June 7, 2012

Ms. Alison Oakley
Bureau of Corrective Actions
Nevada Division of Environmental Protection
901 S. Stewart Street, Suite 4001
Carson City, Nevada 89701-5249

Subject: Final Meeting Minutes
Remedial Project Managers Meeting, March 29, 2012
Naval Air Station Fallon

Dear Ms. Oakley:

On behalf of the Navy, please find the attached Final Remedial Project Managers minutes from the March 29, 2012 meeting for your files. Copies of the two presentations given during the meeting are included in this submittal.

Please call me at (303) 312-8815 if you have any questions about these meeting minutes.

Sincerely,

Diane S. MacMillan

Diane MacMillan, P.E.
Tetra Tech Project Manager

Enclosure: Final Remedial Project Managers Meeting Minutes, Naval Air Station Fallon, March 29, 2012

Copy to:

Mike Quesada, Naval Facilities Engineering Command (NAVFAC), Southwest
Becky Kurtz, NAVFAC, Naval Air Station (NAS) Fallon
Debora Waxer, NAVFAC, NAS Fallon
Stephen McKay, NAVFAC, NAS Fallon
Kathy Monks, Tetra Tech EM Inc.
Stephanie Hernandez, Building Solutions Inc.
Diane Silva, NAVFAC Administrative Records

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REMEDIAL PROJECT MANAGERS MEETING

MEETING MINUTES

NAVAL AIR STATION FALLON

MARCH 29, 2012

10:00AM – 2:00PM

Attendees	**Affiliation**
Mr. Mike Quesada	Naval Facilities Engineering Command (NAVFAC), Southwest
Mr. Rafael Torres	NAVFAC, Southwest
Becky Kurtz	NAVFAC, Naval Air Station (NAS) Fallon
Debora Waxer	NAVFAC, NAS Fallon
Stephen McKay	NAVFAC, NAS Fallon
Alison Oakley	Nevada Division of Environmental Protection (NDEP)
Kathy Monks	Tetra Tech EM Inc. (Tetra Tech)
Dave Berestka	Tetra Tech
Diane MacMillan	Tetra Tech
Stephanie Hernandez	Building Solutions Inc.

The Remedial Project Manager (RPM) meeting for NAS Fallon was held at Building 307 at 10:00 a.m. on Thursday, March 29, 2012. The meeting consisted of two presentations; the first presentation discussed the results of the 2010/2011 basewide groundwater and surface water monitoring and the second presentation summarized the status of the time-critical removal action (TCRA) at Site 16. The PowerPoint slides for both presentations are attached to these meeting minutes.

Presentation on 2010/2011 Basewide Groundwater and Surface Water Monitoring:

- Ms. Monks presented the results of the 2010/2011 basewide groundwater and surface water monitoring; this presentation is attached to these meeting minutes.
- Ms. Monks noted that the number of monitoring wells and the analysis conducted on the samples have been modified since 2008 depending on the data and the needs of the Navy or NDEP. The data collected in 2010 and 2011 will be used to update the conceptual site models (CSM) and trend analysis of the groundwater plumes at NAS Fallon. The CSMs and trend analysis will be incorporated into the RI addendum/FS for the Northern and Southern Operable Units (OU).
- Ms. Oakley stated that there are no NDEP guidance criteria for total petroleum hydrocarbons (TPH) in groundwater; however, constituents of fuel products (such as benzene and naphthalene)

are evaluated in a human health risk assessment to develop risk-based criteria, if necessary. Ms. Oakley added that NDEP no longer has a numerical standard for TPH in soils but have identified residential and industrial screening levels for petroleum constituents. Ms. Oakley provided the Navy with a table of draft constituent closure screening levels for compounds in soil.

- Ms. Oakley suggested plotting non-detected concentrations as ½ the detection limit on the well concentration graphs. Ms. Oakley also suggested adding the maximum contaminant level (MCL) for each constituent to the graphs. Ms. Monks responded that she will make these changes to the graphs for the presentation of the data to the Restoration Advisory Board.
- Ms. Monks concluded the presentation and stated that current trends indicate that the concentrations of most contaminants at NAS Fallon are stable or decreasing.
- Mr. Quesada stated that the Basewide Groundwater Study has been very successful. The Navy and NDEP collaborated, optimized the program, and extended the study an additional two years. The 2010/2011 biannual report will conclude the Basewide Groundwater Study. The data collected will be evaluated as part of the Northern OU and Southern OU RI addendum/FS and the contaminant investigation report for the petroleum sites. Future groundwater and surface water monitoring may be recommended as part of the remedial actions for the OUs. Additional groundwater and surface water monitoring will be limited to quarterly sampling as part of the TCRA at Site 16. Surface water samples are collected from sampling location SW05, located downstream of NAS Fallon. High concentrations of chlorinated solvents at Site 16 are currently being treated by the TCRA groundwater treatment system.
- Mr. Quesada requested a meeting with Ms. Oakley following the RPM meeting to discuss the 2010/2011 Biennial Basewide Hydrologic Monitoring Report. Mr. Quesada said that he would like Ms. Oakley's input on reducing the size of the report. Ms. Oakley, Mr. Quesada, and Ms. Monks met after the RPM meeting to discuss this topic.

Presentation on the Site 16 Time-Critical Removal Action

- Mr. Berestka summarized the TCRA activities and provided pictures and figures showing the completed modifications to the E4X Drain and the installation of the ozone/hydrogen peroxide groundwater treatment system. The presentation is attached to these meeting minutes.
- Ms. Oakley asked if the injection of air, ozone, and hydrogen peroxide may push the chlorinated solvent plume into surface water. Mr. Quesada responded that chlorinated solvents have not been detected in samples collected from the E4X Drain or Lower Diagonal Drain. In addition, the modifications to the E4X Drain eliminate the pathway for contaminants in groundwater to enter surface water in the drain. Typically, the E4X Drain in the vicinity of the chlorinated solvent plumes will be dry and when it does contain surface water, it will be under losing stream conditions.

Additional Topics:

- Mr. Quesada stated that the Navy has added a new site to the Installation Restoration Program. UST-Restoration Site 6 is the former fuel pipeline located south of Site 16. The Navy will

evaluate the need for further investigation and possible actions to address petroleum hydrocarbon contamination associated with the former fuel pipeline.

- Ms. Oakley provided the Navy with copies of documents regarding a petroleum spill near Sites 22 and 28 (northeast of the runway). Ms. Oakley suggested that petroleum compounds identified in monitoring well BA22-MW03 may be from a release of JP-5 and JP-8 in 1999. Ms. Oakley provided the Navy with the spill documentation that may help characterize the source of the petroleum product found in the area.
- Ms. Oakley requested additional data on closed sites, including Site 12, the Pest Control Shop, to complete NDEP's files. Ms. Oakley will submit a list of requested documents to Mr. Quesada or Ms. Kurtz.
- Mr. Quesada stated that the Southern OU RI Addendum/FS and the Contaminant Investigation Report for Fuel Sites UST-R Site 1, UST-R Site 2, and Site 6 are scheduled to be submitted to the Navy in May. After the Navy reviews the reports, Mr. Quesada intends to arrange a meeting with NDEP to present the conclusions of the reports.

The RPM meeting concluded with a site walk at Site 16 to observe the completed drain modifications and the TCRA groundwater treatment system. Several small punchlist items were noted by Navy personnel and were relayed to Building Solutions Inc and Tetra Tech. These items included:

1. Grounding the two hazmat storage lockers
2. Labeling the PulseOx trailer and tank with the appropriate NFPA safety diamond and labeling the tank to indicate that it contains hydrogen peroxide.
3. Completion of trench backfilling and grading near injection well TT16-IW04

The schedule for the next round of groundwater sampling was discussed during the site walk. Mr. Berestka suggested conducting the 3-month groundwater sampling event a few weeks earlier than planned to allow for more time to adjust the operation of the system based on the results of the samples. Ms. Oakley agreed with this approach.

The site walk and RPM meeting was concluded at approximately 2:00 pm.

Naval Air Station Fallon

Remedial Project Managers Meeting
March 29, 2012

Mike Quesada
Remedial Project Manager
Naval Facilities Engineering Command Southwest

2010/2011 Basewide Groundwater and Surface Water Monitoring

Purpose

- Monitor groundwater and surface water quality near base boundaries
- Assess plume stability, characteristics, and trends at the leading edge of contaminant plumes
- Provide continued post-closure monitoring
- Provide updates to the basewide hydrologic conceptual site model that may affect future remedial strategies

Scope

- Semiannual groundwater and monthly surface water quality monitoring
- Quarterly data-logger downloads
  - Continuous pressure transducer water level and temperature measurements
  - Continuous flow sensor groundwater velocity and direction measurements
- Four years of basewide monitoring completed
- Completed Final Well Utilization Plan (WUP) in February 2011

2010/2011 Basewide Groundwater and Surface Water Monitoring (cont.)

- **Specific uses for wells included in the network for 2011:**
  - 49 wells sampled for basewide water quality (March and October)
  - 38 wells in the basewide network available for water quality sampling if needed to support future remediation efforts
  - 99 wells used for semiannual water level monitoring and, if floating fuel is present, product thickness monitoring
  - 97 wells and piezometers available for future water level and product thickness monitoring related to remedial strategy development
- **Some wells have more than one use**
- **Basewide monitoring is dynamic – changes with time, trends, needs**
- **153 monitoring wells recommended for plugging in Well Utilization Plan**

Basewide Groundwater and Surface Water Monitoring – 2010/2011 Sampling Location Map

ROADS

FENCES

DRAINAGE DITCH

NAS FALLON BOUNDARY

BUILDING

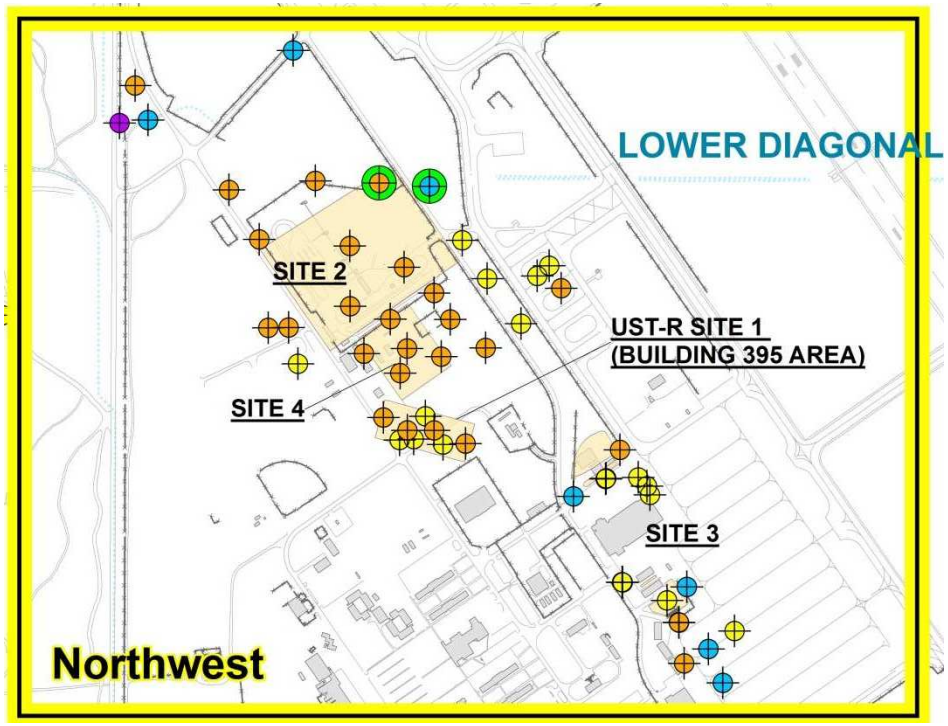
SITE 16 SITE BOUNDARY

WWTP - WASTEWATER TREATMENT PLANT

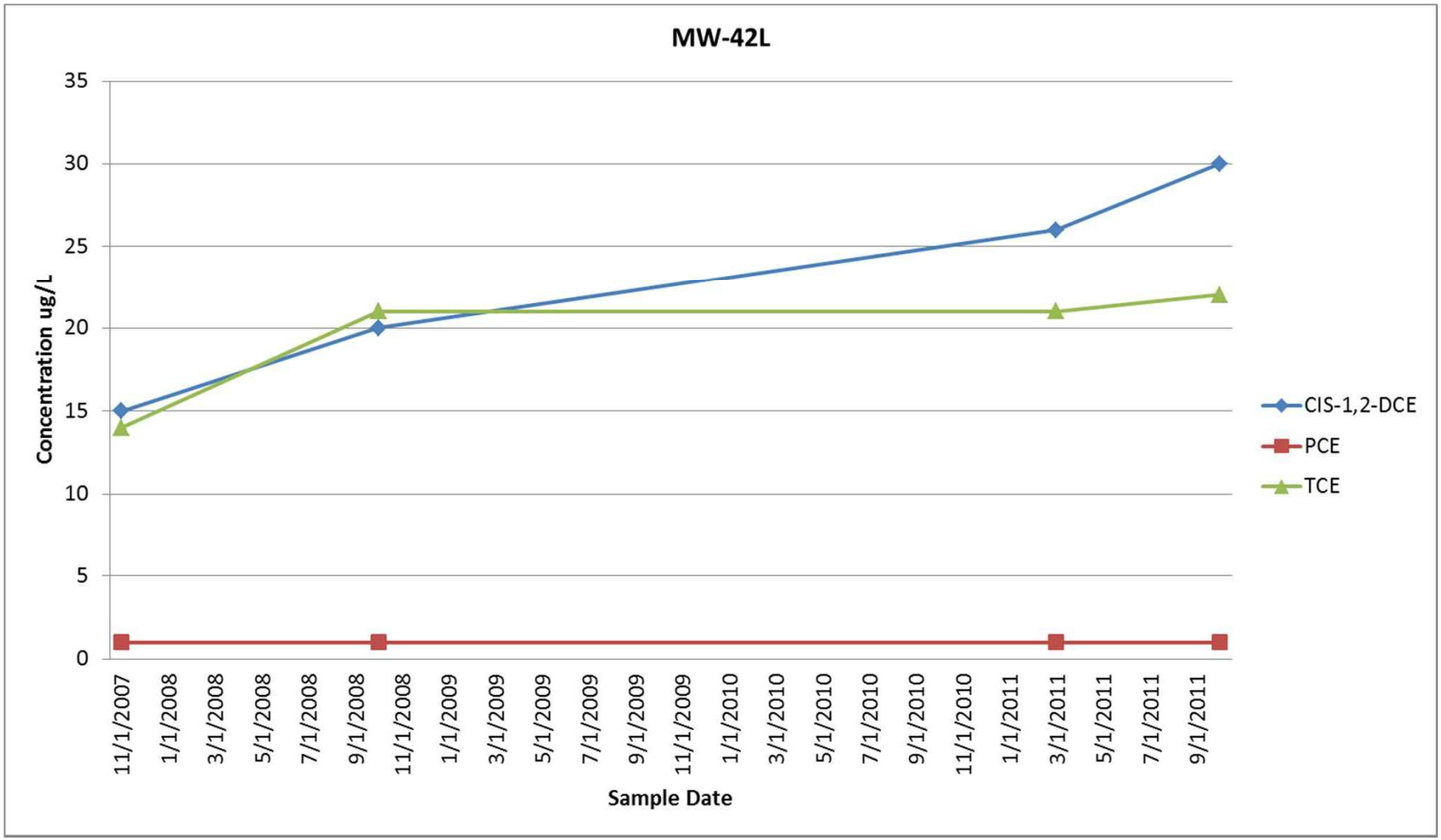
- MONITORING WELL SAMPLED SEMIANNUALLY FOR WATER QUALITY
- SURFACE WATER SAMPLING LOCATION
- OBSERVATION WELL USED FOR SEMIANNUAL WATER LEVEL MONITORING
- SUPPLEMENTAL MONITORING WELL INCLUDED IN THE BASEWIDE MONITORING WELL NETWORK (NOT CURRENTLY SAMPLED FOR WATER QUALITY)
- VELOCITY SENSOR (DOWNLOADED QUARTERLY)
- MONITORING WELL OR PIEZOMETER EQUIPPED WITH A PRESSURE TRANSDUCER

