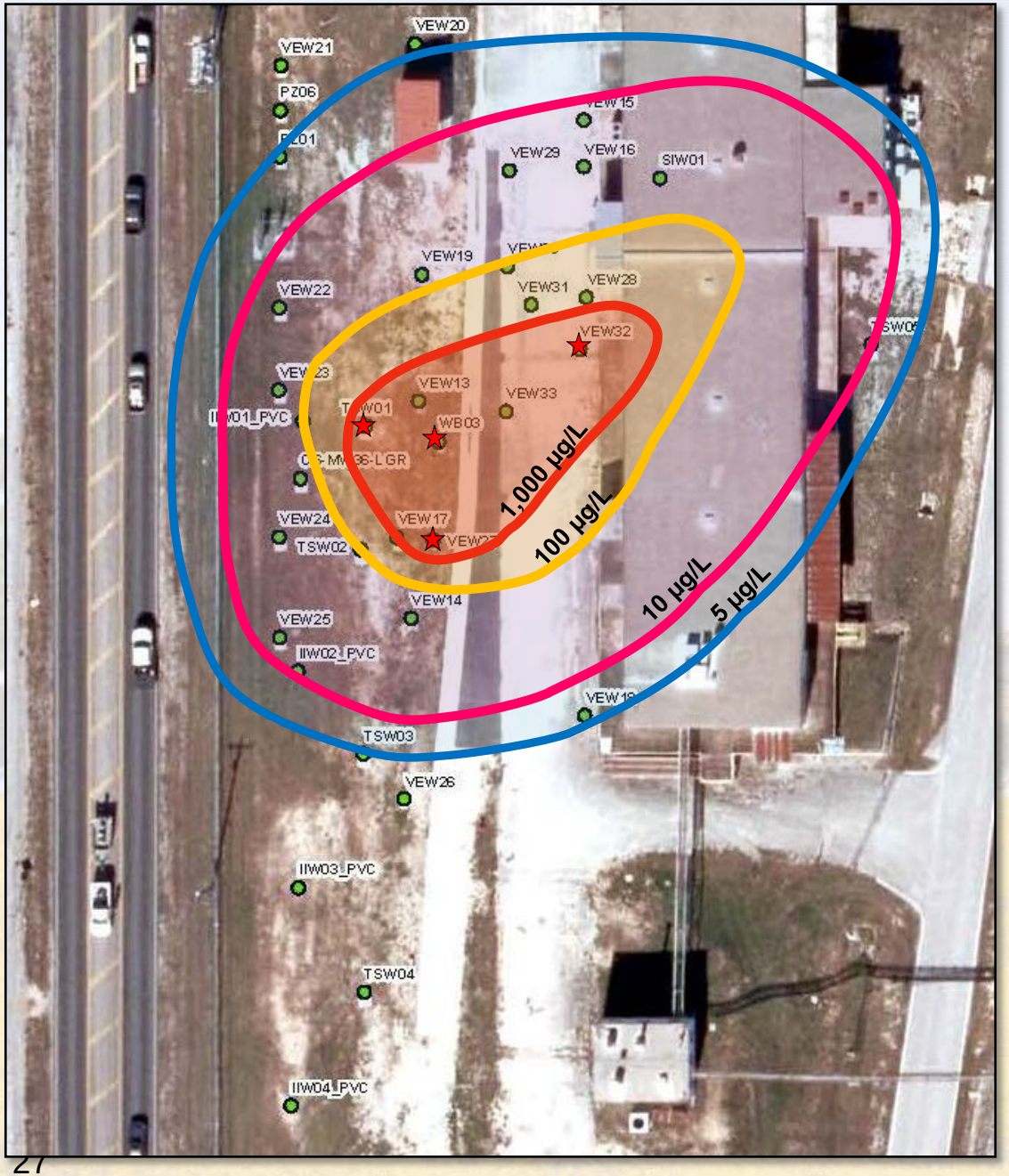
- Larger area influenced but primarily located between the infiltration trench and IIWs

