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NAS Fallon, Fallon, NV
Contract Number N62473-06-D-2206
Task Order Number 0107

Final Meeting Minutes Remedial Project Manager Meeting

**Conference Room, Environmental Department, Building 307, NAS Fallon, Fallon, NV
Naval Air Station Fallon
Fallon, Nevada**

October 6, 2011

These minutes summarize the Remedial Project Manager (RPM) meeting held by the Department of the Navy (Navy) on August 31, 2011, related to the Installation Restoration Program (IRP) updates and other on-going site investigation and cleanup efforts at the base.

The meeting was held between 10:00 AM and 12:30 PM, and the subsequent site walks were held between 1:30 PM and 3:30 PM after a one-hour break for lunch.

Agenda

- Meeting agenda ([Attachment A](#))

Meeting Participants

NAVFAC SW Remedial Project Manager: Mike Quesada

NAS Fallon Environmental (NAS Fallon Env.): Stephen McKay, Becky Kurtz, Debora Waxer

Nevada Division of Environmental Protection (NDEP): Scott Smale, Alison Oakley

The Alliance Compliance Group Joint Venture (Alliance): Mehrdad Javaherian, Wenqian Dou

Tetra Tech EM (Tetra Tech): Kathy Monks, Ken Powell, Diane MacMillan, David Berestka

A sign-in sheet is included as [Attachment B](#).

A brief introduction and description of the IRP and site investigation design were provided by Mr. Quesada. Then the meeting proceeded to a presentation ([Attachment C](#)). This presentation was divided into four parts, each by a different presenter.

Part I (Slides #1 and #2)

Meeting Agenda, by Mr. Mike Quesada from NAVFAC SW

Mr. Quesada discussed the IRP Site Map and pointed out that the petroleum sites are separated because they need to be covered under the petroleum program. Limited sampling has been proposed and conducted for landfill sites to verify whether existing covers are still protective.

Part II (Slides #3 to #12)

Hot Pit #3 Site Investigation (SI) and Landfill Site 18 Supplemental SI, by Mr. Mehrdad Javaherian from Alliance

Presentation Highlights:

Summary of Hot Pit #3 SI results:

- Groundwater flow direction: The data from the three newly installed wells indicate that groundwater flows at the site towards the southeast, which is consistent with the regional flow direction at NAS Fallon.
- Soil: Total petroleum hydrocarbons as kerosene (TPH-k) is the only chemical detected above the screening level at two locations (both at 5 feet below ground surface [bgs]).
- Groundwater: TPHs were detected at multiple locations at the site at concentrations from 20J micrograms per liter ($\mu\text{g/L}$, “J” indicates estimated values) to 645,000 $\mu\text{g/L}$. There are no applicable standards available for TPH in groundwater. Benzene, toluene, ethylbenzene, and xylenes (BTEX) or methyl tert-butyl ether (MTBE) were detected but below the U.S. Environmental Protection Agency (EPA) Drinking-Water Maximum Contaminant Levels (MCL).
- Recommendation: Annual groundwater monitoring to verify plume stability.

The Summary of Landfill Site 18 SSI results (Mr. Javaherian pointed out that data for Site 18 SSI are preliminary and subject to change once data validation is completed; however, right now, there is no indication that there is any major issue about these preliminary data):

- Geophysical survey: The Site 18 boundary has been revised based on the geophysical survey results, which confirmed the locations of the four known disposal trenches.
- Soil: Dioxins were the only chemical group with reported exceedances across the site.
- Groundwater: No chemicals were detected, except for total petroleum hydrocarbons as diesel (TPH-d) and total petroleum hydrocarbons as gasoline (TPH-g), which were detected at 10J to 16J $\mu\text{g/L}$. Specifically, aldrin, which was historically detected in groundwater close to Site 18, and its oxidation product dieldrin were not detected above their respective reporting limits of 0.006 $\mu\text{g/L}$ and 0.01 $\mu\text{g/L}$. Although the detection limits are above the screening levels (0.004 $\mu\text{g/L}$ for aldrin and 0.0042 $\mu\text{g/L}$ for dieldrin), they are the lowest technically achievable in a commercial laboratory.
- Recommendations: Perform human health risk assessment for soil, and conduct a focused feasibility study (FFS) to evaluate remedial alternatives, followed by a proposed plan and a Record of Decision (ROD) for the selected remedy.

Additional Discussion:

Slide #6: Hot Pit #3 groundwater results – NDEP Comment: MW-6, which is the downgradient well, did not show anything different from MW-5. Were the pipes pressure-tested, since there is suspected leaking due to high concentrations of TPH?

Navy Response: All three new groundwater monitoring wells (MW-4 through MW-6) have the same concentrations of TPH-k (110 µg/L) and were “not detected” (ND) for other chemicals, which indicate commingled contamination from several historical releases, rather than only from Hot Pit #3. The base conducts pressure-testing of the pipes each year, and the pipes are not currently leaking. Analytical results of the grab groundwater samples at the boring locations can be skewed up by the fines in the samples.

Slide #10: Site 18 soil results – NDEP Comment: Were there burning activities happening at the site which caused the elevated dioxin levels?

Navy Response: The depths of the disposal trenches are not defined. If there were burning activities, a full suite of dioxins would be expected to be detected in the analytical results. Since there are exceedances of only two dioxins, the source may be from the pesticides used and disposed at the site. In the FFS, remedial alternatives, including a complete excavation of the landfill, will be evaluated. Mr. Javaherian added that he did a back of the envelope calculation using the maximum detections of the two exceeding dioxins and the calculated risk was at the level of 10^{-5} under residential land use scenario, and slightly over 10^{-6} under industrial/commercial land use scenario. Both of these risk values are within the risk management range. And if we would do a calculation using the 95% UCL concentrations, the risks would be even lower.