Results – 2010/2011 Groundwater Monitoring, Northwest Quadrant

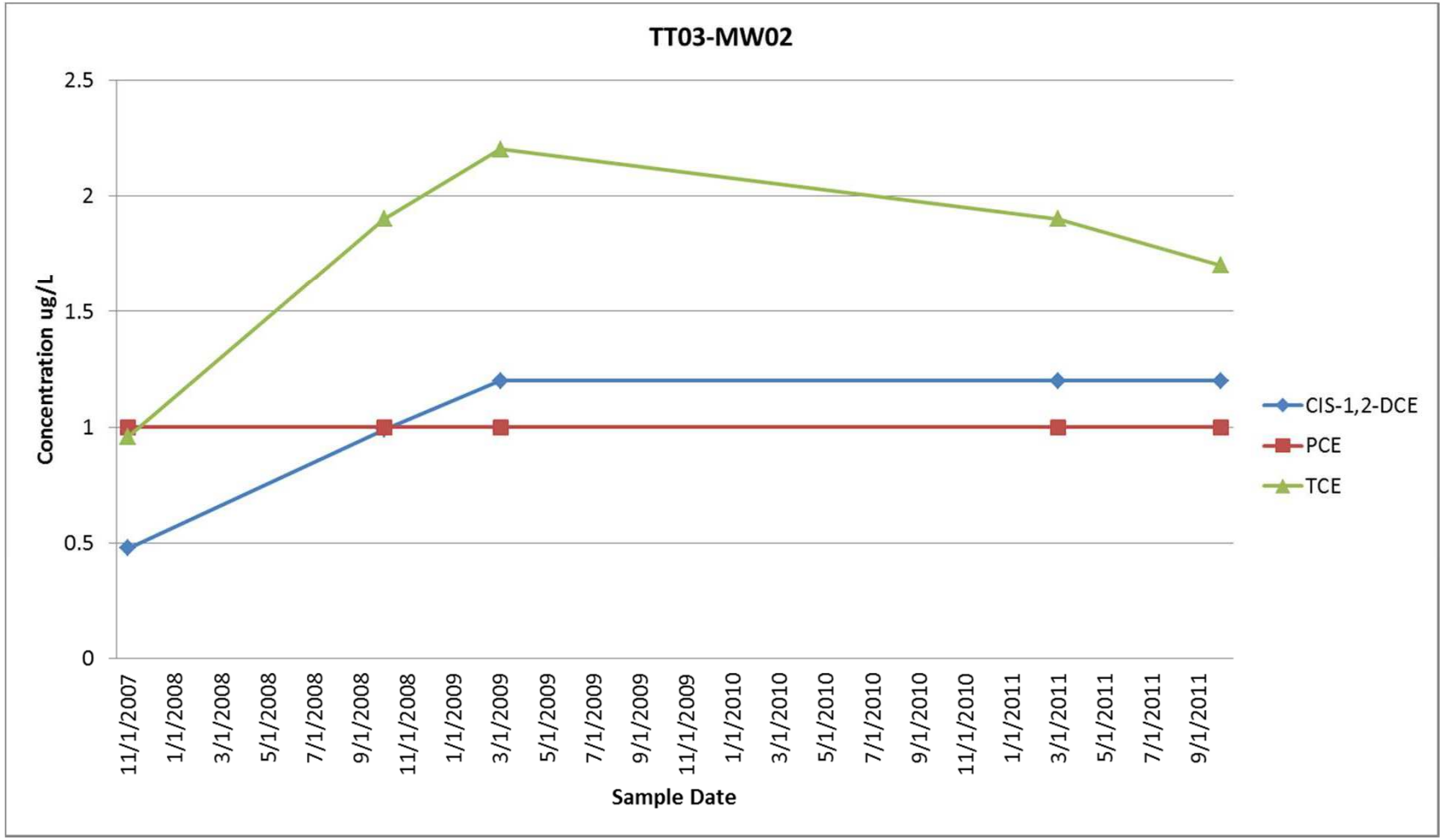
- **Depths to groundwater range from about 6 to 11 feet bgs**
- **Groundwater levels and temperature trends indicate that groundwater and surface water from the Lower Diagonal No. 1 Drain are interconnected**
- **TCE was the only organic compound exceeding the MCL (5 µg/L) in northwest quadrant groundwater samples**
  - In 2011, maximum concentrations of TCE were 21 µg/L in March and 22 µg/L in October at Site 3 (well 42L)
  - No exceedances in 2010



Trends for Chlorinated Solvent Compounds, Site 3

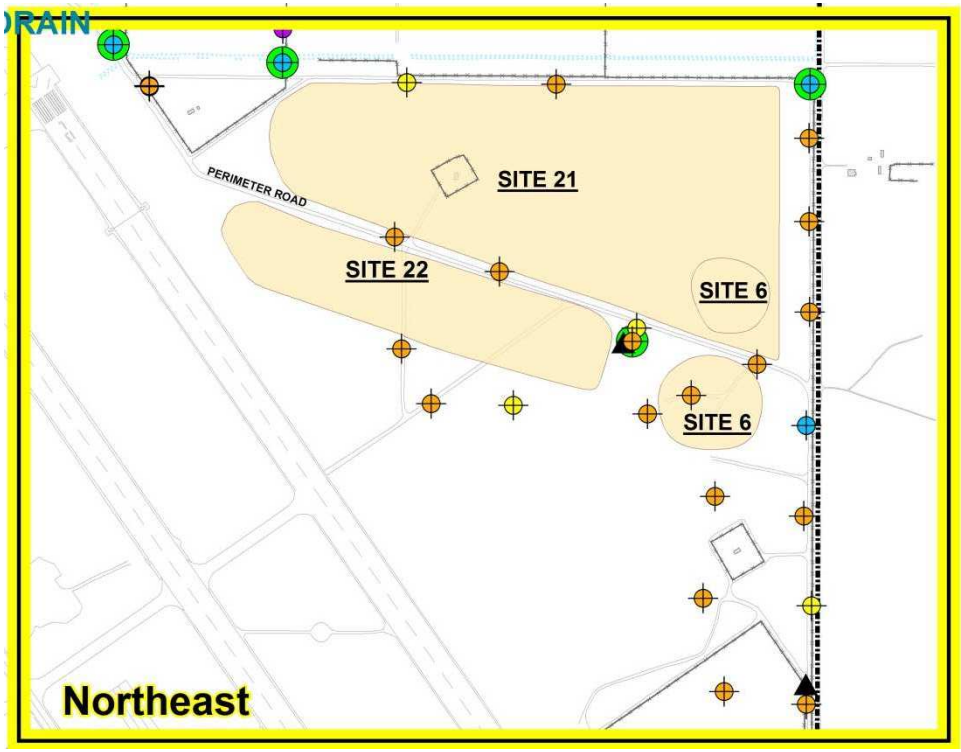


Trends for Chlorinated Solvent Compounds, Site 3



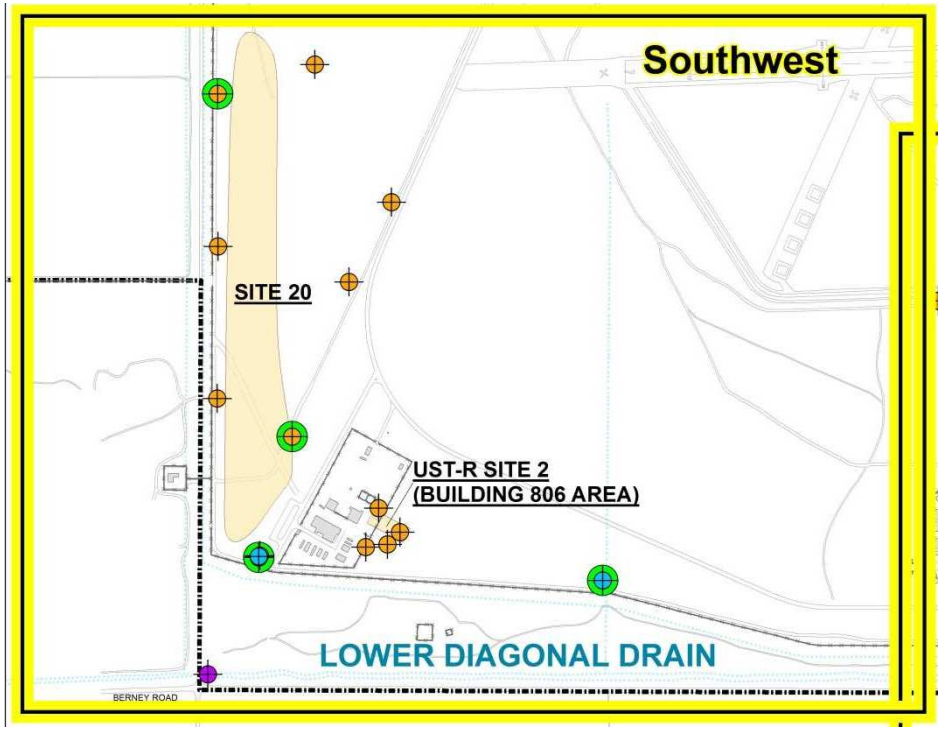
Results – 2010/2011 Groundwater Monitoring, Northeast Quadrant

- **Depths to groundwater range from about 3 to 12 feet bgs**
- **Groundwater levels and temperature trends indicate that groundwater and surface water from the Lower Diagonal No. 1 Drain are interconnected**
- **Total petroleum hydrocarbons as diesel-range organics (TPH-DRO) was the only organic compound that exceeded NDEP guidance criteria (1,000 µg/L) in northeast quadrant groundwater samples**
  - In 2011, 2 exceedances of TPH-DRO 1,800 µg/L (well BA22-MW02) and 2,500 µg/L (well BA22-MW03)
  - In 2010, 1 exceedance of TPH-DRO 3,000 µg/L (well BA22-MW03)



Results – 2010/2011 Groundwater Monitoring, Southwest Quadrant

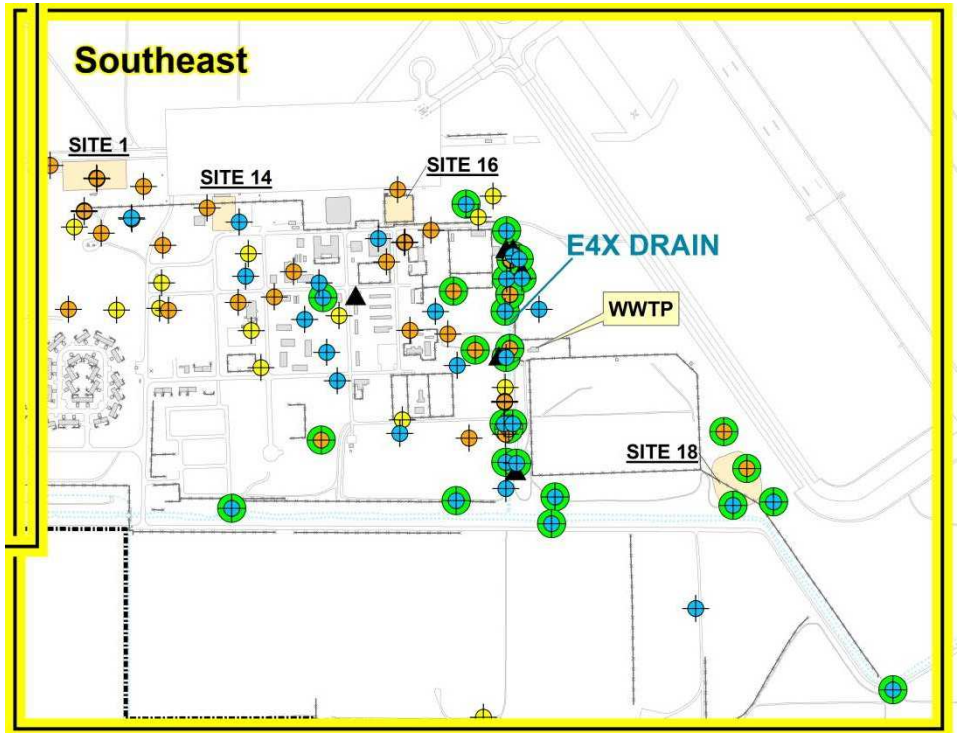
- Depths to groundwater range from about 4 to 8 feet bgs
- Groundwater temperatures range from 52 to 69 ^{o}F
- No organic compounds exceeded MCLs in 2010 or 2011

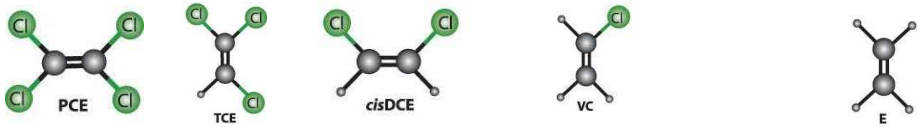


Results – 2010/2011 Groundwater Monitoring, Southeast Quadrant (Southern OU)

- Depths to groundwater range from about 4 to 11 feet bgs
- Groundwater levels and temperature trends indicate that groundwater and surface water from the E4X Drain are interconnected
- Organic compounds exceeding decision criteria in southeast quadrant groundwater samples during 2010 and 2011 included naphthalene, benzene, 1,2-DCA, PCE, TCE, DCE, and vinyl chloride
- Chlorinated solvent degradation sequence:

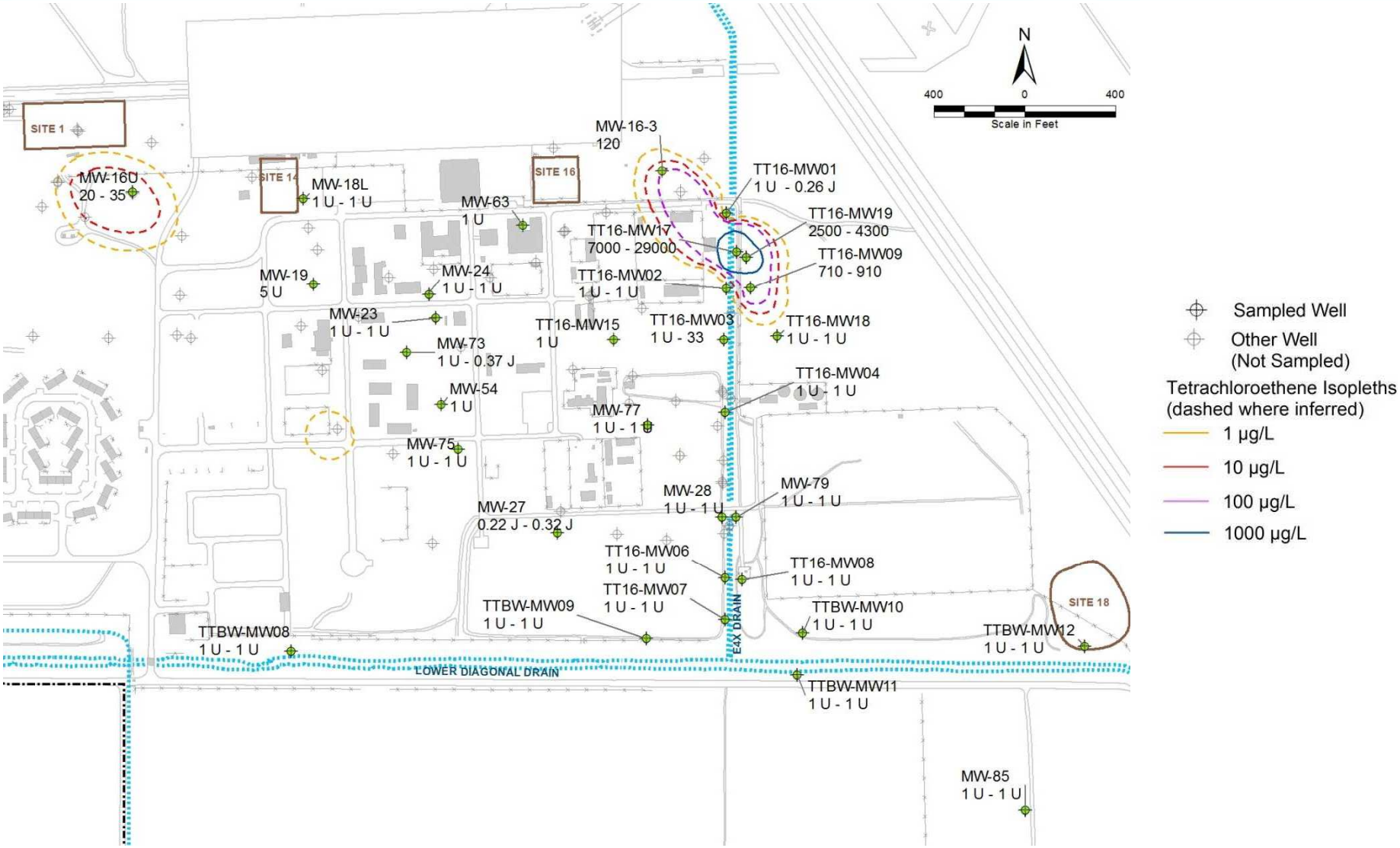
PCE → TCE → DCE → vinyl chloride →ethene



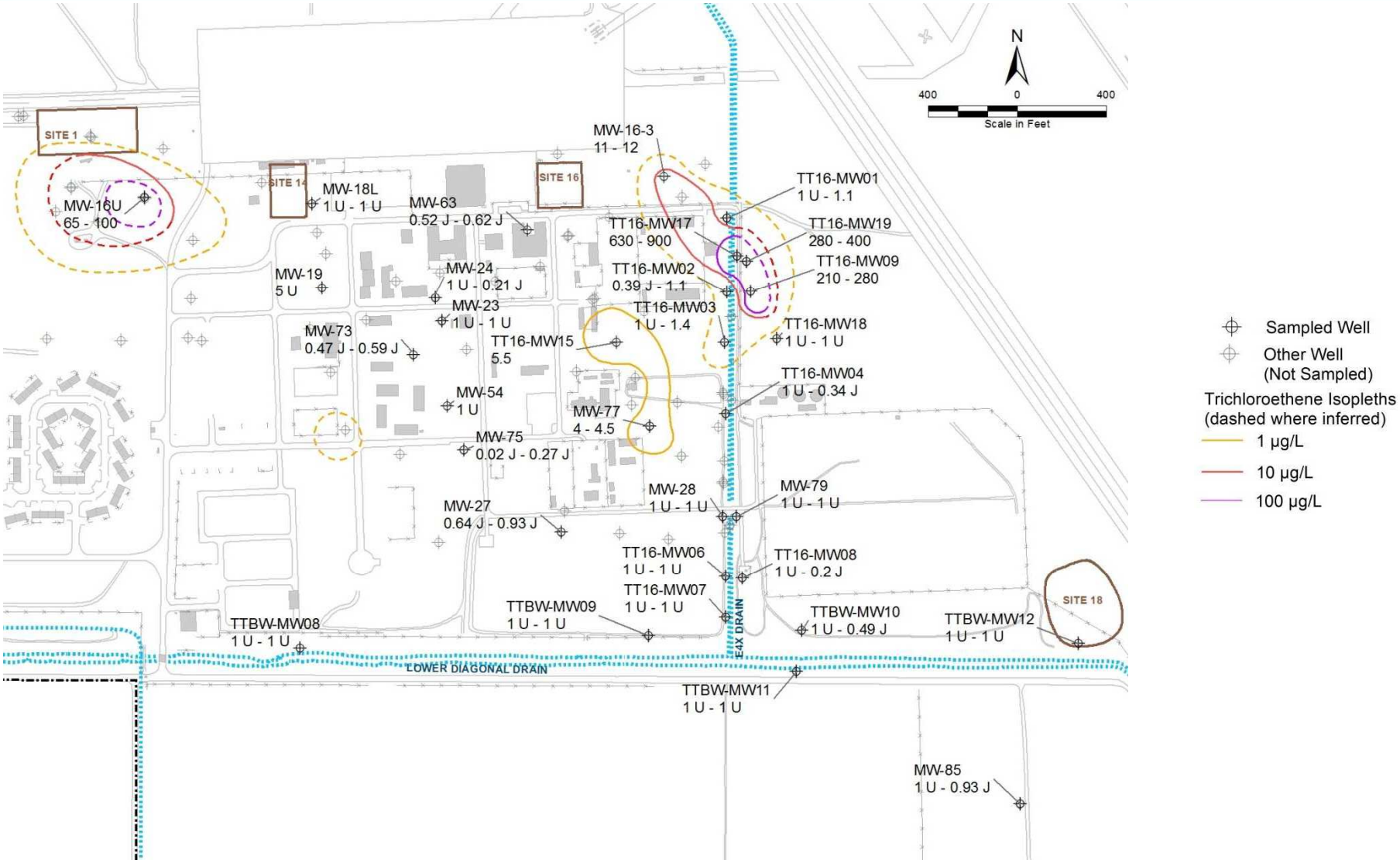


Molecture structures demonstrating the natural degradation of PCE to ethene. Illustrations by Monica D. Ramirez

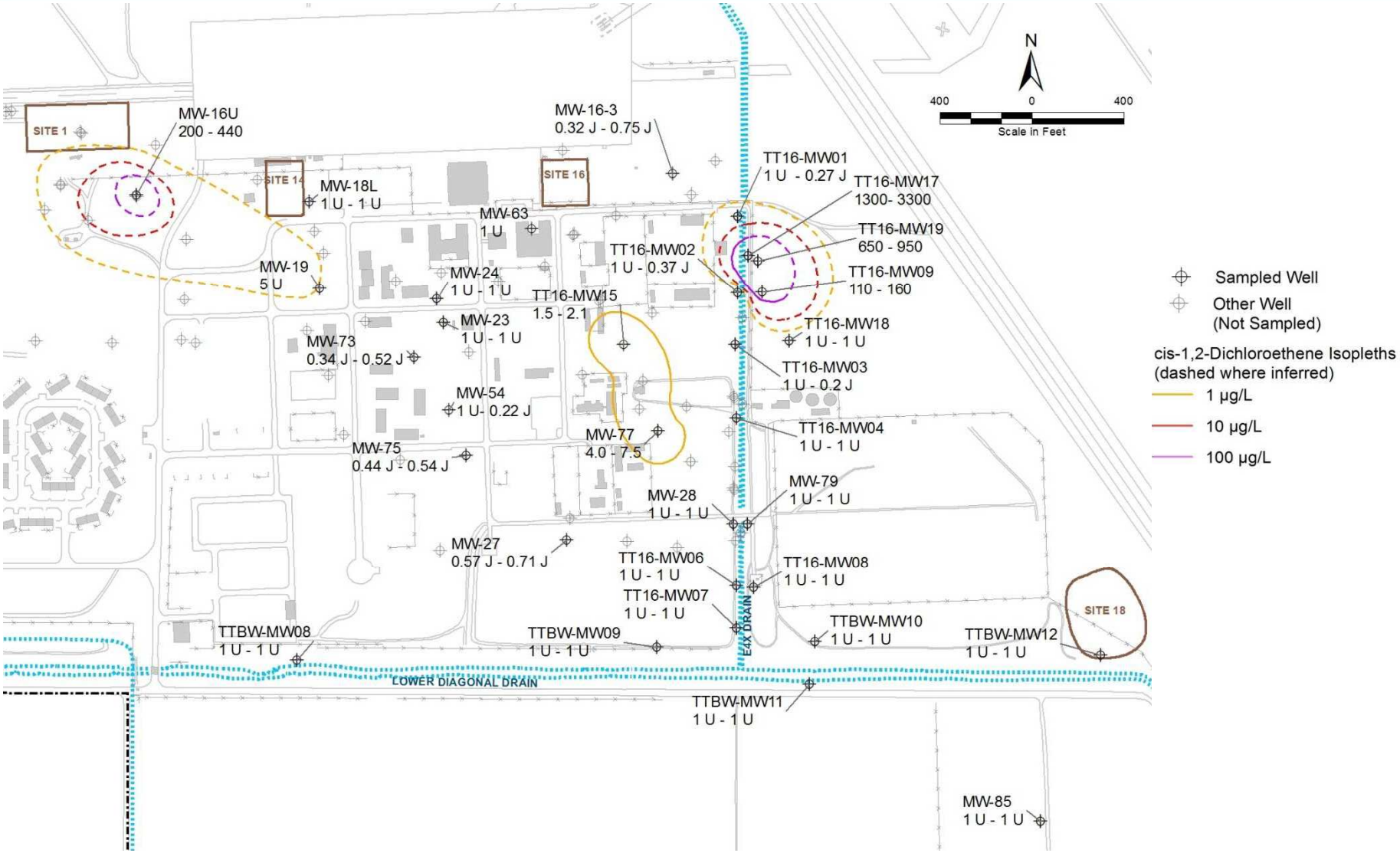
2010/2011 Results – PCE in Groundwater, Southeast Quadrant



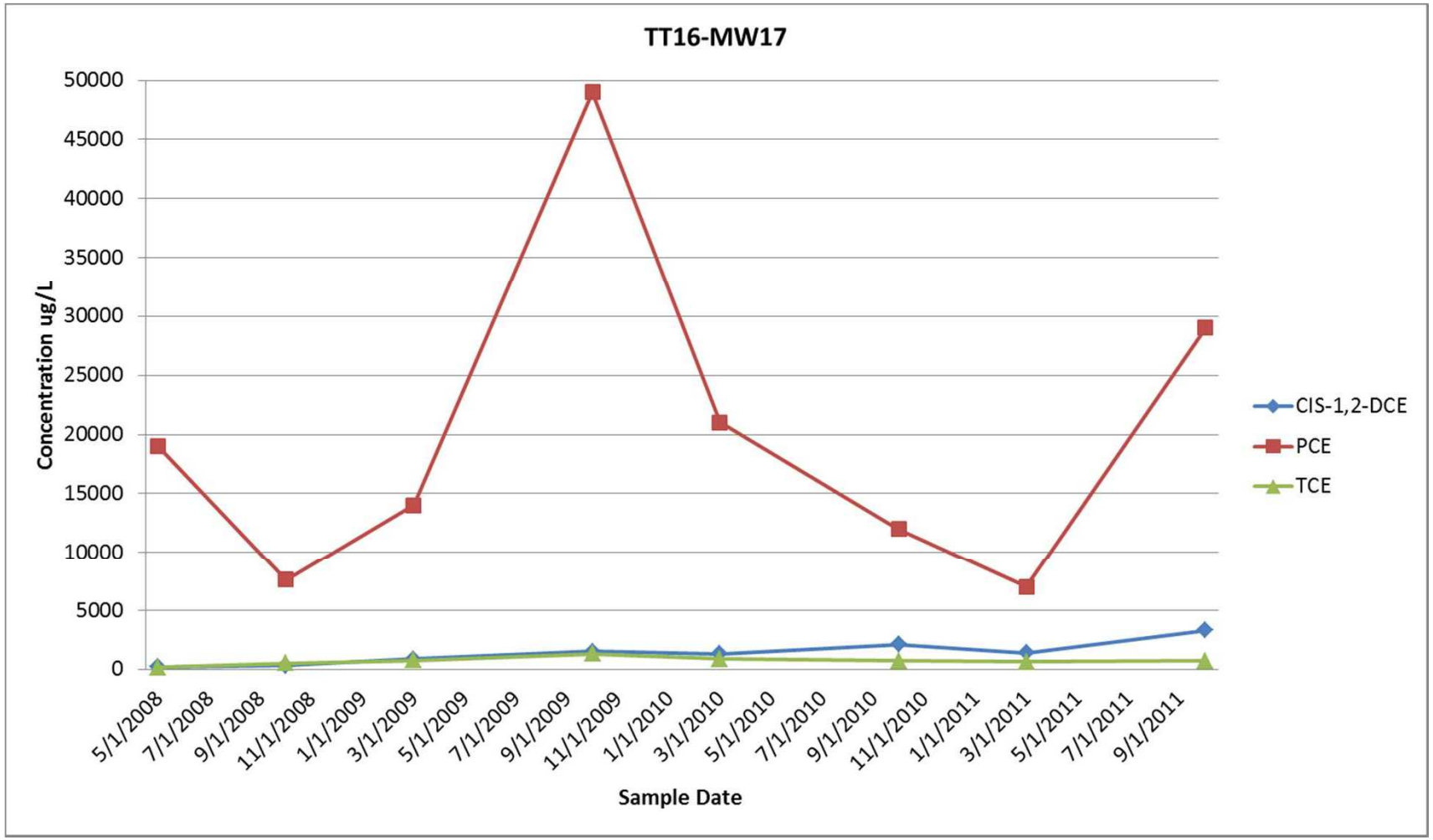
2010/2011 Results – TCE in Groundwater, Southeast Quadrant