Distribution of ISCO Solution

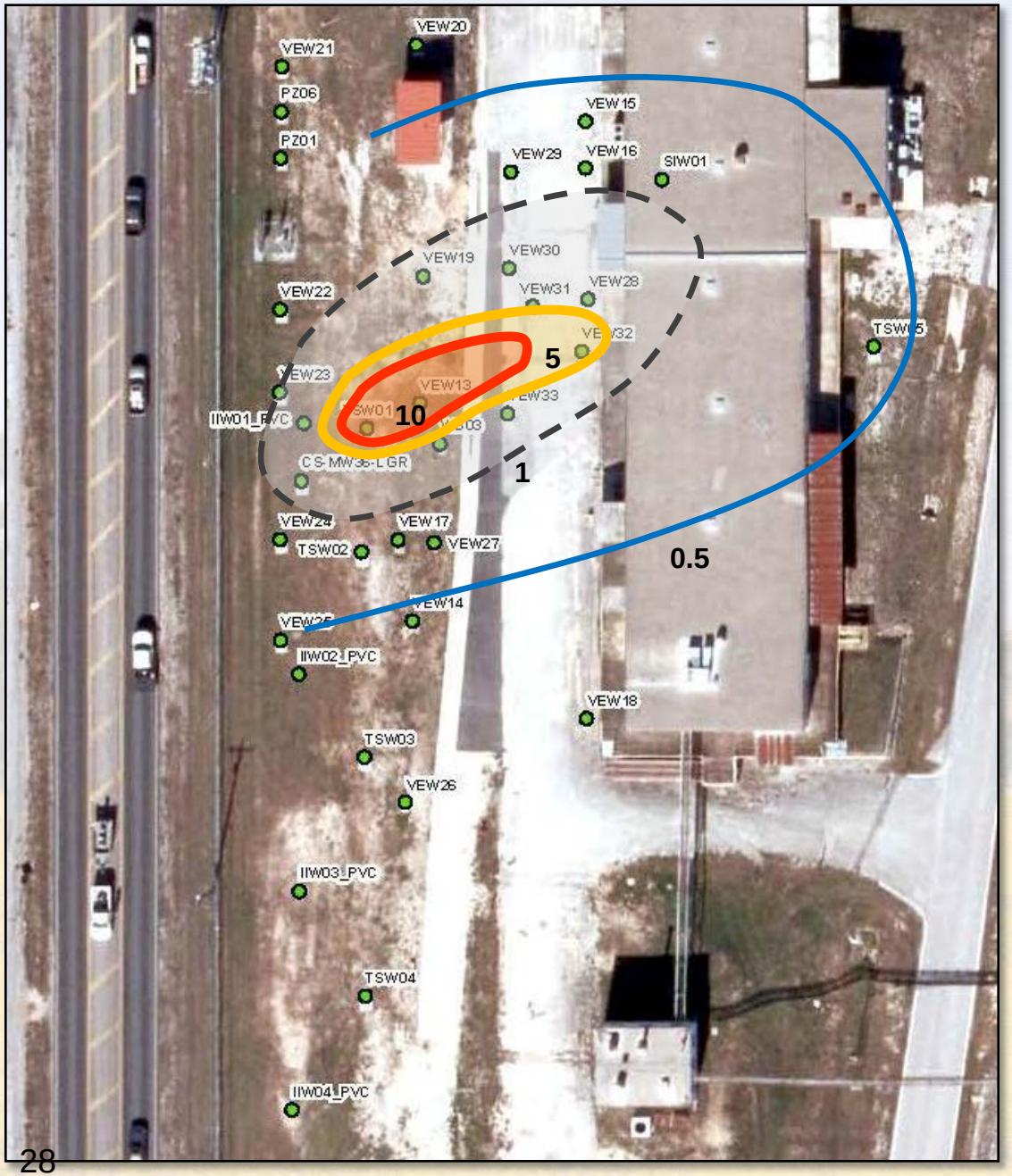


Phase III

- Greater area of influence
- However, still little impact to the east of the trench