Part III (Slides #13 to #40)

Ongoing Remedial Investigations (RI) and Remediation Activities on the Base, by Mr. Ken Powell from Tetra Tech

Presentation Highlights:

- RI Addendum /Feasibility Study (FS): Initiated for 9 “active” sites
- Site 2 fuel removal: Approximately 74,000 gallons removed all together; 3,213 gallons removed between 2009 and 2011.
- Site 16 E4X Drain evaluation: Plume containment system was shut down in 2007 with concurrence from NDEP. A new solvent plume was identified, and passive soil-gas survey was used to delineate plume extent. Also completed a pilot study to test effectiveness of air-spargage/soil-vapor extraction (SVE).
- New underground storage tank (UST) site/fuel distribution system identified near Site 16: conducted passive soil-gas survey and geophysical survey.
- Site 16 time-critical removal action (TCRA): Completed drain alteration design and groundwater treatment system design.

Additional Discussion:

Slide #13: Ongoing Activities – Navy Comment: Navy is now combining RI with FS in one report to make the process more streamlined.

NDEP Response: Agree with Navy’s approach, and it also helps to save time.

Slide #15: Summary of Recent Investigations – Navy Comment: Navy RPM is now reviewing the petroleum report and expects to complete the review by September. UST Site 5 is a small site with a removed aboveground storage tank (AST). This site has a low priority.

Slide #17: Results of Floating Product/Soil Smear Zones, UST-R Site 1 – NDEP Comment: It is a gasoline tank; why is the free product in the subsurface mainly diesel?

Navy Response: Both gasoline and diesel were stored at the site.

Slide #18: Results of Floating Product/Soil Smear Zones, UST-R Site 2 – NDEP Comment: Is the free product in the subsurface also mainly diesel?

Navy Response: Both gasoline and diesel compounds are found in the subsurface at this site.

Slide #19: Results of Floating Product/Soil Smear Zones, Site 6 – NDEP Comment: Is the free product in the subsurface also mainly diesel? Was a soil gas survey also performed at this site?

Navy Response: Topsoil at the site is very soft, and the groundwater table is approximately 7 to 8 feet bgs. Site Characterization and Penetrometer System (SCAPS) was unable to gain access to the site at the time of investigation. However, prior to the SCAPS investigation, a passive soil gas survey was conducted at Site 6 in August 2006 to screen for fuel-related compounds. About 0.5 foot of floating product was found and is mainly composed of Jet Fuel #5.

Slide #20: Results of Floating Product/Soil Smear Zones, Northern OU Sites 2 and 4 – Navy Comment: The Navy removes free product from 25 wells with skimmers every week and has removed about 3,200 gallons during the last couple of years. These two sites will be kept as IR sites. Recommendations made in the RI for these two sites are to monitor the plume and verify that the free product is not migrating offsite. Even groundwater monitoring wells at the sites do not show elevated BTEX concentrations, so the free product in soil has been stable for the last 20 years also and is less likely to migrate offsite now.

Site 3 is also part of the Northern Operating Unit (OU), but will be covered in Part IV of this presentation.

Slide #21: Results of Floating Product/Soil Smear Zones, Northern OU Site 1 – Navy Comment: An approximately 0.5-foot-thick layer of free product (identified as Jet Fuel #5) was observed in 20 to 30 wells. Approximately 900 gallons of free product have been removed from the site. The wells shown at the lower right corner of the slide are pilot study wells. Surface soil at this site was removed in the past due to contamination by dioxins.

Slide #22: Results of Floating Product/Soil Smear Zones, Southern OU Site 14 – Navy Comment: Free product in the subsurface at this site is mostly gasoline and approximately 1 foot thick. Dissolved phase hydrocarbon compounds have been detected in groundwater at this site.

Slide #23: Results of Floating Product/Soil Smear Zones, Southern OU Site 16 and New UST Site – NDEP Comment: How about the pipelines showing on the picture?

Navy Response: The pipelines were transferring heating oil and are no longer intact. They are likely rusted away rather than removed. This figure looks more significant than it should be, since SCAPS cannot determine floating product vs. residual product. A lot of red area here only has residual product, and not floating product. The Navy plans to create a new UST site to further characterize and remediate remaining residual product. NDEP concurred that would be a good idea.

Slide #24: Soil-Gas/Vapor-Intrusion Results – Navy Comment: This investigation has been done in two phases. Phase II was performed six months after Phase I was completed.

Slide #25: Soil-Gas/Vapor-Intrusion Results (continued) – NDEP Comment: Did the Navy perform any indoor air sampling?

Navy Response: Indoor air sampling was not performed. A lot of the samples were collected under pavement (near slab). There's no clear-cut difference between samples collected under pavement and samples collected from open soil locations, so indoor air sampling was considered not necessary.

Slide #26: Results of Human Health Risk Assessment – NDEP Comment: Are there irrigation drains around the site?

Navy Response: Yes. They are shown on the IRP Site Map. Most of the residential areas are upgradient of the base. In addition, the Navy conducts surface-water monitoring on a monthly basis at one location that is in the Lower Diagonal Drain, downgradient of the E4X Drain; however, the frequency may be reduced to quarterly, based on the fact that no significant impact to the surface water has been found.

Slide #29: Site 16 TCRA – NDEP Comment: Will the Navy consider creating a new site out of Site 16?

Navy Response: In order to expedite the Site 16 TCRA the Navy did not create a new site near the E4X Drain. However, the Site 16 TCRA is bounded within the Southern Operable Unit and will be further evaluated in the upcoming RI/FS.

Slide #30: Site 16 TCRA (continued) – Navy Comment: There is no constant release at the site, and the source of the chlorinated solvents could be from a small debris pile observed at the site.

Slide #31: Site 16 TCRA (continued) – Navy Comment: Only during a certain time of the year would the groundwater table rise above the drain bottom. The Navy has not detected any contamination in the drain. In order to prevent the contaminants from getting into the drain and migrating offsite, it is recommended that the base of the E4X Drain be raised.

Slide #35: E4X Drain Proposed Modifications – NDEP Comment: What is the small yellow area to the right on the slide?