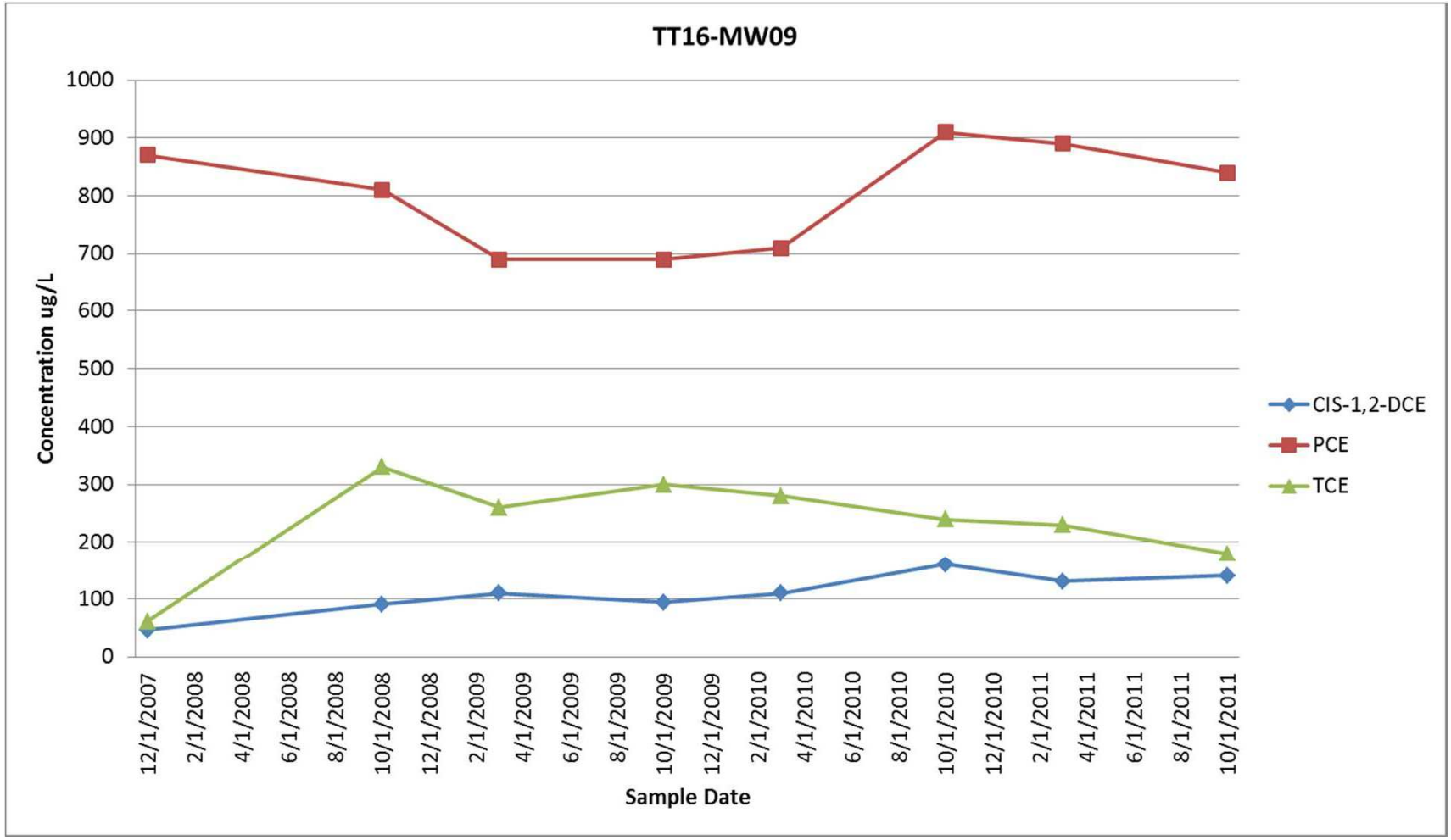
2010/2011 Results – cis-1,2-DCE in Groundwater, Southeast Quadrant



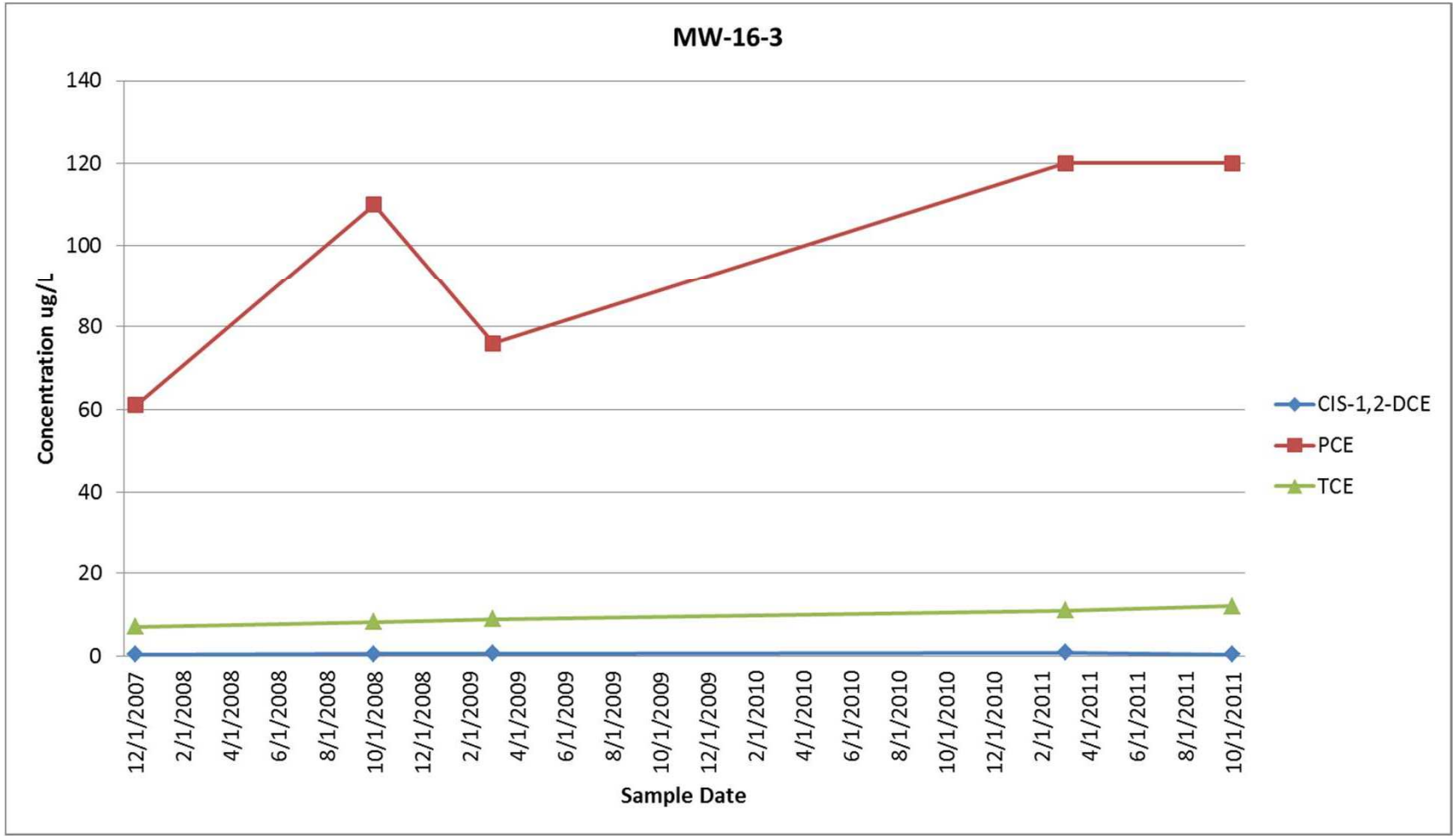
Trends for Chlorinated Solvent Compounds, Southern OU (E4X Drain Area)



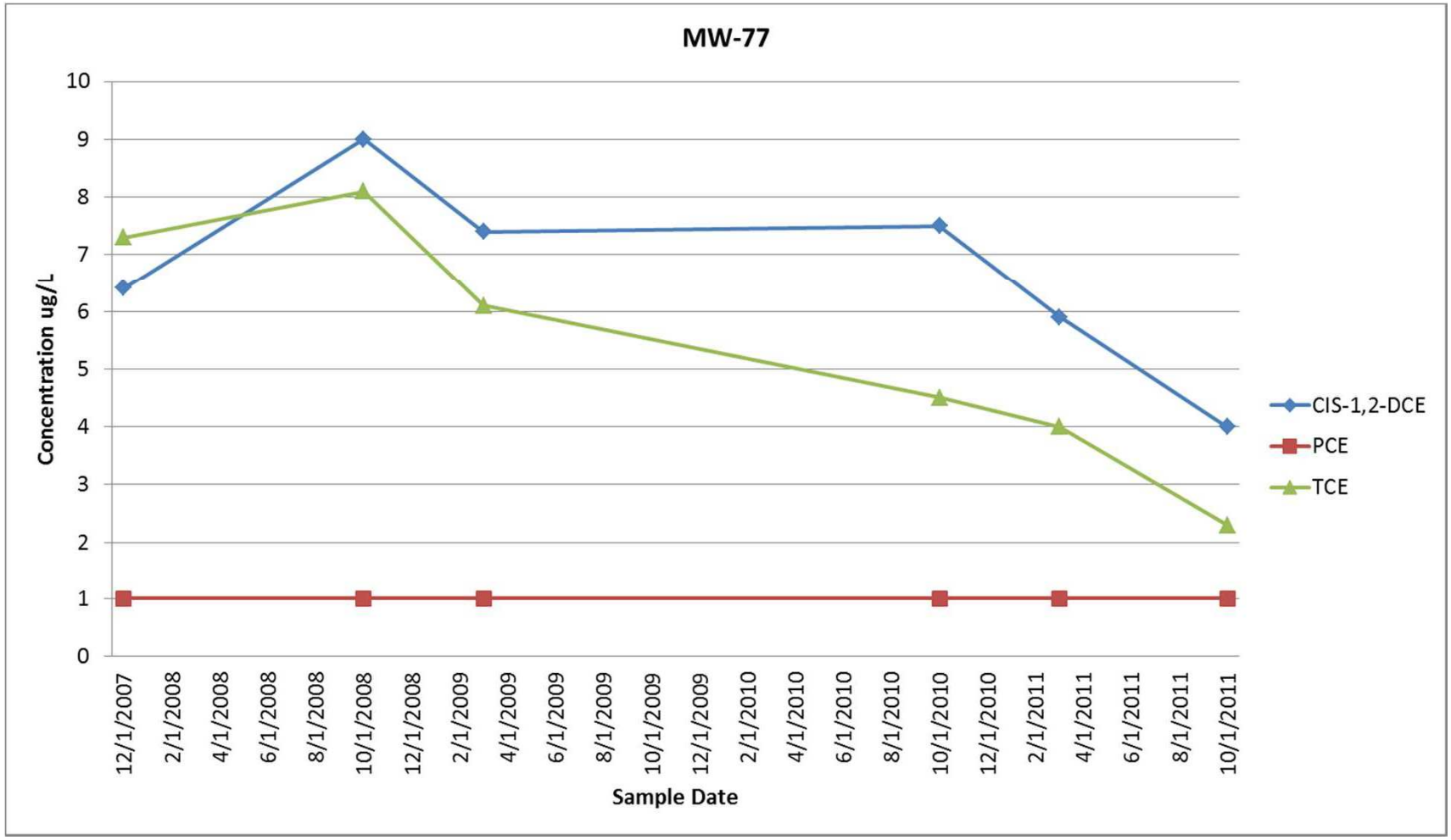
Trends for Chlorinated Solvent Compounds, Southern OU (E4X Drain Area)



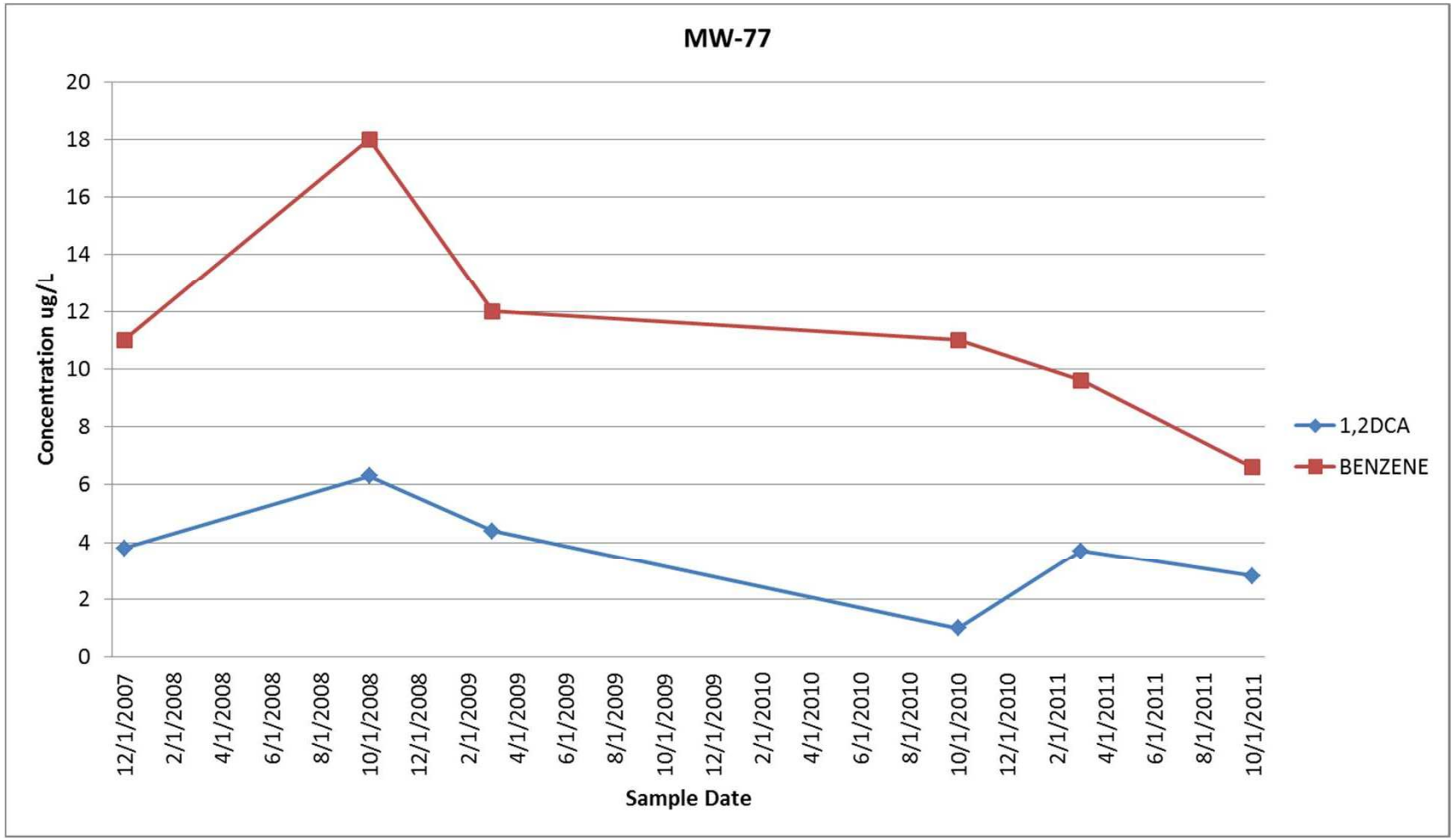
Trends for Chlorinated Solvent Compounds, Southern OU (Site 16)