Baseline PCE Concentrations
July 2012



One month following Phase I injections

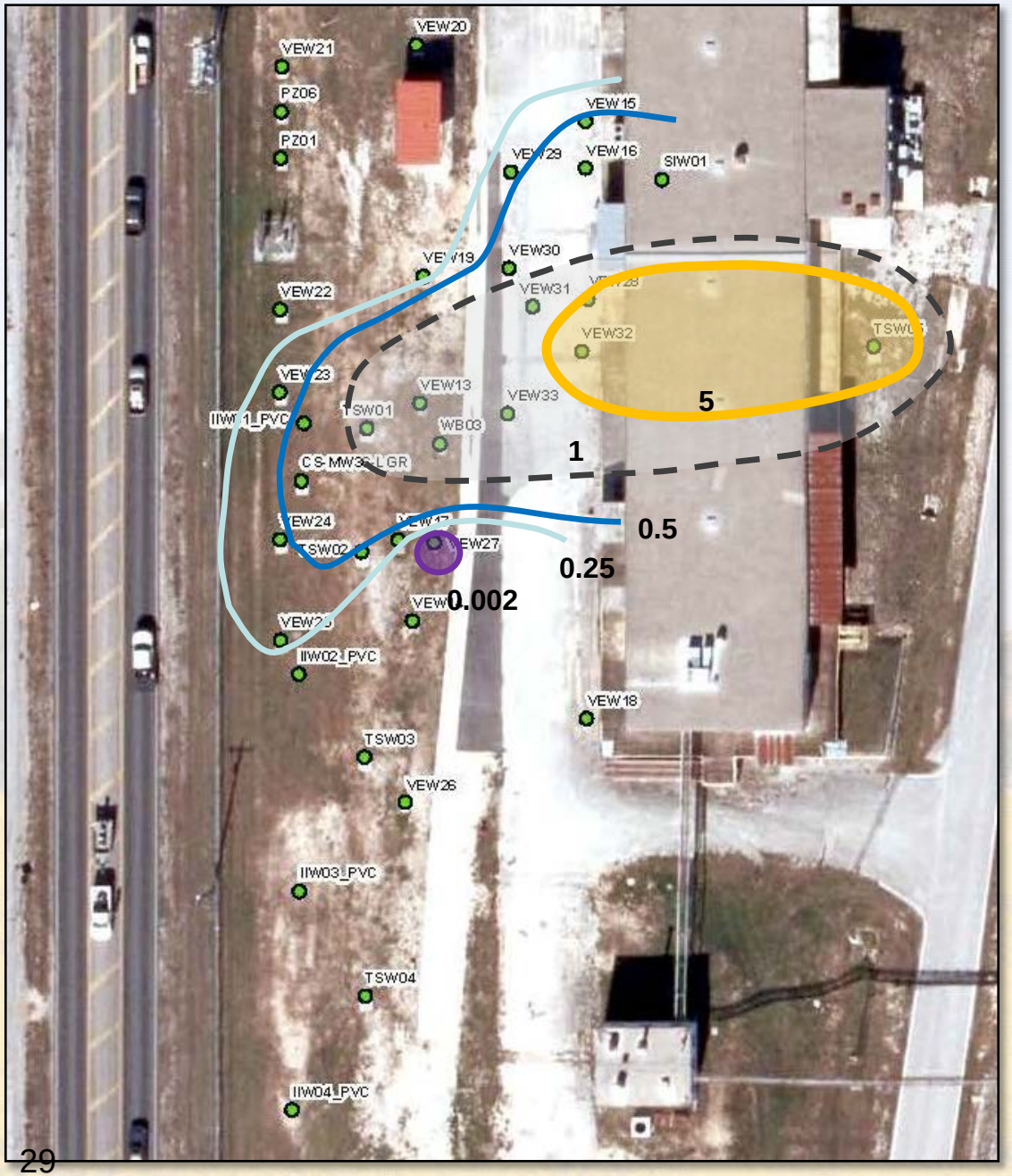
Data is presented as a ratio of the sample result to the baseline concentration.

Contours are the ratio:

Sample concentration

Baseline concentration

> 1 = increasing
1 = stable
< 1 = decreasing



One month following Phase II injections

Data is presented as a ratio of the sample result to the baseline concentration.

Contours are the ratio:

Sample concentration

Baseline concentration

> 1 = increasing
1 = stable
< 1 = decreasing

One month following Phase III injections

Data is presented as a ratio of the sample result to the baseline concentration.

Contours are the ratio:

Sample concentration

Baseline concentration

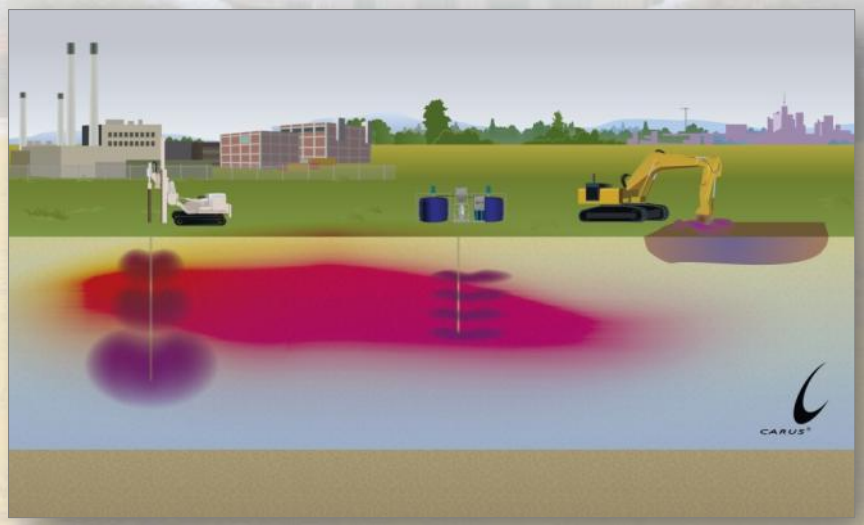
> 1 = increasing
1 = stable
< 1 = decreasing

ISCO Observations

- Injected solution affects areas adjacent, and west and south of AOC-65
- Suspect a pneumatic push of contaminated groundwater to the east.
- Data suggest the UGR is well-connected; however, transmissivity may be lower than originally thought
- Travel times for the injected solution are longer than the persulfate lifespan (3-5 weeks).