Navy Response: It is a low-concentration trichloroethylene (TCE) hit at ppb [parts per billion] level, and this is the reason for the weir.

Slide #37: Phase 2 – Treatment of Chlorinated Solvent Plume Adjacent to the E4X Drain – NDEP Comment: What's the depth of the proposed injection of the oxidants?

Navy Response: The proposed oxidants to be injected at the site to oxidize chlorinated solvents are ozone and hydrogen peroxide. The proposed injection depth for ozone is 19 feet bgs, which is just above the groundwater table, and the proposed injection depth for hydrogen peroxide is 13 to 14 feet bgs. The oxidation-reduction potential at the subsurface will be monitored for the first couple months, and then will transition to quarterly groundwater sampling.

Slide #40: Anticipated Schedule of TCRA – Navy Comment: The Navy is now reviewing the Applicable or Relevant and Appropriate Requirements (ARARs) and is expecting to complete the review in the next couple of weeks. Then the Action Memorandum (AM) will be sent to NDEP for review. The Navy awarded the field work for the construction of the remedial design of the TCRA on August 30, 2011.

Part IV (Slides #41 to #58)

2010/2011 Basewide Groundwater and Surface-Water Monitoring, by Ms. Kathy Monks from Tetra Tech

Presentation Highlights:

- Purpose of the groundwater and surface-water monitoring: Monitoring groundwater and surface-water quality, assess plume stability, provide continued post-closure monitoring, and provide updates to the basewide hydrologic conceptual site model.
- Scope of the monitoring: Semiannual groundwater quality and monthly surface water quality monitoring, semiannual groundwater and surface water level monitoring, and continuous groundwater level, temperature, and velocity monitoring at selected locations (downloaded from dataloggers quarterly). Three years of basewide hydrologic monitoring will be completed in 2011. In addition, a Well Utilization Plan that discusses the monitoring well network and provides well construction and sampling rationale was completed in February 2011.
- Groundwater monitoring results:
 - Northwest quadrant: TCE was the only organic compound exceeding MCL
 - Northeast quadrant: No organic compounds exceeded MCLs
 - Southwest quadrant: No organic compounds exceeded MCLs
 - Southeast quadrant: Organic compounds exceeding decision criteria included naphthalene, benzene, 1,2-dichloroethane (1,2-DCA), tetrachloroethylene (PCE), TCE, dichloroethylene (DCE), and vinyl chloride.

Additional Discussion:

Slide #41: 2010/2011 Basewide Groundwater and Surface-Water Monitoring – NDEP Comment:

There is a lot of talk about monitoring today, but where is the report? This is one of the data gaps identified for the base.

Navy Response: The Navy is currently reviewing the 2008/2009 monitoring report. This biannual report includes statistical analyses of both recent and historical analytical results, as requested by Mr. Ramon Naranjo (Ms. Alison Oakley's predecessor). Once the 2008/2009 report is finalized, it can be used as a template, and the production of the 2010/2011 report can be expedited.

Slide #42: 2010/2011 Basewide Groundwater and Surface-Water Monitoring (continued) – NDEP

Comment: There are 153 wells proposed for plugging in the Well Utilization Plan, but is there a timeframe when it will be completed? The Navy should make sure nobody will accidentally use any of the wells.

Navy Response: This is not a high priority now. Considering the budgetary issue, the Navy may phase in wells each year for decommissioning. The Navy will take the necessary measures to avoid misuse of the wells.

Slide #45: Results of 2010/2011 Basewide Groundwater Monitoring, Northwest Quadrant – Navy

Comment: The basewide groundwater monitoring strategy is dynamic; if a monitoring well is added or dropped from the sampling list, it would be discussed with the NDEP ahead of time.

Slide #58: Basewide Hydrologic Monitoring Conclusions/Recommendations – Navy Comment: The Navy intends to reduce the semiannual monitoring to annual monitoring due to stable trends observed so far and the budgetary issue.

NDEP Response: Will need to review the report first before providing feedback.

At this point, the presentation was completed, and the discussion moved on to the general environmental issues at the base.

NDEP Comment: Mr. Scott Smale from NDEP commented that, when there is a personnel change, NDEP does not intend to go back into history and evaluate whether the previous decisions made were correct. In the past, he always deferred to Mr. Ramon Naranjo for decision-making. Mr. Smale has requested Ms. Alison Oakley to review all historical documents from NAS Fallon, but no decision documents were found for the closed sites.

Navy Response: Mr. Mike Quesada from the Navy responded that there are Action Memoranda and Decision Documents for various sites and he will get them from the Navy Administrative Record (AR) and forwarded to Ms. Oakley.

NDEP Comment: Ms. Oakley commented that there is not any document on file at NDEP for Site 13. Reference to a 1995 EE/CA was noticed in other documents, but is missing in NDEP's record. She also has a lot of questions with regard to tank removals. In addition, in the Preliminary Assessment and Site Inspection (PA/SI), Sites 5, 8, 25, 26, and 27 were proposed for no further action (NFA) and for closure. NDEP has the concurrence record in the file for Sites 25, 26, and 27, but such concurrence for Sites 5 and 8 is missing. Also, there is no documentation of what has been done at Site 15.

Navy Response: Mr. Mike Quesada responded that he will look for these missing documents and provide to NDEP.

Navy Follow-up Response: To address this action item, on September 7, 2011 Mr. Mike Quesada forwarded to NDEP the NDEP No Further Action concurrence letters for IR Sites 5, 8, 13, and 15.

NDEP Comment: Ms. Oakley commented that the Basewide Well Utilization Plan does not include any wells at UST-R2 and Landfill Site 20. The 5-year review of the landfills also includes groundwater monitoring, but the results are not included in the groundwater monitoring report. The inconsistency needs to be resolved.