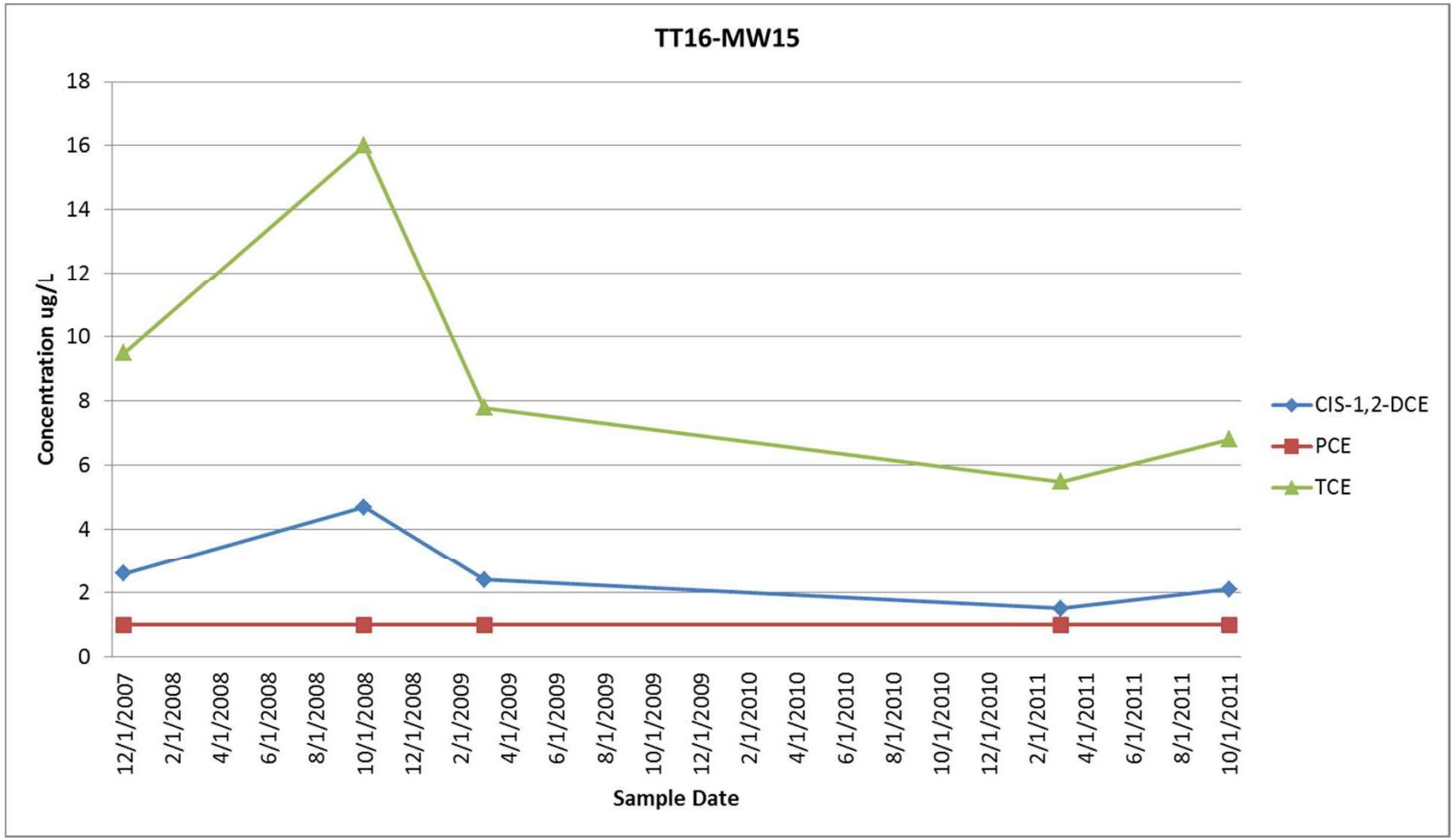
Trends for Chlorinated Solvent Compounds, Southern OU (South of Site 16/West of E4X Drain)



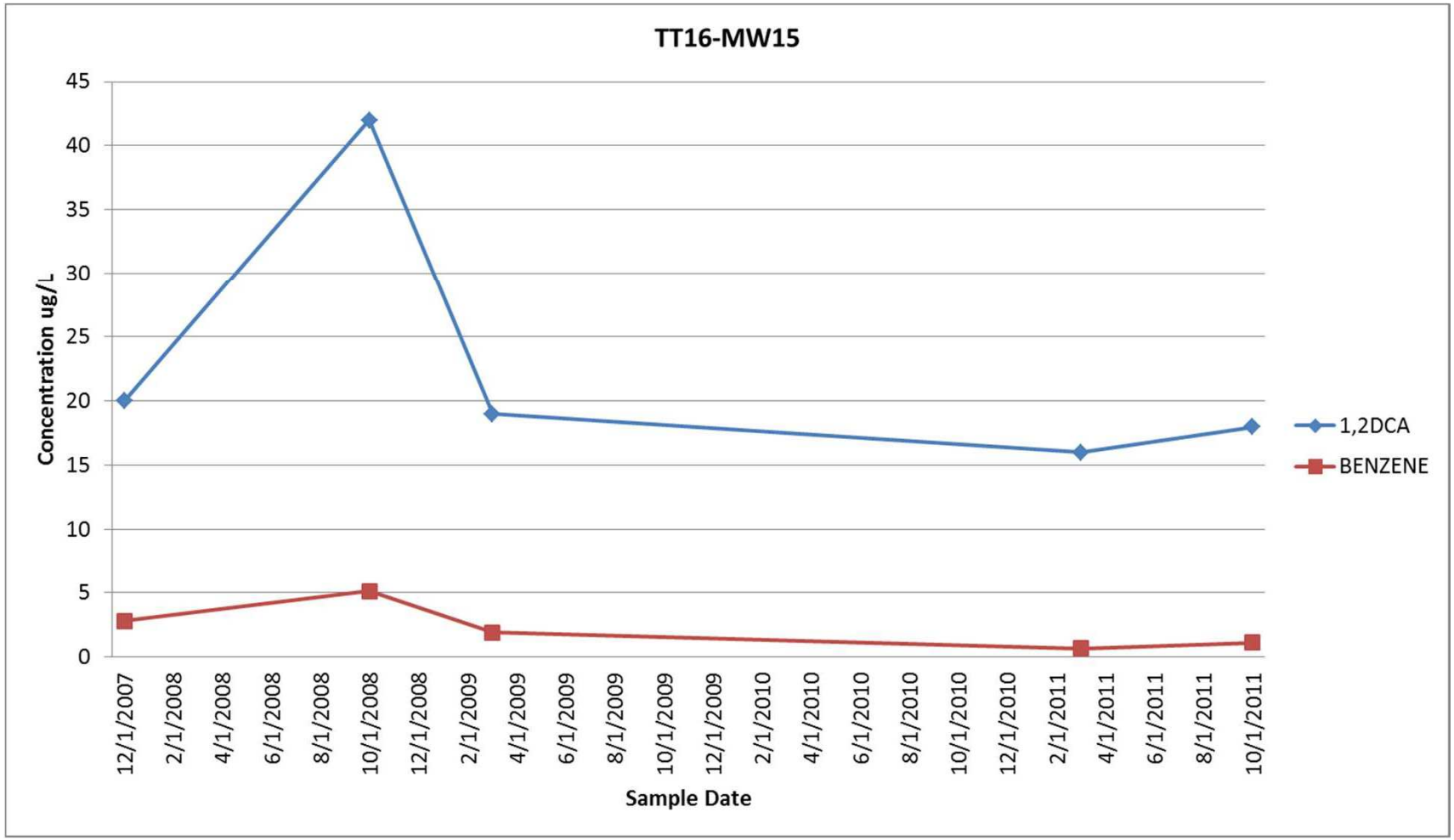
Trends for Hydrocarbon Compounds, Southern OU (South of Site 16/West of E4X Drain)



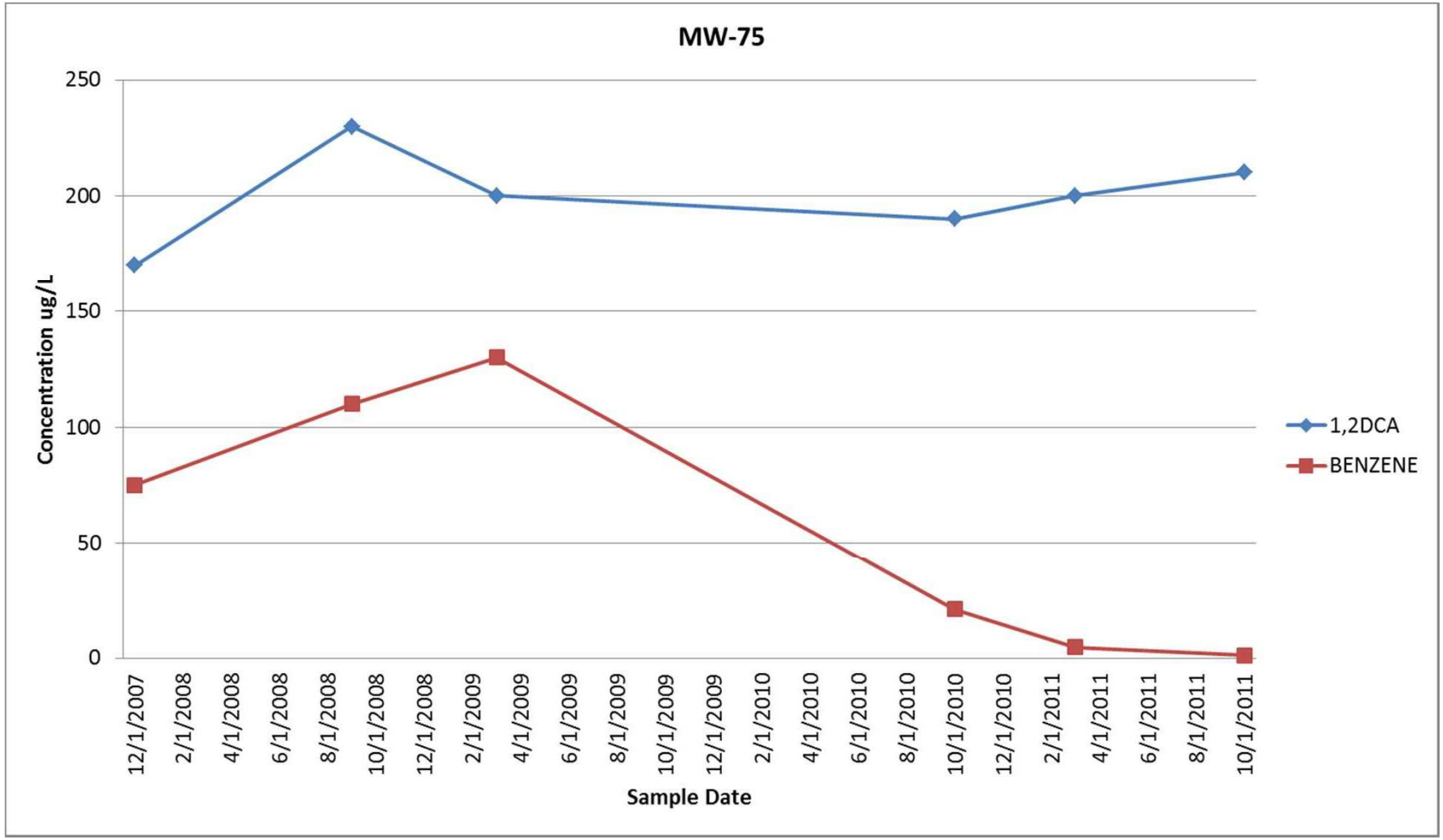
Trends for Chlorinated Solvent Compounds, Southern OU (South of Site 16/West of E4X Drain)



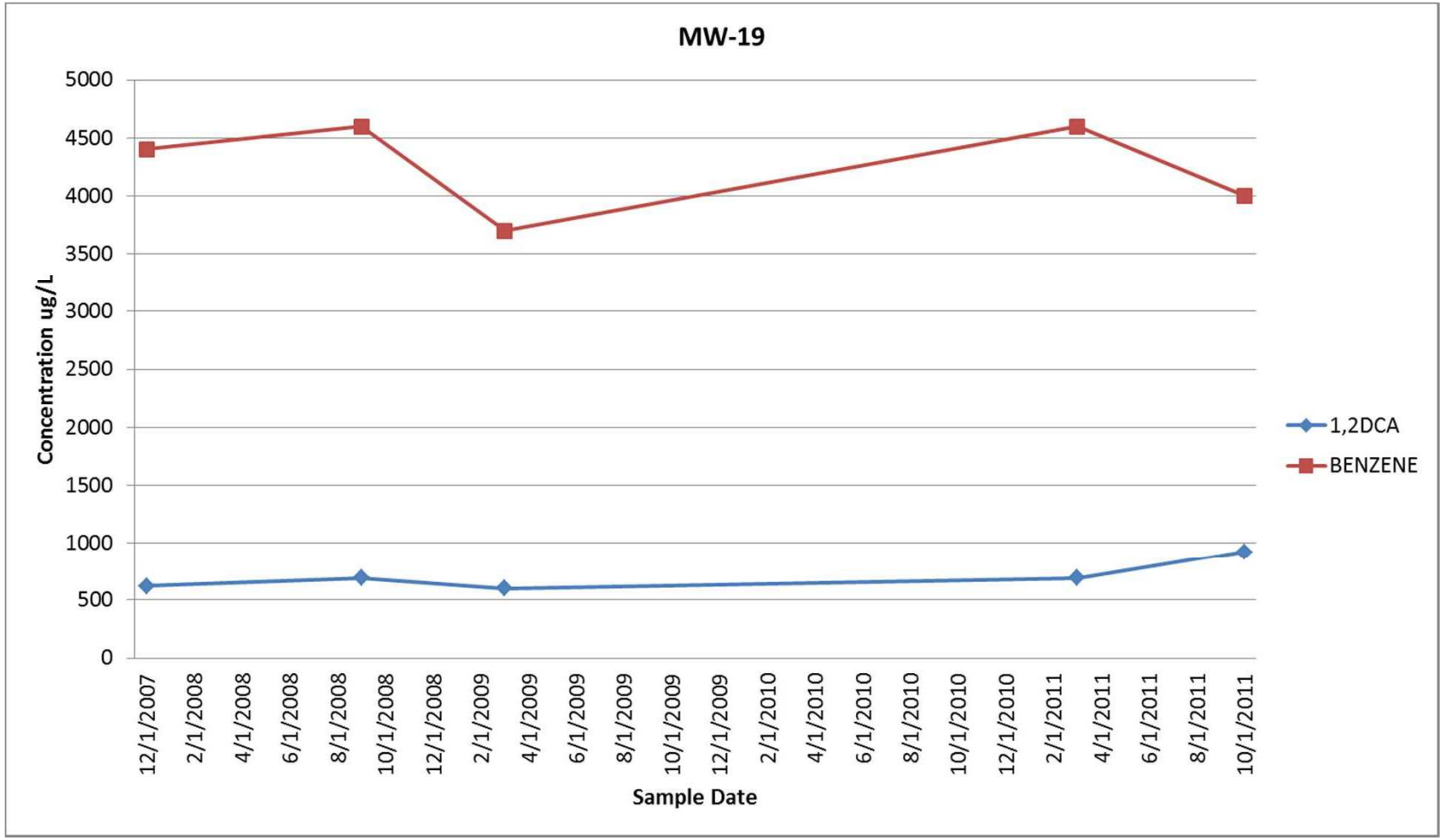
Trends for Hydrocarbon Compounds, Southern OU (South of Site 16/West of E4X Drain)