Phase IV ISCO - Permanganate Injections

- Switched to permanganate ISCO solution to address persistence issue
- Similar to persulfate, moderate oxidizer
- Differences from persulfate:
  - Effective at low concentrations
  - No auto-decomposition (longer-lived)
  - Purple color may create a negative perception if “daylighting” occurs
  - Potential to precipitate manganese oxide reduce formation permeability/ transmissive pathways



Source: Carus Corporation

Phase IV ISCO - Permanganate Injections

Focused Approach

- Installed 3 exterior infiltration cells at varied depths (5’, 10’, 15’) to the east of the trench
- Installed 2 cells in the vault
- Dye tracing to determine flowpaths:
  - Applied dyes in VEWs; results were not definitive
  - One positive result was a connection between VEW-32 and VEW-18

First Application of Permanganate

3,500 gallons of 0.4 mg/L permanganate solution:

- 1,000 gallons in each exterior cell
- 500 gallons split between the two interior cells

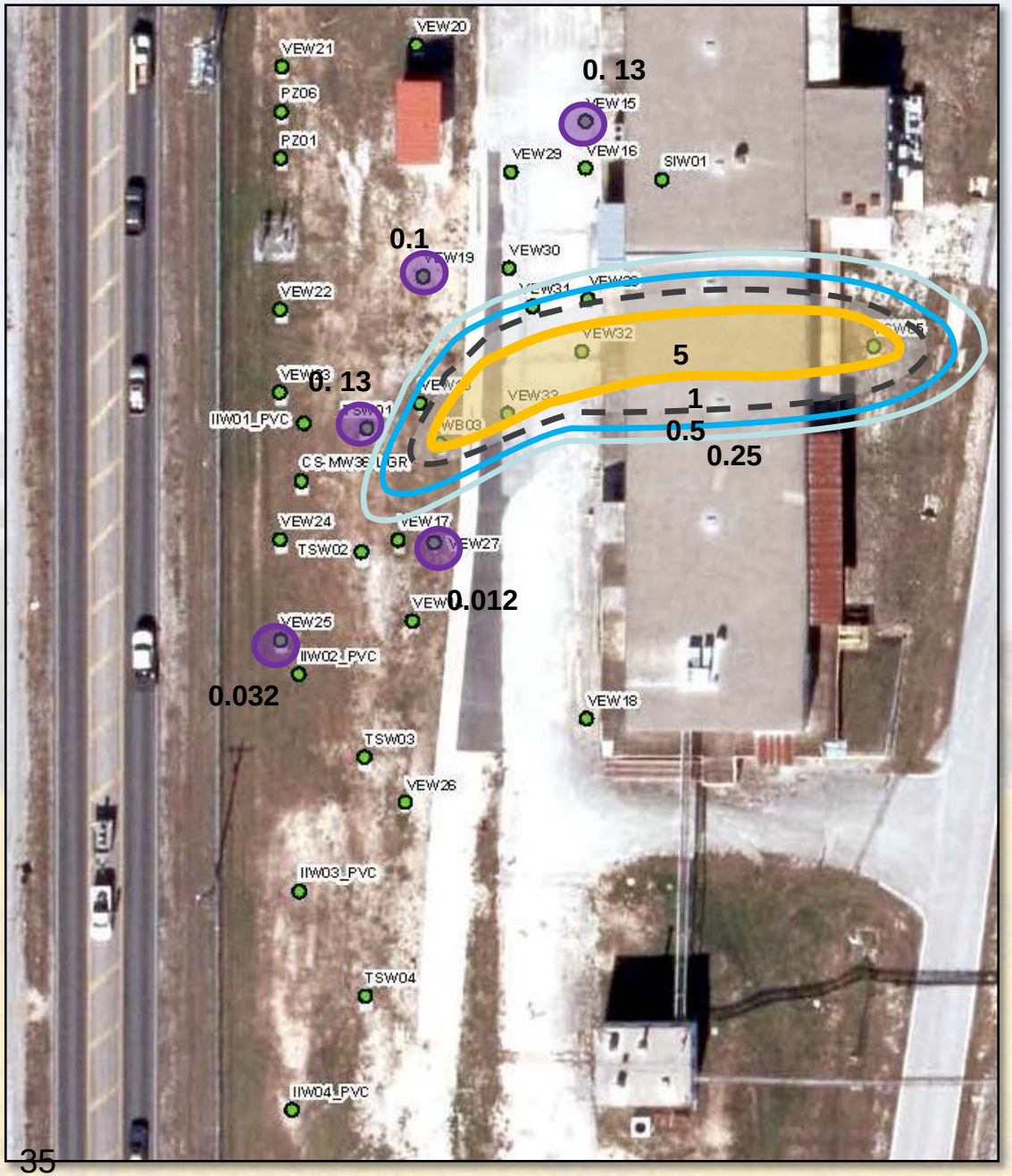
Cell ID	Sample Date	1,1-Dichloro-ethene µg/L	cis-1,2-Dichloroethene µg/L	Tetrachloro-ethene (PCE) µg/L	Trichloroethene (TCE) µg/L	trans-1,2-Dichloroethene µg/L	Vinyl chloride µg/L
Middle-IC	8/25/2015	0.12	**7.6**	**1,400**	**11**	0.080	0.080
	9/9/2015	0.24	0.14	0.12	0.10	0.16	0.16
	9/24/2015	0.24	0.14	0.12	0.10	0.16	0.16
South-IC	8/25/2015	0.12	0.070	**1,900**	**1.1**	0.080	0.080
	9/9/2015	0.24	0.14	0.12	0.10	0.16	0.16
	9/24/2015	0.24	0.14	0.12	0.10	0.16	0.16