Navy Response: Ms. Kathy Monks from Tetra Tech responded that the wells are included in both the Well Utilization Plan and basewide groundwater monitoring reports. Ms. Monks also noted that landfill groundwater monitoring may have been done by other companies under other contracts, and the landfill groundwater monitoring data should have been included in other reports. Ms. Monks also pointed that basewide groundwater monitoring at NAS Fallon is dynamic and subject to change according to site conditions, plume stability, trend analyses, and in support of remedial strategies. Ms. Debora Waxer asked if efforts under every program are reflected in this groundwater monitoring network. Mr. Quesada confirmed that they are. He added that landfills are separate and are presented in other reports.

NDEP Comment: NDEP does not understand the decision made between Kinder Morgan and the Navy about who is responsible for the contamination outside the base fence. In one of the documents generated by Kinder Morgan, a 1995 document has been referenced saying there is an agreement between Kinder Morgan and the Navy, but NDEP does not have this agreement document in the file.

Navy Response: Ms. Becky Kurtz indicated that there is a Memorandum of Understanding (MOU) between Kinder Morgan and the Navy, and she will forward it to NDEP. Mr. Ken Powell pointed out that the Navy did investigate that area by collecting soil samples. He also indicated that SCAPS data is available for that area.

NDEP Comment: Ms. Oakley commented that the Navy forwarded some forms to NDEP indicating where the tanks are, and she was trying to correlate the information on these forms with the IR sites, especially for Sites 2 and 16. However, no removal records of the missing tanks were found. She questioned whether there was any investigation conducted at the time these tanks were removed, and stated that these could be potential data gaps. She said she will scan the document she has and send to the Navy.

Navy Response: The Navy stated that they will try to address the missing documentation and send to NDEP once they get further information from NDEP regarding what is missing.

Navy Follow-up Response: To address this action item, on September 9, 2011, the Navy provided NDEP with an assessment describing the USTs and a geophysical survey report of the area. It appears that there were no geophysical anomalies that correspond to buried USTs left in-place. In addition, NAS Fallon personnel have worked with NDEP to recover any missing documentation.

NDEP Comment: Mr. Smale commented that there was an anonymous phone call made to NDEP complaining of poor management of aircraft parking areas at NAS Fallon and of leaking observed. Mr. Chuck Deverin from the base responded to NDEP in August 2010 that NAS Fallon will submit an investigation report to address this issue, but there is no follow-up since. NDEP needs formal feedback from the Navy to file with the complaint.

Navy Response: Ms. Becky Kurtz from the base responded that some of the aircraft sitting on the ground may be the cause of the leaks that are getting below the aircraft parking areas due to concrete joint sealant decay over time; however, the base has implemented best management practices and is in the process of sealing concrete cracks and resealing concrete joints. Ms. Kurtz indicated that the base will look into this issue and provide a formal response to NDEP.

At this point, the RPM meeting was completed.

Site Walk

After a one-hour lunch break, site walks were conducted, including an inspection of the Site 2, Site 16, and Hot Pit areas. Key observations from the site walks included the locations of the fuel storage tanks, the groundwater monitoring wells, and the free-product removal wells at Site 2, the E4X Drain near Site 16, and the highest hit and exceedances locations at the Hot Pit area.

Attachments

- A [Meeting Agenda](#)
- B [Sign-in Sheet](#)
- C [Presentation File](#)

Attachment A Meeting Agenda

(One sheet)

**RPM Meeting Agenda
for
10:00 AM, 31 August 2011
Naval Air Station (NAS) Fallon**

1. Introductions
2. Pipeline Discussion
3. Installation Restoration (IR) Program update
 - a. Site Map
 - b. Landfill Updates
 - c. Results from the Hot Pit Investigations (Compliance)
 - d. Overview on the ongoing basewide remedial investigations for Petroleum, Northern and Southern Operable Units
 - e. Summary of the basewide groundwater monitoring program
4. Schedule
5. Site Tours

Attachment B Sign-In Sheet

(Two sheets)

NAS Fallon Remedial Project Managers Meeting

Sign-In Sheet

August 31, 2011; 10:00am – 12:30pm; Building 307, NAS Fallon, NV

Name	Title / Organization	Phone No.	Email
KATHY MONKS	TETRA TECH EM	(505) 934-0715	kathy.monks@tetratech.com
KEN POWELL	TETRA TECH	(303) 312 8824	ken.powell@tetratech.com
Wendy (Elaine) Dou	Sullivan Int'l Group	(415) 321-1785	wdou@sullivan.com
Mehrdad Javaherian	Sullivan Int'l Group	(415) 706-8935 (415) 321-	mjavaherian@sullivan.com
Diane MacMillan	Tetra Tech EM	303-312-8815	diane.macmillan@tetratech.com
DAVID BERESTKA	TETRA TECH	303 312 8856	david.berestka@tetratech.com
Stephen McKay	NAVFAC SW	(775) 426-3186	Stephen.McKay@navy.mil
BECKY KURTZ	NAVFAC EU NAS Fallon	775-426-2242	becky.kurtz@navy.mil

NAS Fallon Remedial Project Managers Meeting

Sign-In Sheet (Continued)

August 31, 2011; 10:00am – 12:30pm; Building 307, NAS Fallon, NV

Name	Title / Organization	Phone No.	Email
Debra Waxer	Env Division Manager NAS Fallon	775 426-2244	debra.waxer @navy.mil
Scott Smale	Nevada Division of Environmental Protection	775 687-9389	ssmale@ ndep.nv.gov
Alison Oakley	Nevada Division of Environmental Protection	775 687-9396	aoakley@ ndep.nv.gov
Mike Guesada	RPM / NAVFAC SW	(619) 532-4176	richard.guesada@ navy.mil

Attachment C Presentation File

(58 sheets)



*Naval Air Station Fallon
Remedial Project Managers Meeting*

August 31, 2011

*Mike Quesada
Remedial Project Manager
Naval Facilities Engineering Command, Southwest*

Meeting Agenda



- **Installation Restoration (IR) Program update**
 - Site Map
 - Landfill Update
 - Results from the Hot Pit Investigations (Compliance)
 - Update on the ongoing basewide remedial investigations for Petroleum, Northern and Southern Operable Units
 - Summary of the basewide groundwater monitoring program
- **Schedule**
- **Site Tours**