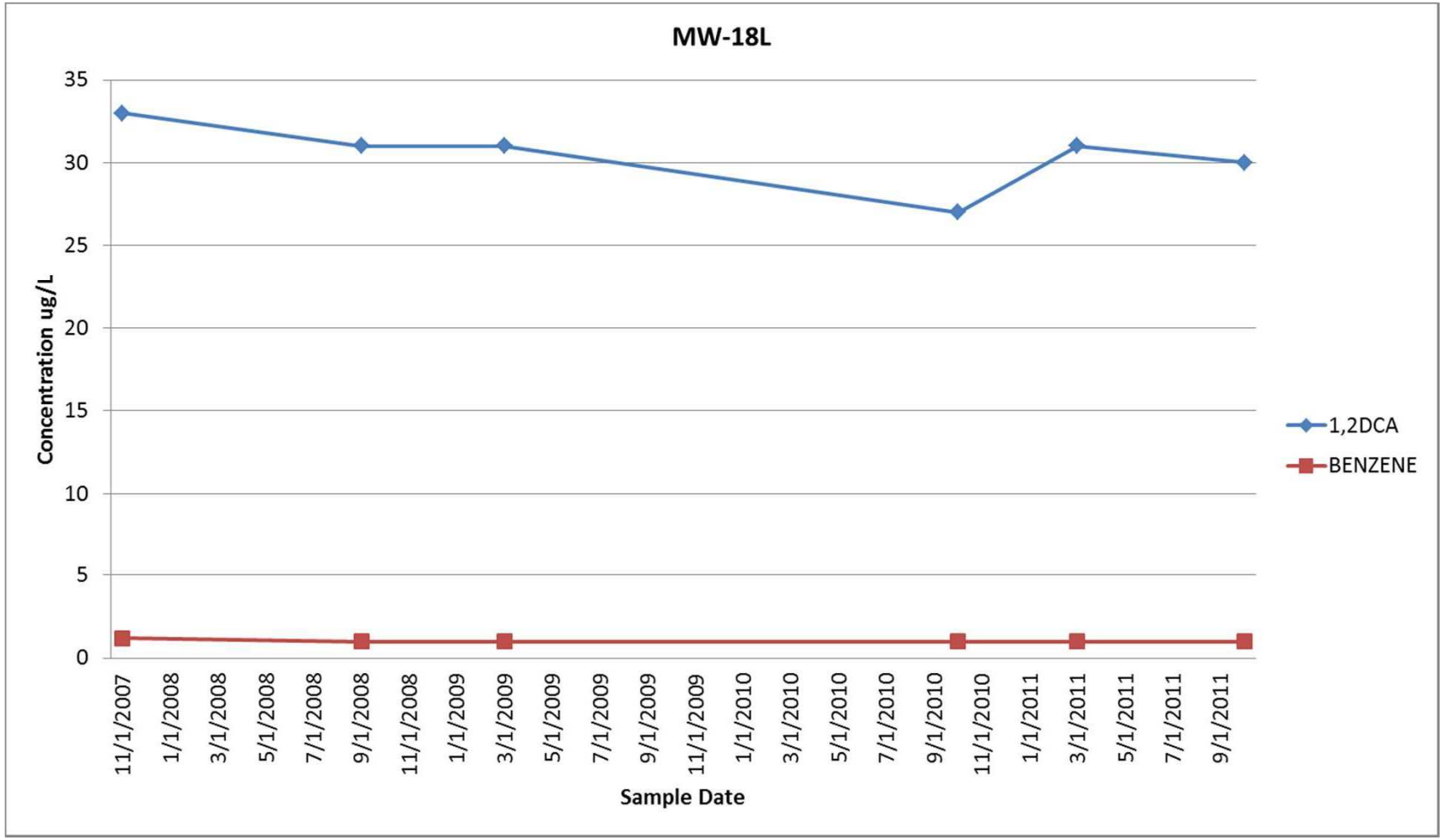
Trends for Hydrocarbon Compounds, Southern OU (Southeast of Site 14/West of E4X Drain)



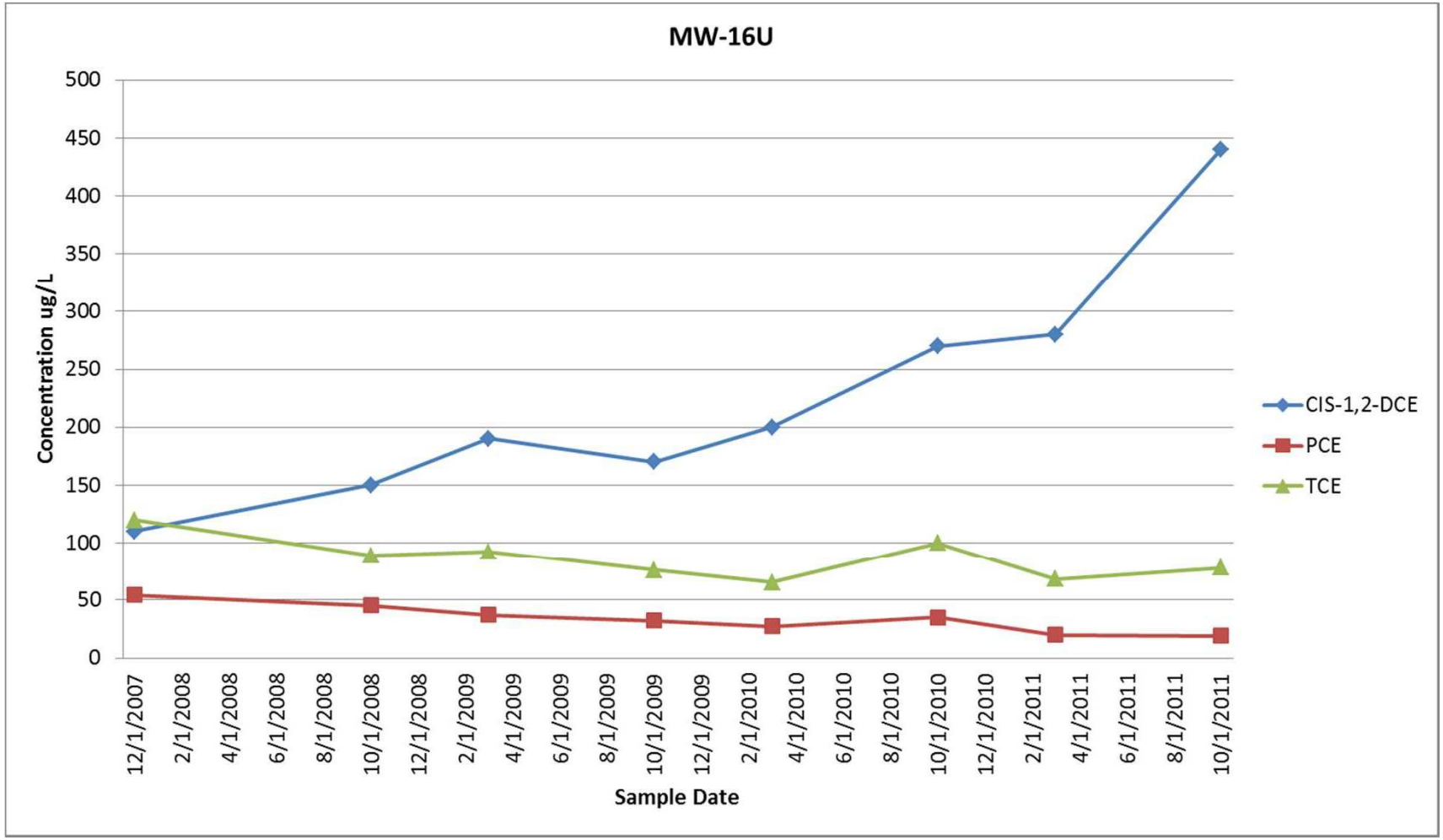
Trends for Hydrocarbon Compounds, Southern OU (South of Site 14)



Trends for Hydrocarbon Compounds, Southern OU (East of Site 14)



Trends for Chlorinated Solvent Compounds, Southern OU (Southeast of Site 1)



Basewide Hydrologic Monitoring Conclusions/Recommendations

- Current focus of the NAS Fallon IRP is the Southern OU
- Conduct quarterly groundwater monitoring along E4X Drain in 2012 as part of the time-critical removal action (TCRA)
- Future groundwater monitoring efforts will be evaluated during the Feasibility Studies for the various OUs and sites
- Prioritize monitoring wells (identified in the WUP) to plug in coordination with NDEP, as funding becomes available
- Update WUP following well plugging

Looking Forward 2012/2013 – IRP Schedule

- **IR and Petroleum Sites**
  - RI/FS and Petroleum Sites Reports
  - Continue to optimize fuel removal action at Site 2
  - Complete TCRA at E4X Drain
  - 2012/2013 – Record of Decisions and Corrective Action Plans
  - 2013 – Remedial Actions

- **Basewide Hydrologic Monitoring**
  - 2012 – Annual groundwater monitoring focused on Southern OU
  - Reporting – Draft 2010/2011 Biannual Basewide Monitoring Report
  - Implement Wellhead Protection Program – well plugging

Question and Answer - ??

Naval Air Station Fallon

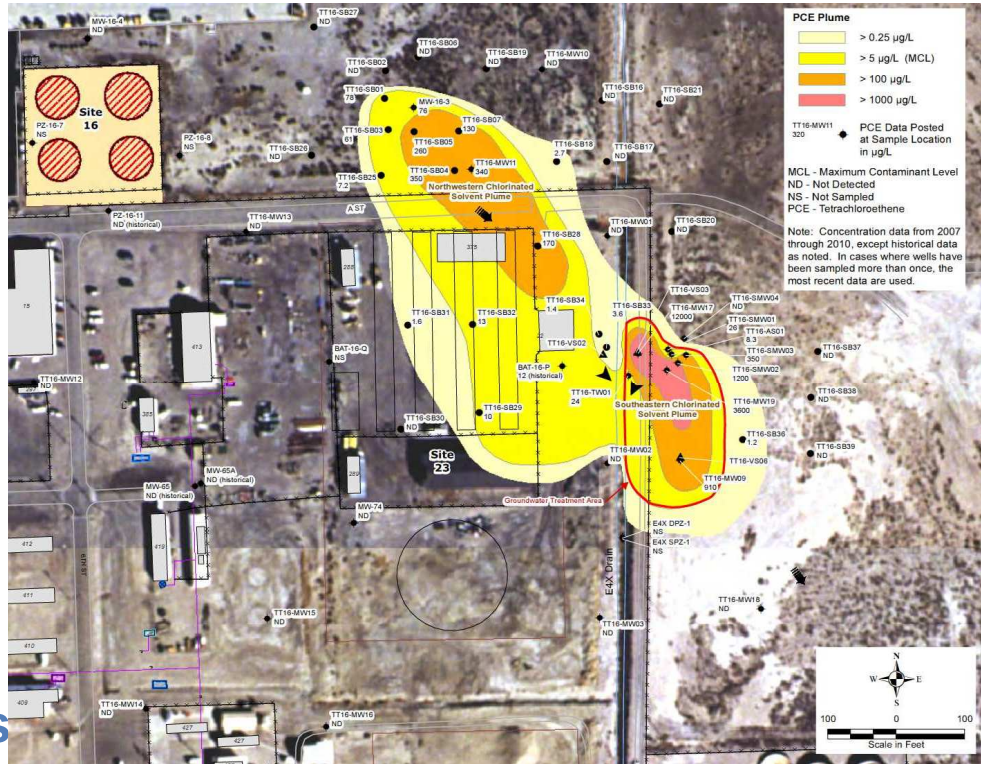
Site 16 Time Critical Removal Action Status Report

Remedial Project Manager Meeting
March 29, 2010

Mike Quesada
Remedial Project Manager
Naval Facilities Engineering Command, Southwest

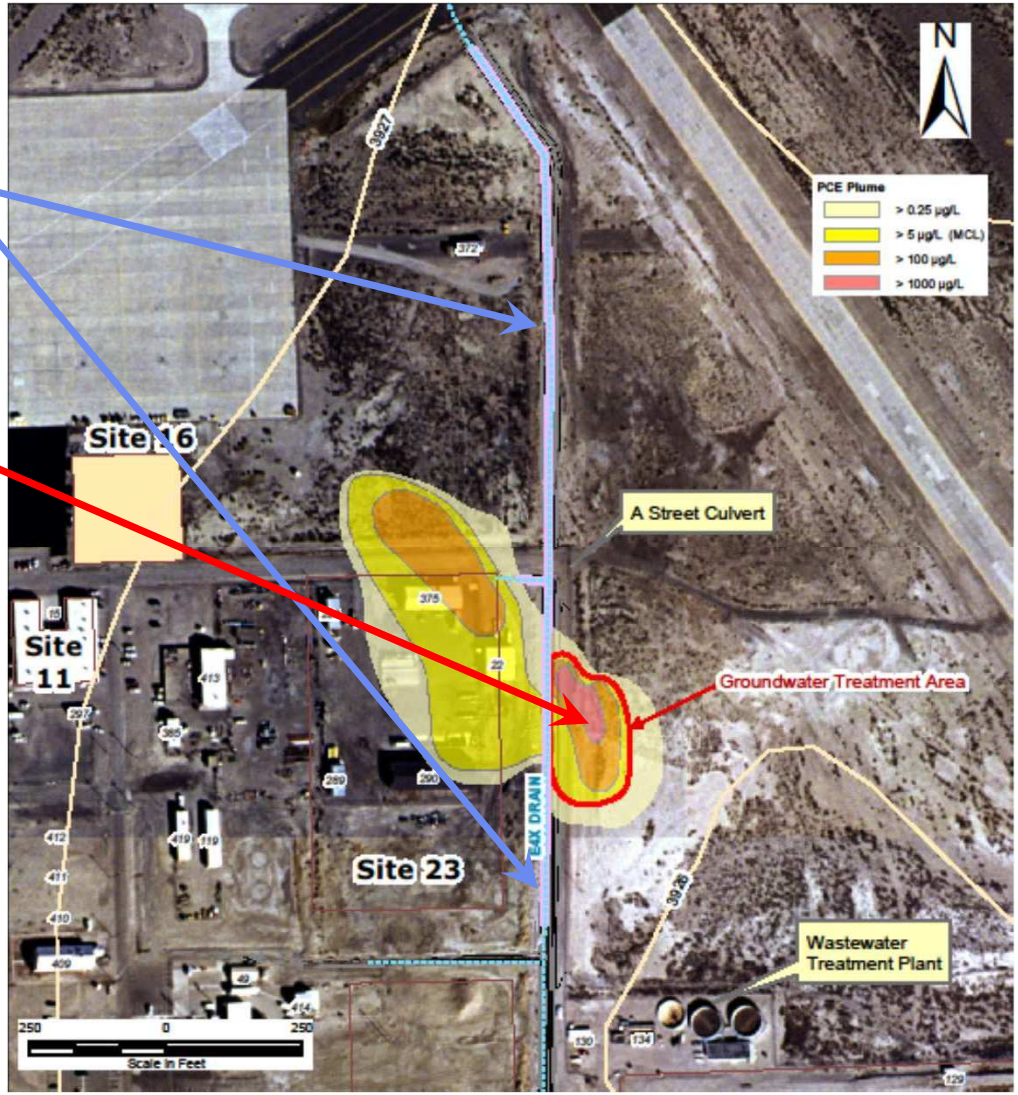
Site 16 Time Critical Removal Action Timeline

- 2004: PCE and TCE detected in BAT-16-P and MW-16-3
- 2005: Passive gas survey delineates plume North of A Street
- 2007/2008: RI; South plume delineated
- 2009: Air sparging/SVE pilot test conducted
- 2011: TCRA Action Memorandum
- January 2012: Construction begins
- March 7, 2012: Groundwater treatment startup
- March 2012: Drain modification complete



Site 16 Time-Critical Removal Action Description

- **Components of TCRA:**
  - E4X Drain Modification
  - Groundwater treatment system (PulseOx)



Site 16 TCRA Component—E4X Drain Modification

➢ **E4X Drain modification:**

- Backfilled drain to raise bottom of drain from 3918 to 3920 feet above mean sea level, approximately 1.5 feet above historical high groundwater levels
- The drain will be dry outside of irrigation season, except for precipitation events
- During irrigation season, surface water may be present in drain, but only under losing stream conditions
- The reduction of gaining stream conditions eliminates the groundwater-to-surface water contaminant migration pathway

PulseOx Groundwater Treatment System Details

- Injects hydrogen peroxide (liquid) and ozone (gas)
- These combine to form a stronger oxidant—hydroxyl radicals
- Hydroxyl radicals non-selectively oxidize all organic compounds in the aquifer, including chlorinated solvents

$$H_2O_2 + H_2O \longrightarrow HO_2^- + H_3O^+$$

(hydrogen peroxide)