Detections are bolded. Results not highlighted are detections above the RL.
Not detected. Reported result is reported as the MDL and flagged U.
Trace value. Reported result is a value between the MDL and the RL and is flagged F.

* Northern Infiltration Cell and Interior Building 90 Cells were dry

Does permanganate work?

Yes



One month following Phase IV injections

Data is presented as a ratio of the sample result to the baseline concentration.

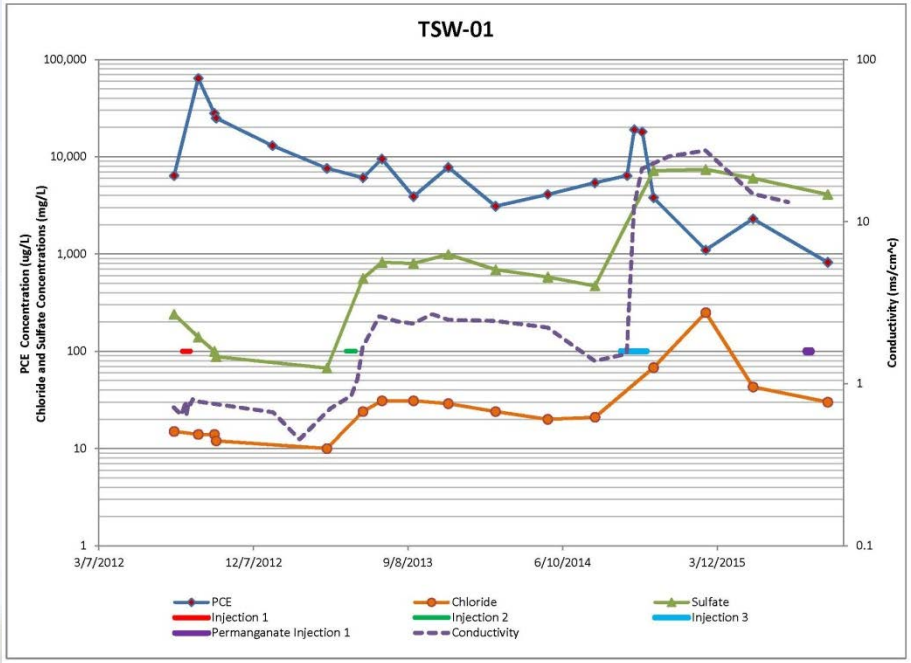
Contours are the ratio:

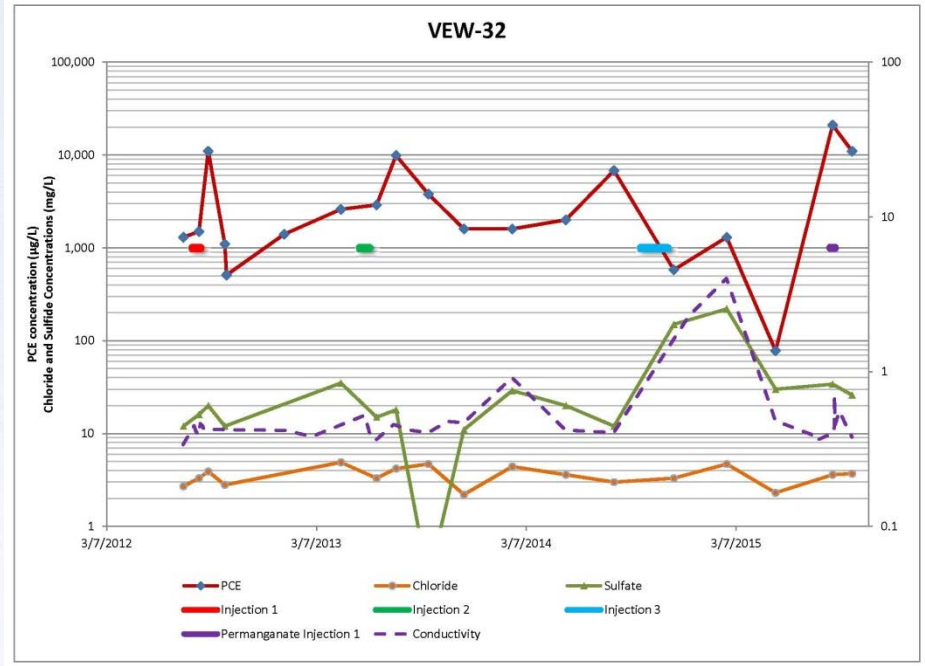
Sample concentration

Baseline concentration

> 1 = increasing
1 = stable
< 1 = decreasing

PCE Concentrations September 2015





West of trench

- Step-wise increase in anion concentrations following injections.
- Decreasing PCE concentration trend.

East of trench

- Little increase in anion concentrations following injections
- Little overall variation in PCE concentrations.

Follow-up Permanganate Injection

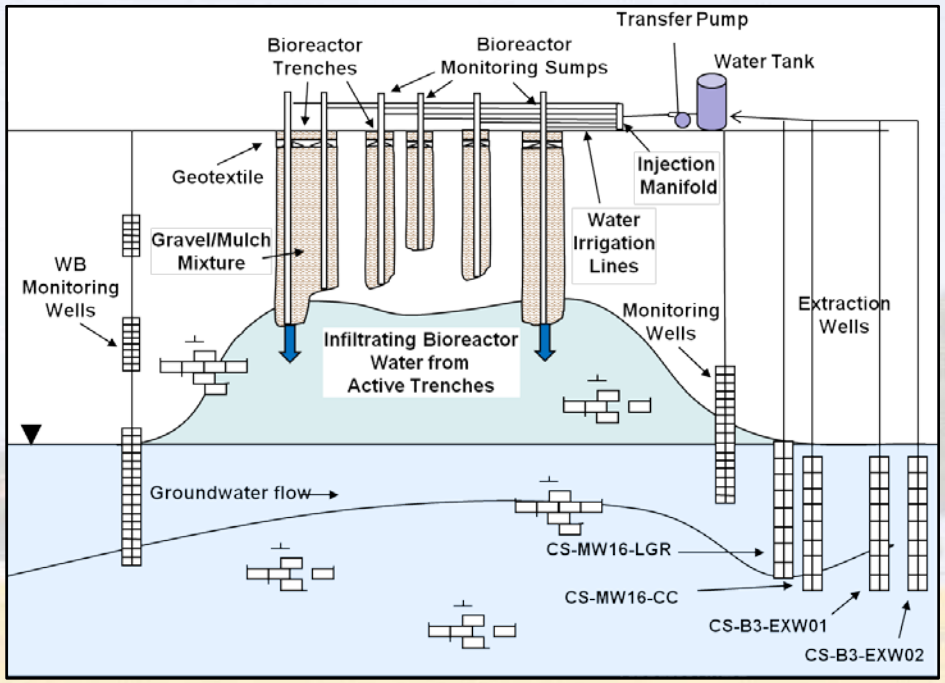
- Follow-up injection (this week) will increase concentration and volume of applied solution
- Will prioritize injections into the shallowest (northernmost exterior cell and vault cells)
- High infiltration rates observed during initial injection

ISCO Path Forward - Questions

- Is permanganate more/less effective than persulfate?
- Does ISCO via permanganate work?
- Are PCE concentrations being reduced? In absence of metals mobilization?
- Do we see a rebound of PCE concentrations?
- Are we affecting concentrations farther from the injection locations?
- If low-concentration permanganate injections are effective, look into passive-slow progression injection or permanganate wax application?
- What are the effects of changing groundwater levels? How will higher groundwater levels affect the flow of injected (or passively applied) ISCO?

SWMU B-3 Bioreactor
Quarter 32 Update

- VOC degradation is occurring with biological degradation end products methane, ethene, ethane, and CO_2 identified in surrounding UGR wells and LGR wells.
- Data from monitoring indicate the bioreactor has continued to maintain appropriate geochemical conditions (low DO, ORP, and pH) for effective anaerobic dechlorination.
- Between May 2014 and April 2015, approximately 20,771,000 gallons of groundwater were extracted and injected into Trenches 1 and 6.