Hot Pit #3 – Site Investigation



- **Background**

- 1987: constructed to train air crew on direct fueling of military aircraft
- 1992 and 1997: product release, free product and contaminated soil removal
- 2004: refueling lines failed in Hot Pit #3 area → NDEP involvement
- 2007: site assessment
 - concluded reported leak of JP-8 fuel had no significant impact on soil or groundwater
 - found contamination of gasoline and JP-5 and recommended additional investigation to be conducted at vicinity of Hot Pit #3

- **Site Investigation (March and June 2011)**

- Soil
 - Soil predominantly consists of interbedded sands, sandy silts, and clays.
 - 20 samples @ 5' and 10' bgs, including 2 duplicate samples
 - Analyzed for TPHs (TPH-k, TPH-d, TPH-g), BTEX, and MTBE
- Groundwater
 - Groundwater was generally encountered at 5-8 feet bgs
 - Ten samples collected from direct-push borings and 7 samples from monitoring wells (3 existing + 3 new), including 2 duplicate samples
 - Samples analyzed for TPHs (TPH-k, TPH-d, TPH-g), BTEX, and MTBE

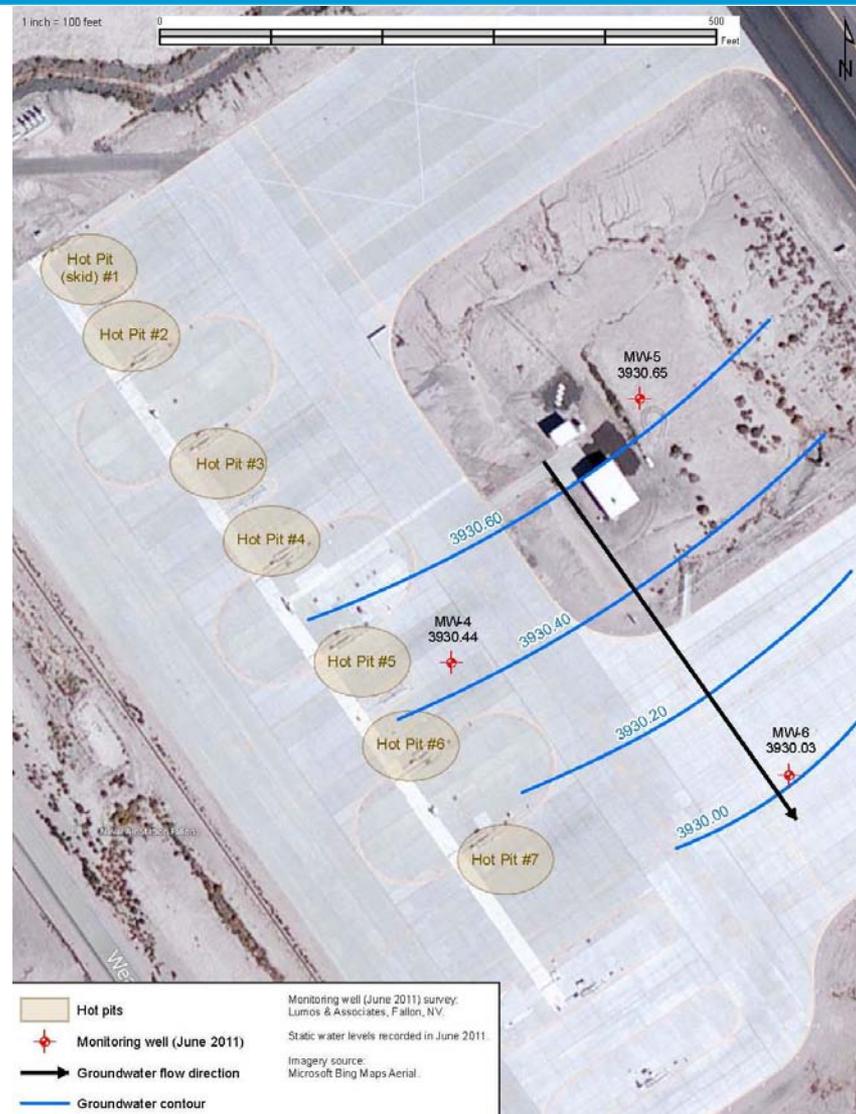
Hot Pit #3

Groundwater Flow



- Groundwater Flow

- Hydraulic gradient 0.0018 ft/ft to southeast
- Consistent with predicted historical groundwater flow direction