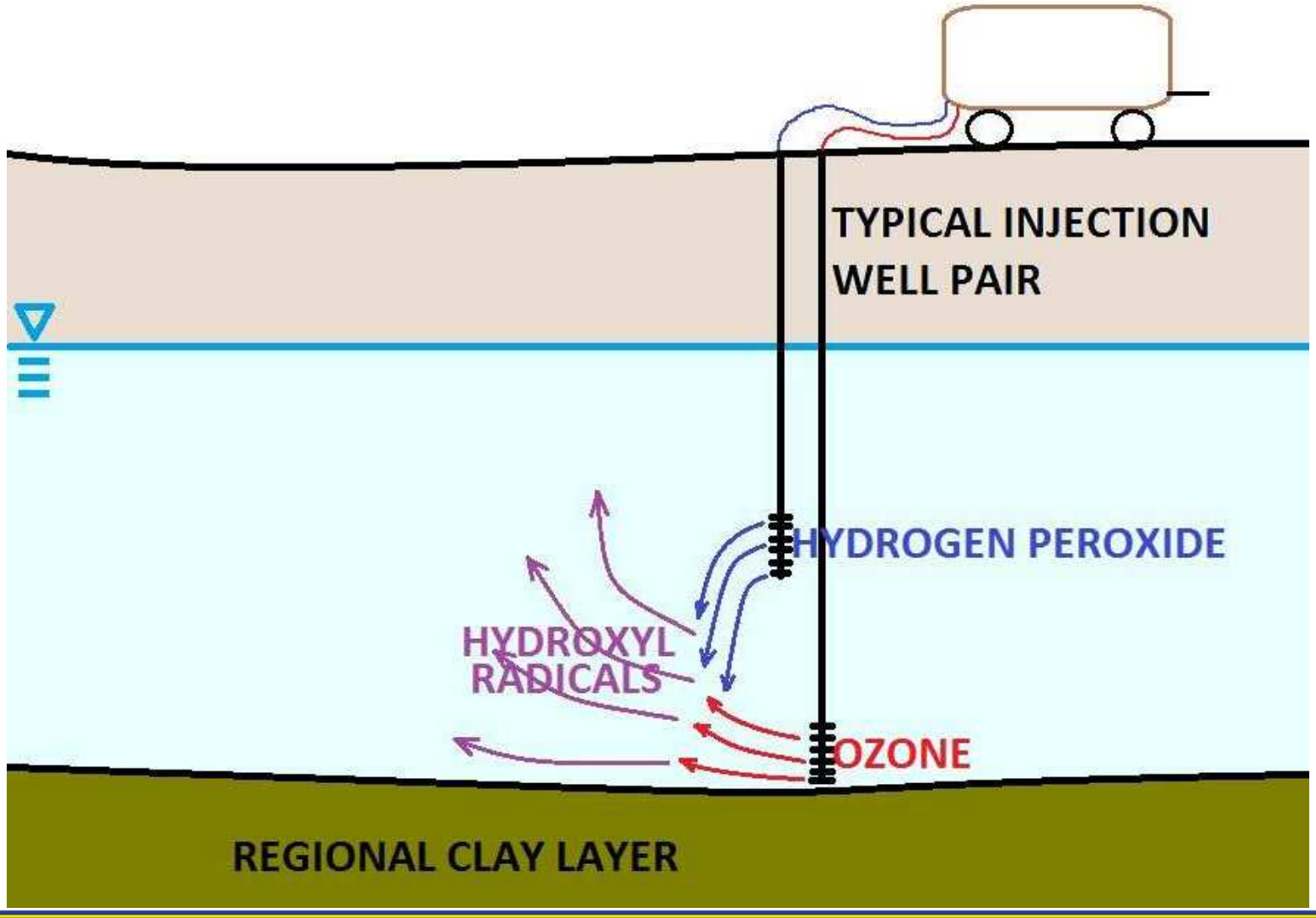
$$O_3 + HO_2^- \longrightarrow OH\cdot + O_2^- + O_2$$

(ozone) (hydroxyl radical)

$$C_2HCl_3 \xrightarrow[\text{yields}]{OH\cdot} CO_2 + H_2O + Cl^-$$

(TCE) (simplified)

PulseOx Hydrogen Peroxide/Ozone Injection Schematic



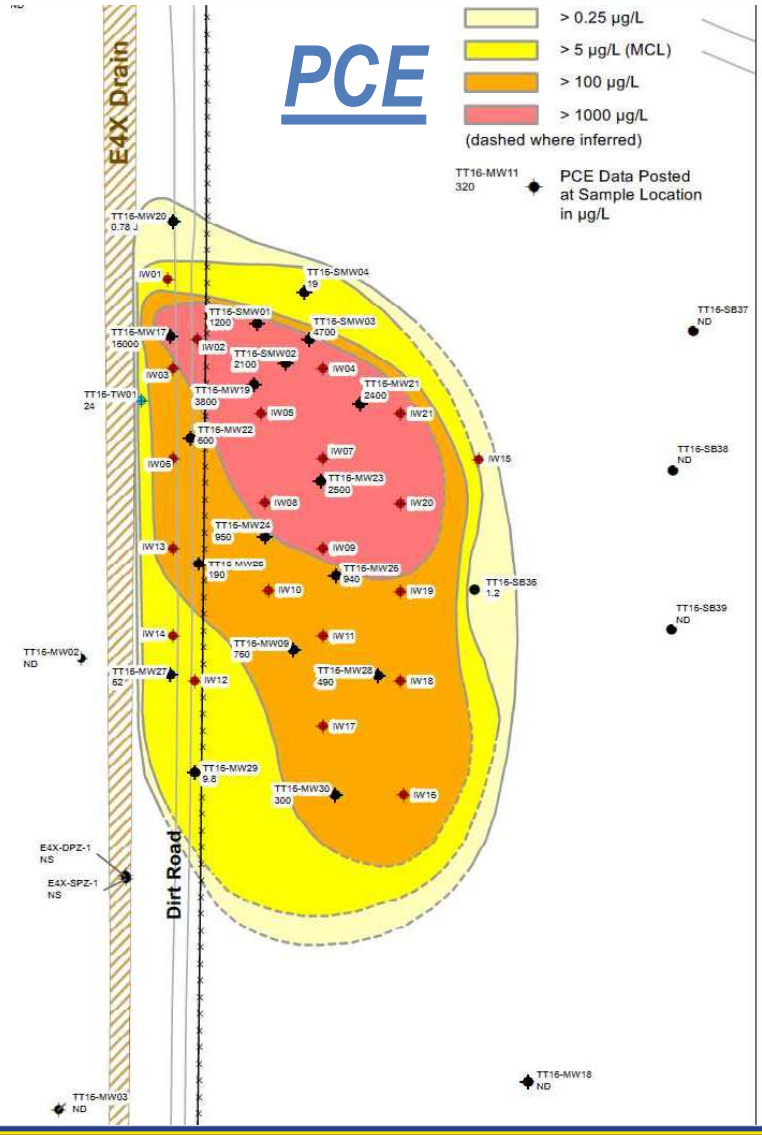
Site 16 TCRA—Groundwater Treatment

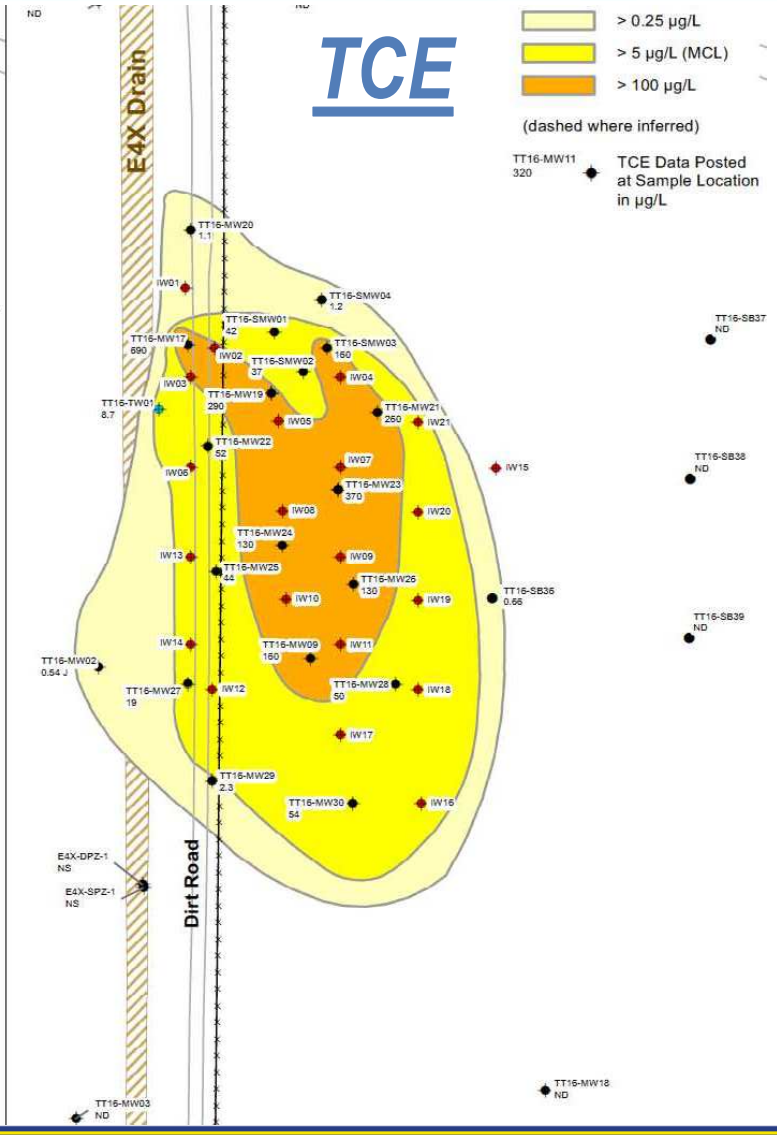
- Installed and sampled 10 new monitoring wells to delineate plume and monitor treatment effectiveness

- Installed 21 pairs of hydrogen peroxide/ozone injection wells

- Adjusted locations of two injection well pairs (IW-15) and (IW-16) to better capture the plume's center of mass

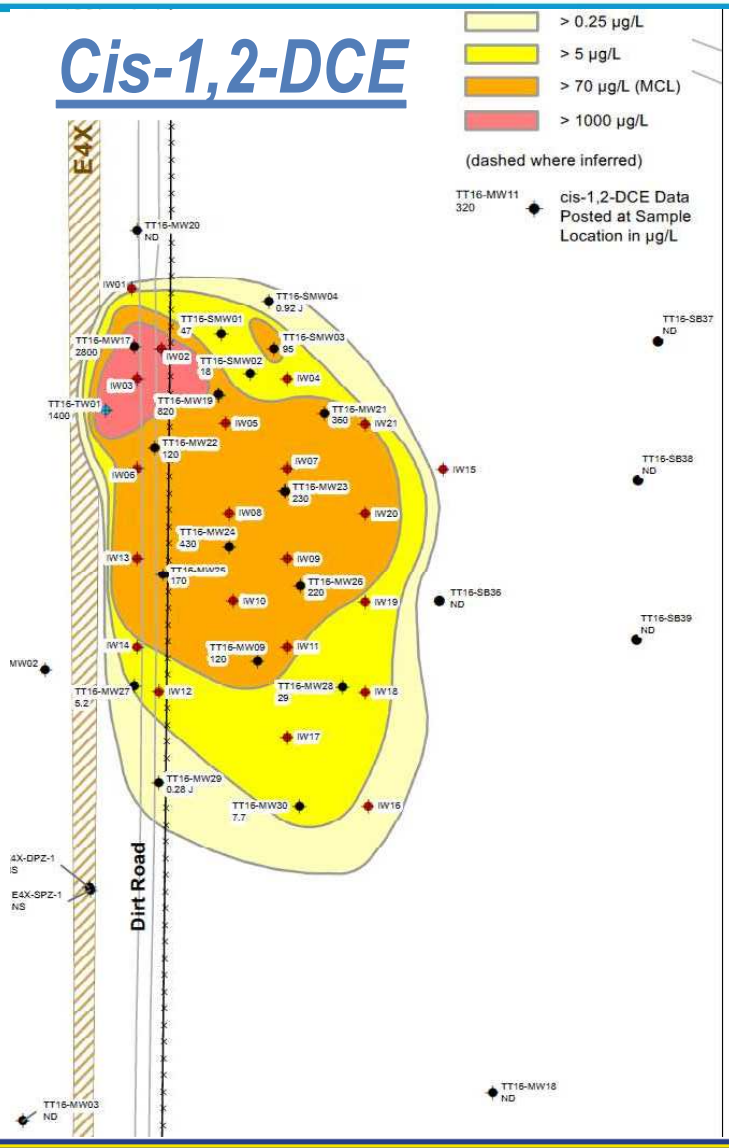
PCE and TCE Plumes During Baseline Sampling