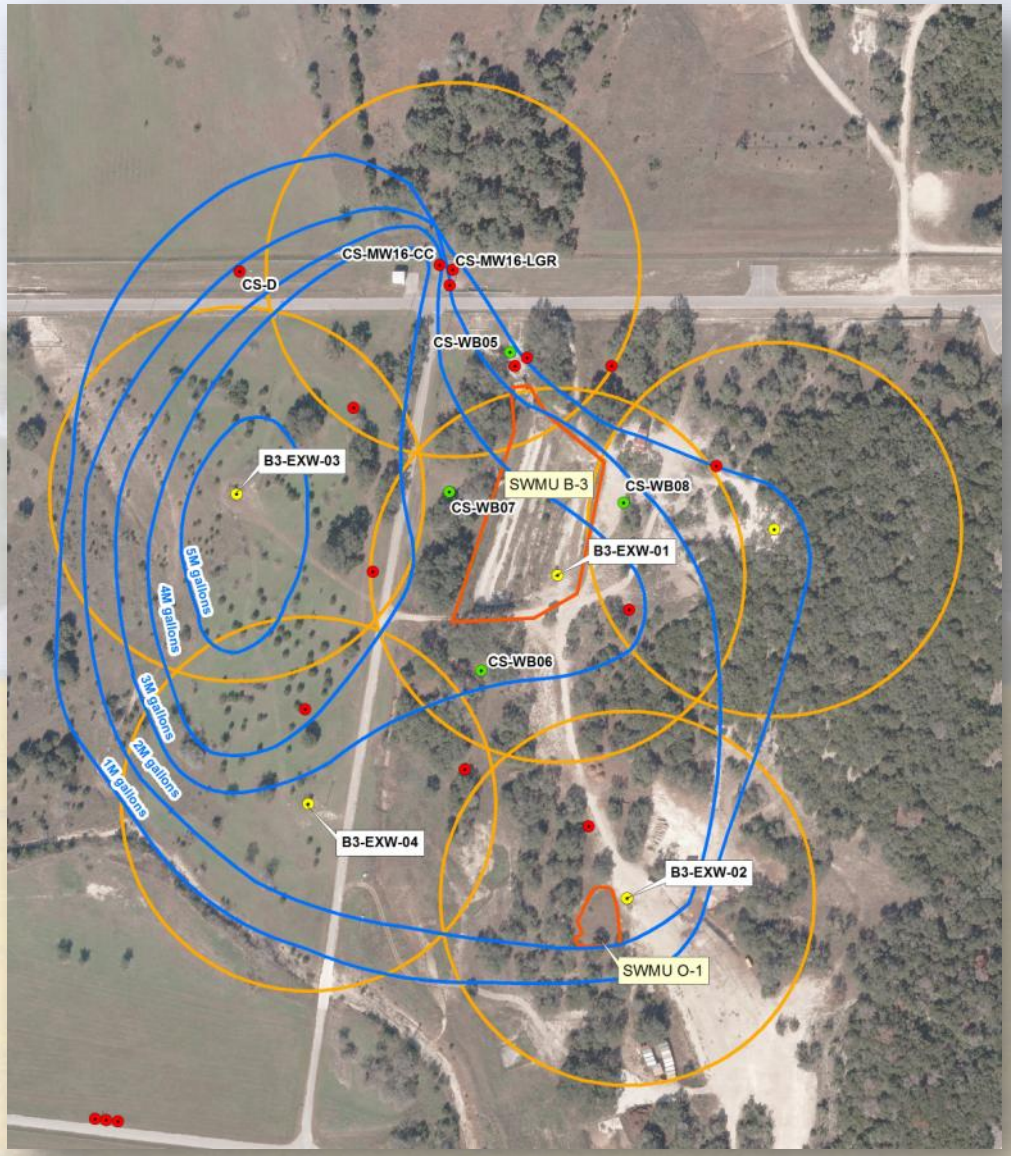


Bioreactor Conceptual Diagram

SWMU B-3 Bioreactor
Quarter 32 Update

Approximate Groundwater Contribution by Well (gallons)

CS-MW16-LGR:	1,031,000
CS-MW16-CC:	4,014,000
B3-EXW01:	3,392,000
B3-EXW02:	2,170,000
B3-EXW03:	6,373,000
B3-EXW04:	2,539,000
B3-EXW05:	1,252,000



SWMU B-3 Bioreactor

Operations, Maintenance, and Monitoring

- Continue monitoring bioreactor and surrounding wells for UIC permit and performance parameters.
- Continue monitoring and maintenance activities for delivery of groundwater to the trenches.
- Conduct semi-annual monitoring.
- Continue UIC monitoring with annual reporting in July 2016.
- Continue SCADA control and automation integration.

Maintenance was performed on the B3-EXW-05 transfer line in October 2015 to repair a leak.

SWMU B-3 Bioreactor
Solar Panels: Status

- Permanent installation of solar panels and command unit complete.
- System was booted up and tested and is working.
- Phase 2, including connection to well EX02, is the next step.