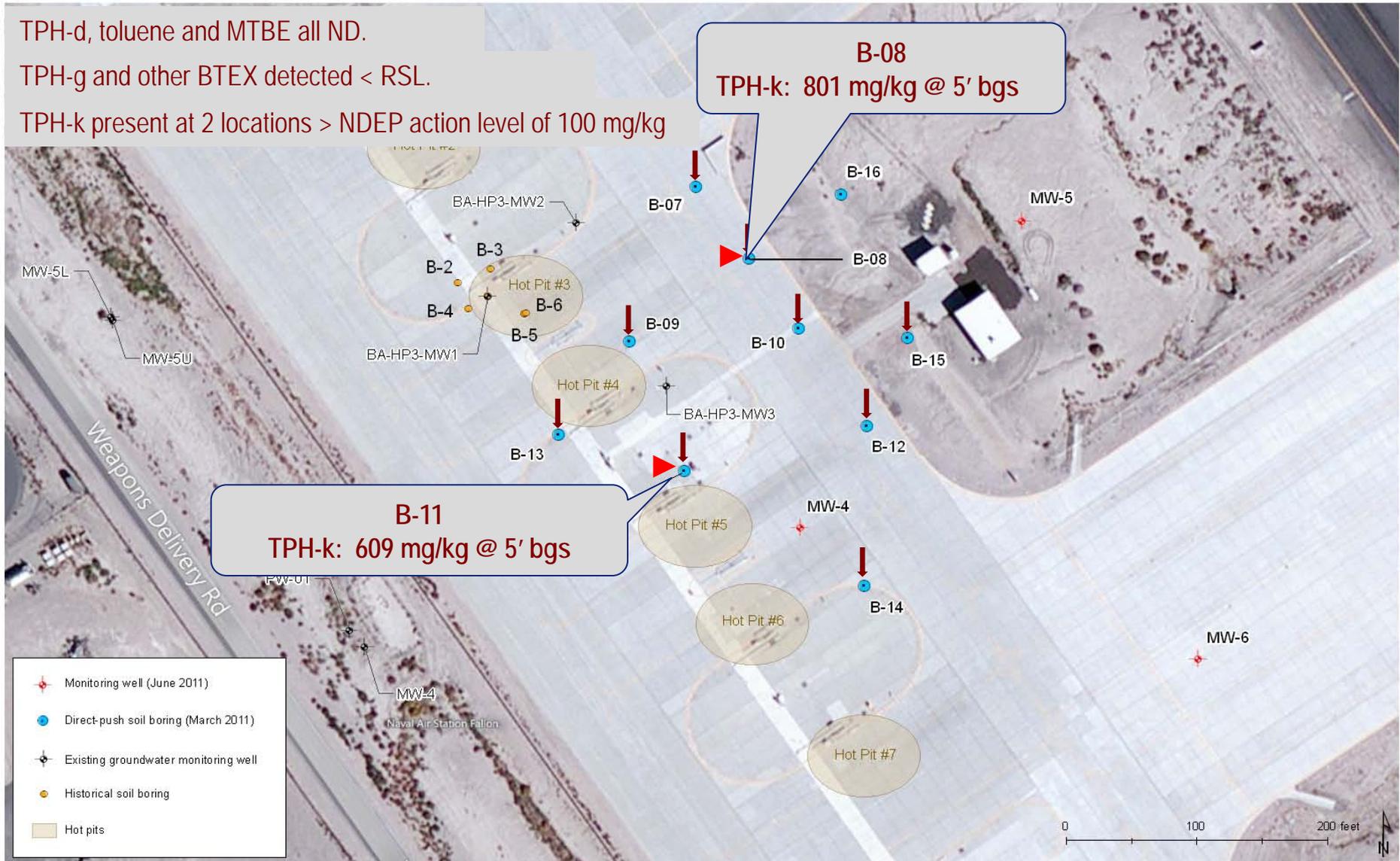
Hot Pit #3 SI Results – Soil



TPH-d, toluene and MTBE all ND.

TPH-g and other BTEX detected < RSL.