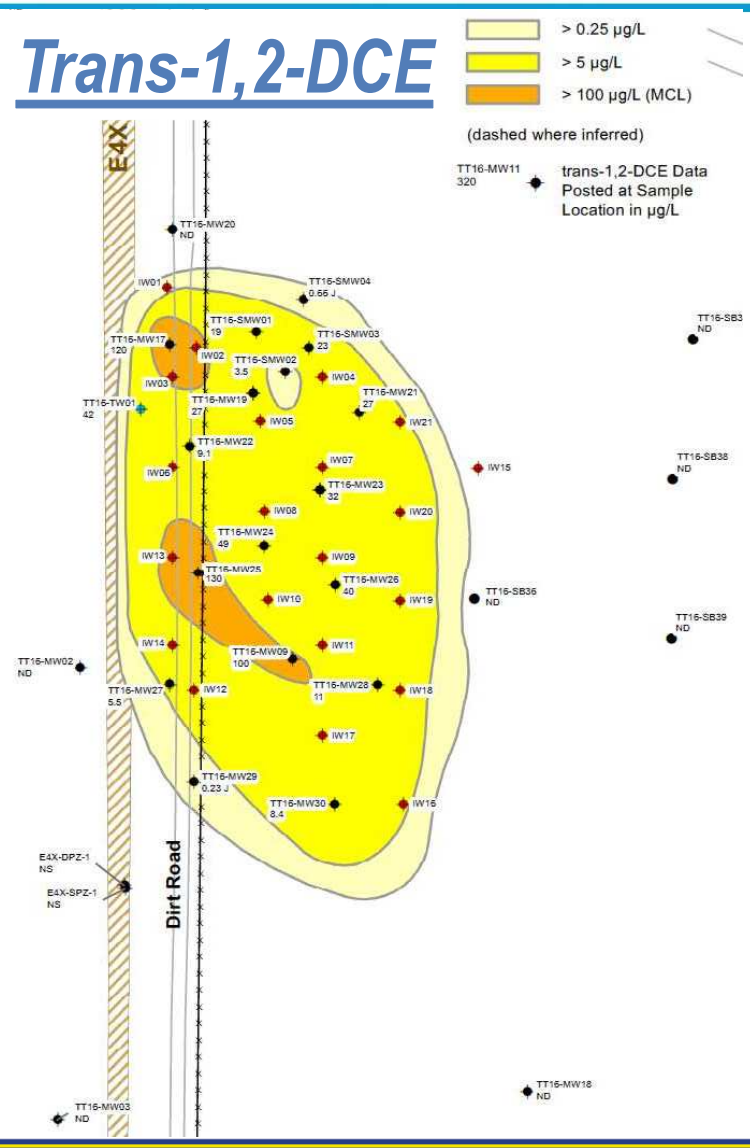


Cis-1,2-DCE and trans-1,2-DCE Plumes During Baseline Sampling

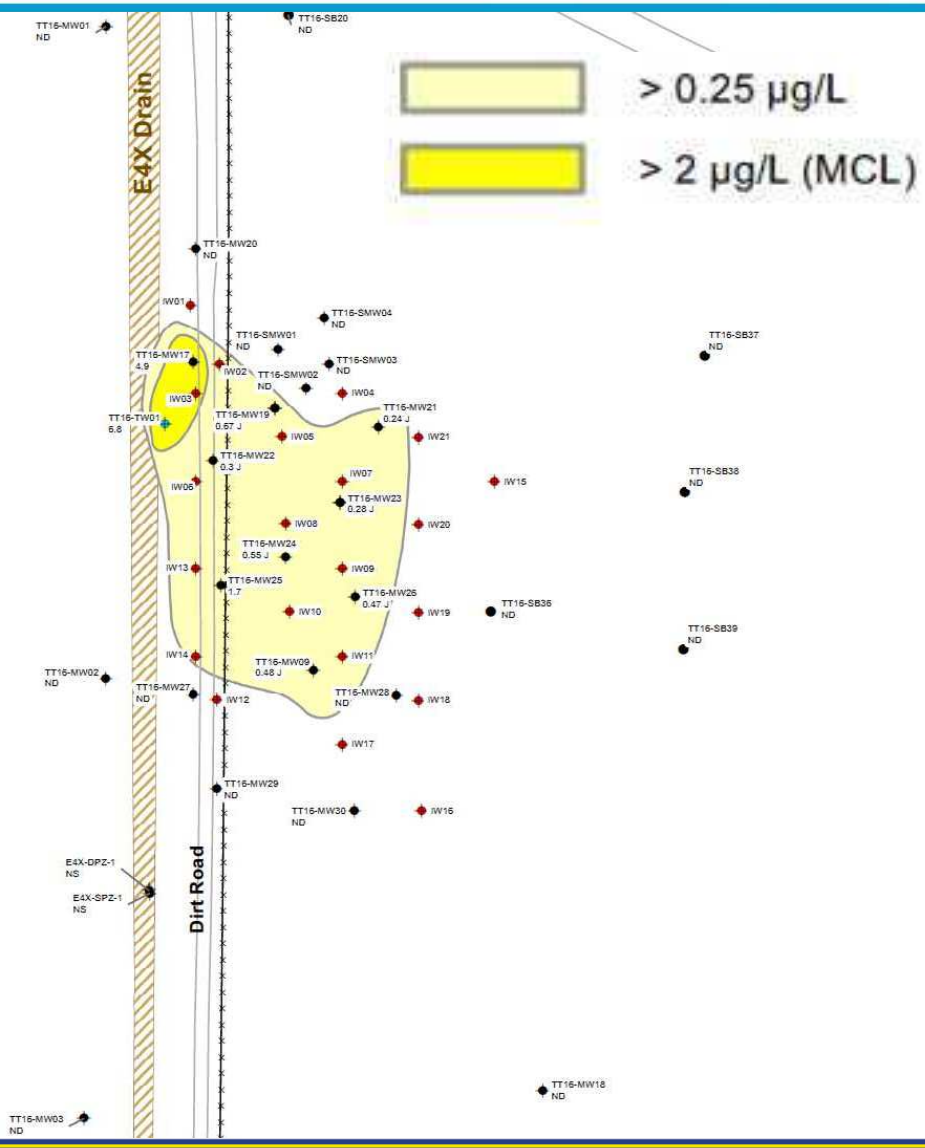
Cis-1,2-DCE



Trans-1,2-DCE

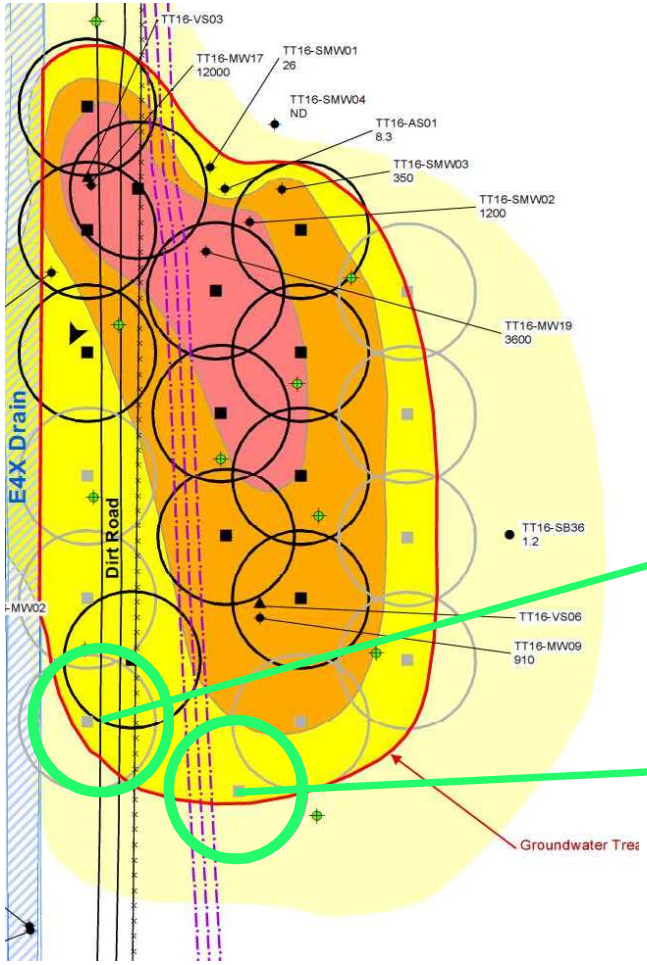


Vinyl Chloride Plume During Baseline Sampling

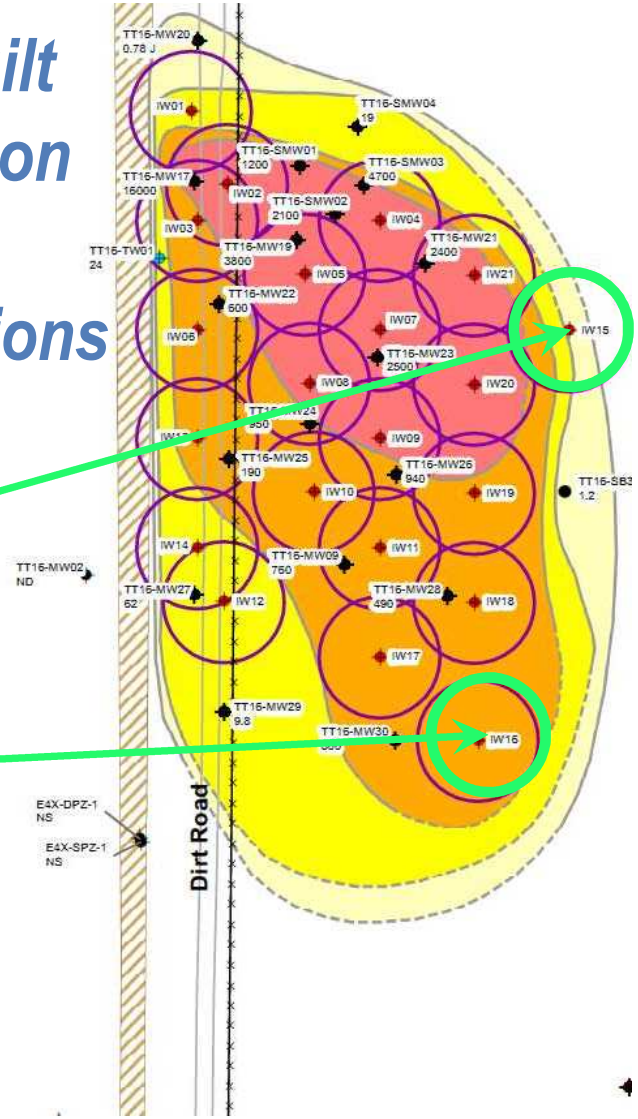


Injection Wells IW15 and IW16 Locations Adjusted

Planned Injection Well Locations

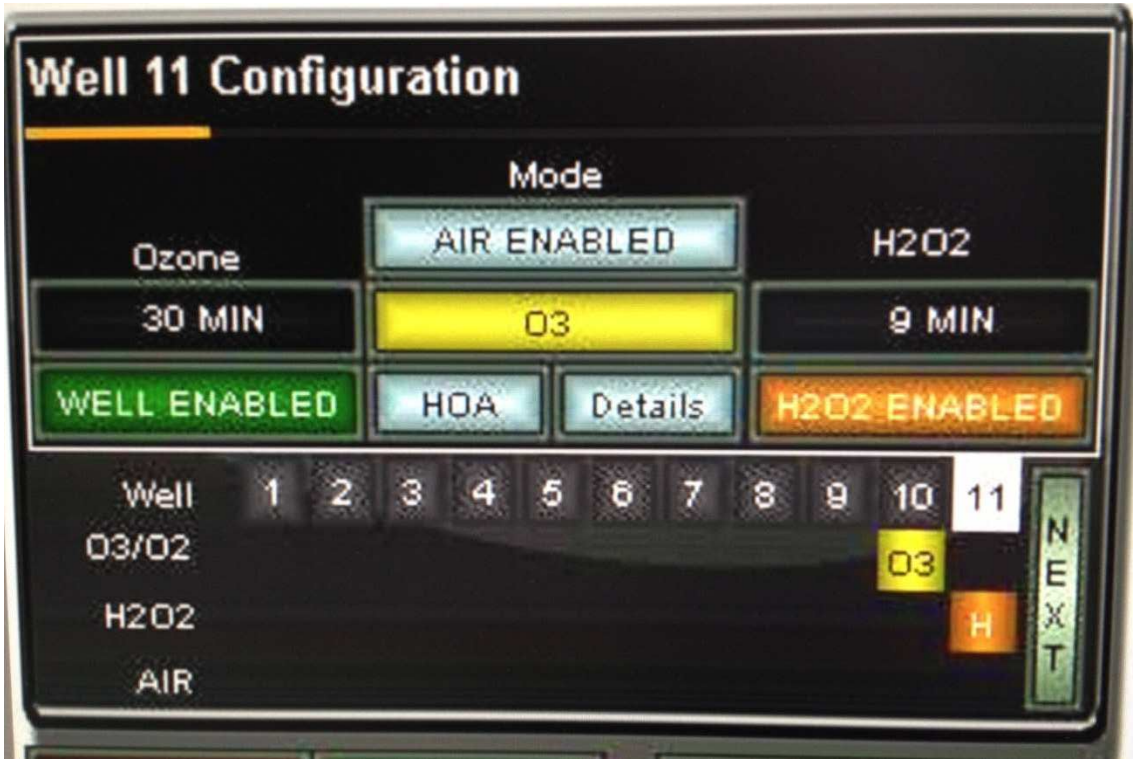


As-Built Injection Well Locations



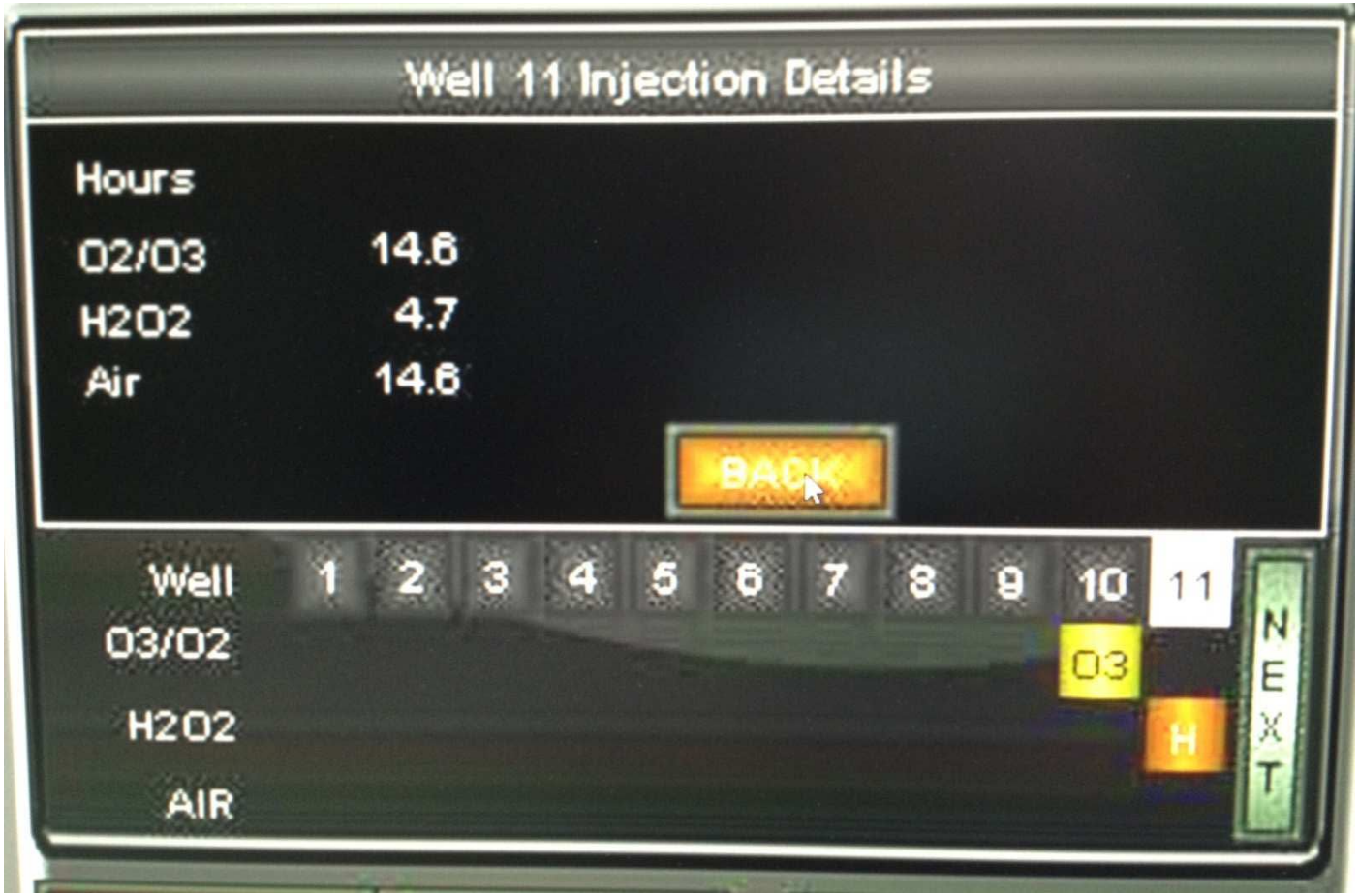
Groundwater Treatment System Remote Interface

- Groundwater treatment system is connected to O&M personnel via cell phone link
- O&M personnel receive daily updates on system performance and instant notification of alarms or system shutdown
- O&M personnel can view (and adjust, if necessary) most system parameters from a secure, password-protected internet portal



Groundwater Treatment System Remote Interface

- System automatically logs and tracks the hours of ozone and hydrogen peroxide injected at each injection well



Groundwater Treatment Performance Monitoring

- Baseline sampling completed
  - Groundwater sampling for VOCs at 21 wells
  - Groundwater sampling for natural attenuation parameters at 15 wells
  - Groundwater sampling for metals at 5 wells
- Groundwater monitoring will be conducted at 3 months, 6 months, 8 months (completion), and 3 months after shut-down
- In-situ field monitoring for oxidation / reduction potential (ORP) and dissolved oxygen (conducted approximately monthly)
- Hydrogen peroxide / ozone injection schedule may be adjusted based on the interim results