SWMU B-3 Bioreactor
Solar Panels: Challenges and Solutions

Issue:

- Hydrogen gas sensors showing elevated hydrogen gas while charging

Potential causes:

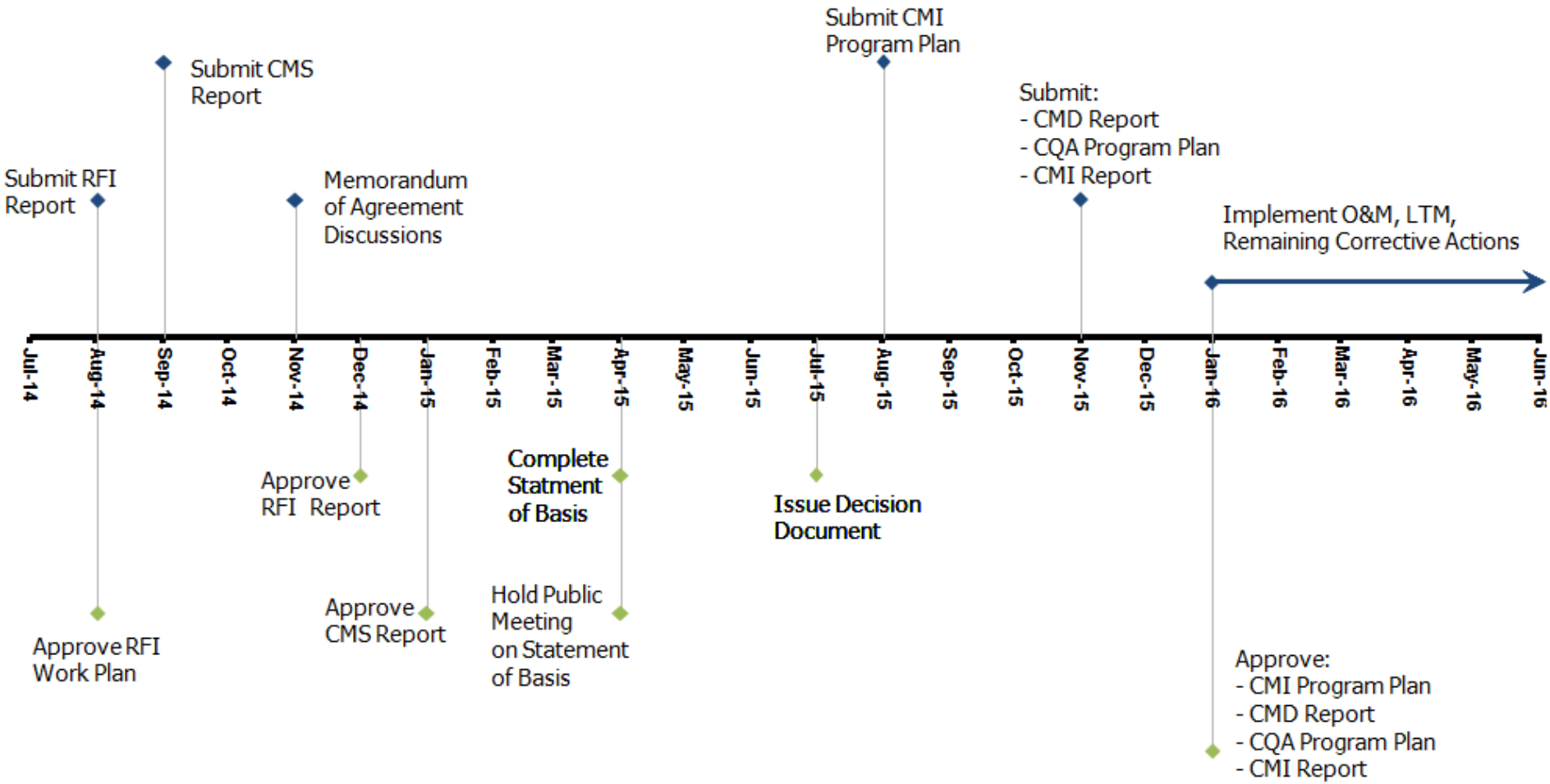
- Faulty hydrogen sensors (receiving new one)
- New batteries at 100% capacity need to be cycled several times for system to “learn” the batteries and prevent overcharging

Proposed Solutions:

- Replace sensors with new one.
- Temporarily connect Sundial to well via Variable Frequency Drive (VFD) to test operation and to cycle batteries while command center is open to provide ventilation while monitoring hydrogen gas levels.
- After testing period of 2-4 weeks, install VFD panel permanently and install transfer switch for switching between pole power and solar power.

PATH FOR EPA ORDER

CSSA 3008(h) Order Timeline



Upcoming Order Documents

- ✓ Corrective Measures Implementation Program Plan
- ❑ Corrective Measures Design Report
- ❑ Construction Quality Assurance Program Plan
- ❑ Corrective Measures Implementation Report