TPH-k present at 2 locations > NDEP action level of 100 mg/kg

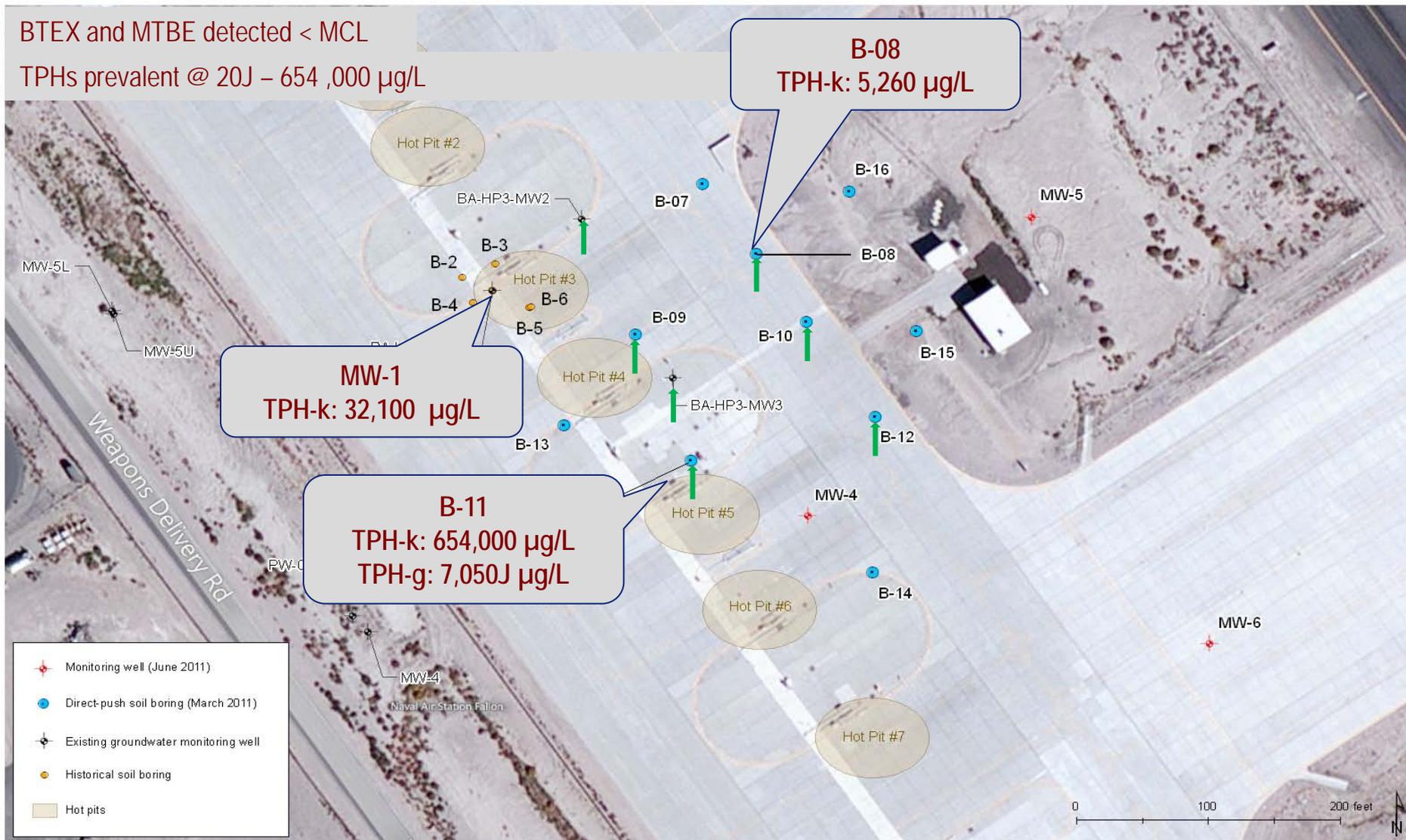


Hot Pit #3 SI Results - Groundwater



BTEX and MTBE detected < MCL

TPHs prevalent @ 20J - 654,000 µg/L



- **Recommendation**

- **Groundwater Monitoring to Verify Plume Stability**

Site 18 – Supplemental Site Investigation



• Background

- Landfill during WWII (1943 – 1946)
- PA/SI (1998), PSC (1991), RI (1994) concluded no contamination
- 1999: draft final decision document (to NDEP in 1999), recommended NFA at Site 18
- 2000: NDEP denied NFA and requested additional sampling and investigation
- 2002: site characterization investigation
- 2004: NDEP agreed on additional sampling before closure would be granted
- Two groundwater samples were taken, one in November 2004 (low season) and one in March 2005, (high season) and analyzed for Aldrin
- Confirmation groundwater sampling for aldrin and dieldrin below 0.47 and 2.3 nanograms per liter (ng/L)
- 2010: discovered landfill trenches

• Site Investigation (April – June 2011)

– Geophysical survey: assess landfill limits

– Soil

- Soil predominantly consists of interbedded sands, sandy silts, and clays.
- Forty surface soil samples (0-6" bgs)
- Five soil samples from each of the two monitoring well borings at 0-6", 5', 10', 15', and 20' bgs
- Samples analyzed for TPHs, PCBs, VOCs (including BTEX), PAHs, Pesticides (Aldrin and Dieldrin), and Dioxins

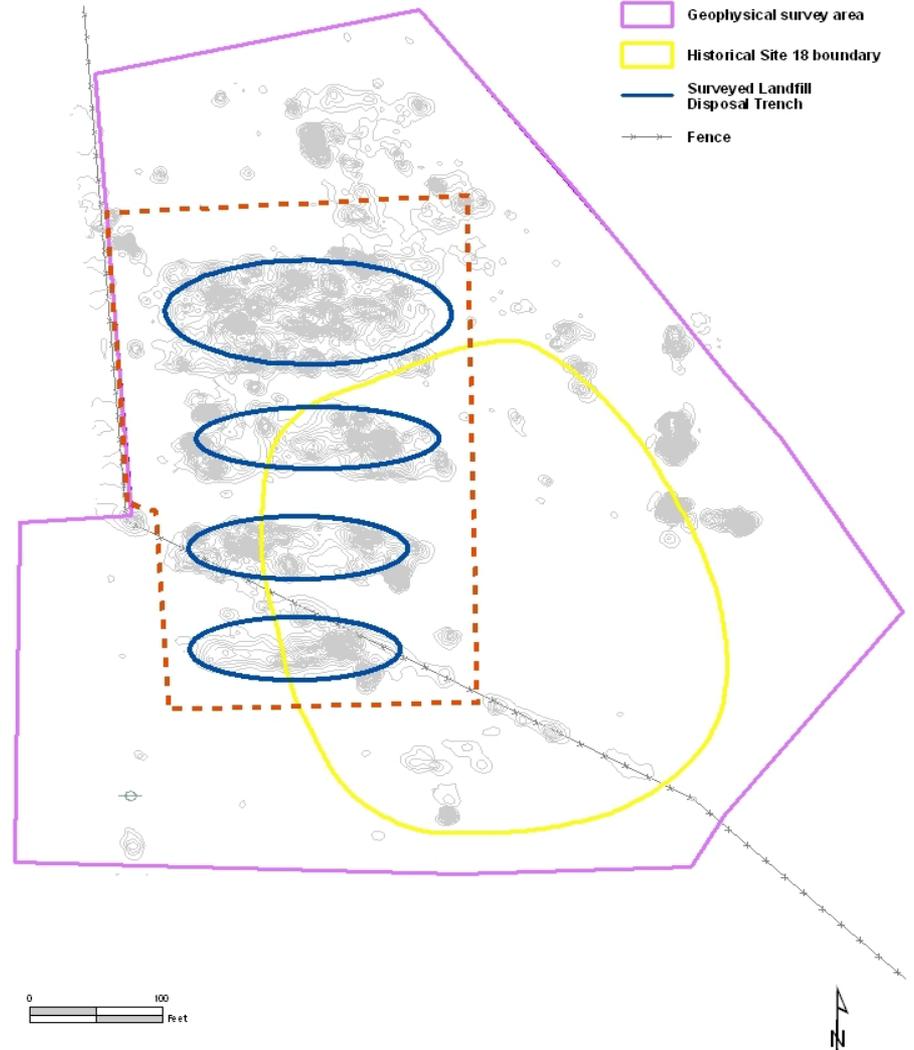
– Groundwater

- Groundwater was generally encountered at 5-8 feet bgs
- Three samples (including 1 duplicate) from 2 newly installed wells
- Samples analyzed for TPHs, PCBs, VOCs (including BTEX), PAHs, Pesticides (Aldrin and Dieldrin)

Site 18 Supplemental Site Investigation



- Proposed Site 18 boundary
- Geophysical survey area
- Historical Site 18 boundary
- Surveyed Landfill Disposal Trench
- Fence

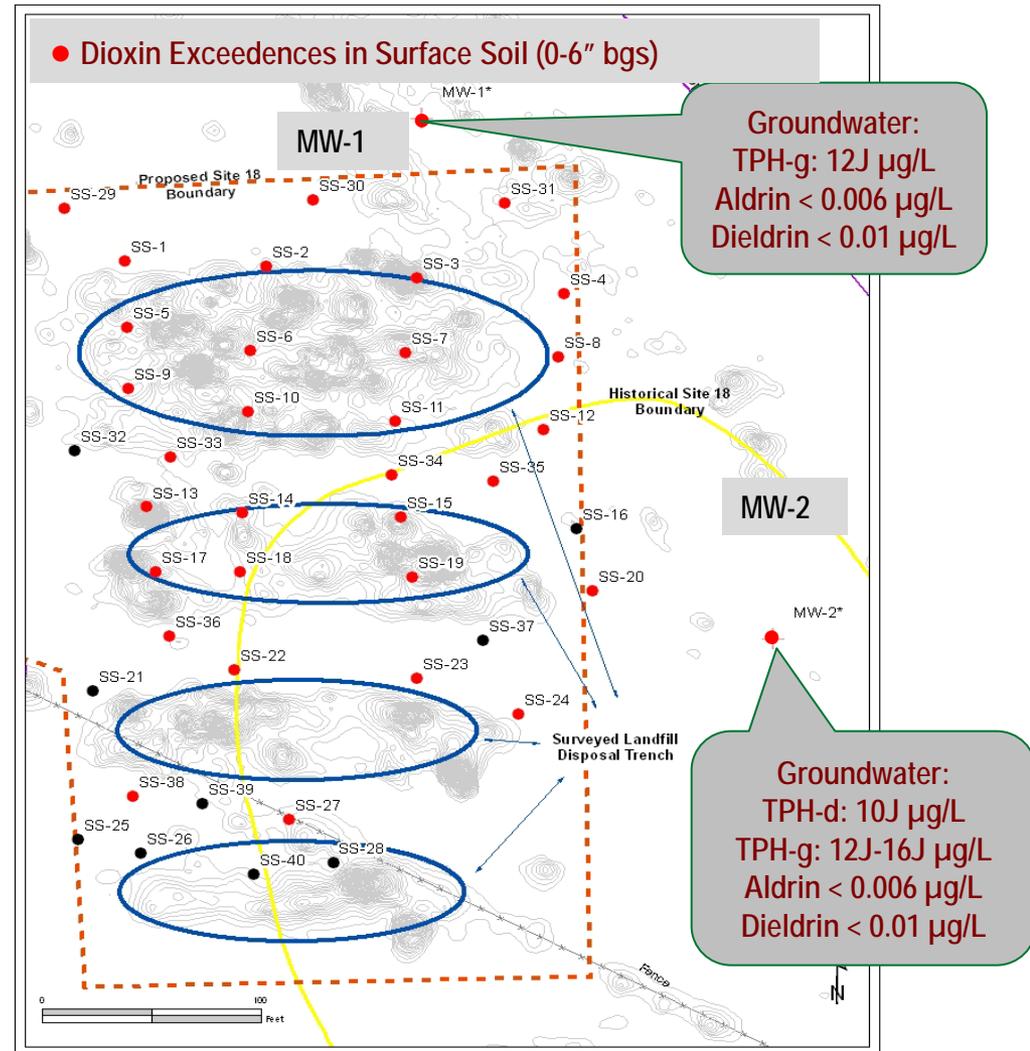


- Geophysical Survey
 - Survey area: 7.25 acre
 - Previously boundary: 3 acre
 - New boundary: 2.3 acre

Site 18 – Supplemental Site Investigation



- Soil (Preliminary Results)
 - Dioxin exceedances across site at surface level (0-6" bgs)
 - No RSL exceedances in subsurface soil samples from MW boring locations
- Groundwater (Preliminary Results)
 - All ND, except
 - TPH-d (10J $\mu\text{g/L}$ @ MW-02)
 - TPH-g (12J-16J $\mu\text{g/L}$ at both MWs)
 - Aldrin ND at detection limit of 0.006 $\mu\text{g/L}$ (Tapwater RSL 0.004 $\mu\text{g/L}$)
 - Dieldrin ND at detection limit of 0.01 $\mu\text{g/L}$ (Tapwater RSL 0.0042 $\mu\text{g/L}$)



- **Recommendations**
 - **Human Health Risk Assessment for Soil**
 - **Focused Feasibility Study**
 - **Proposed Plan**
 - **Record of Decision**

Questions About Hot Pit and Site 18?



- **Remedial Investigation Addendum/Feasibility Study**
 - Initiated for 9 “active” sites (Previous RI completed for 7 of them)

- **Site 2 Fuel Removal**
 - Approx. 74,000 gallons removed all together
 - 3,213 gallons removed between 2009 and 2011
 - Average product thickness reduced from 1.54 to 0.32 feet

- **Site 16 - E4X Drain Evaluation**
 - Plume containment system shut down

- **Site 16 - New Solvent Plume Identified**
 - Passive soil gas survey used to delineate extent
 - Pilot study completed to test effectiveness of air sparge/SVE

Ongoing Activities (cont.)



- **New UST Site/Fuel Distribution System Identified near Site 16**
 - Passive soil gas survey
 - Geophysical survey
- **Site 16 Time Critical Removal Action at E4X Drain**
 - Drain alteration design
 - Groundwater treatment system
- **Basewide Groundwater Assessment and Monitoring**
 - Supplements RI data
 - Monitor for plume migration, contaminant trends
 - Sentinel monitoring for off-station migration
 - Overall hydrogeologic conceptual site model

Summary of Recent Investigations



•RI Addendum/FS Sampling

- Conducted SCAPS investigation to identify areas of fuel product
- Collected extensive soil and groundwater samples at all nine sites between 2007 and 2008
- Added soil gas sampling investigation in 2010
- Investigation complimented by ongoing basewide sampling initiated in 2008
- Reports currently in production

•Site Groupings, Operable Unit Identification

- Sites grouped based on history, co-mingling of plumes, location
 - Petroleum Sites
 - UST-R Site 1 (Building 395 Area)
 - UST-R Site 2 (Building 806 Area)
 - Site 6

Summary of Recent Investigations (cont.)



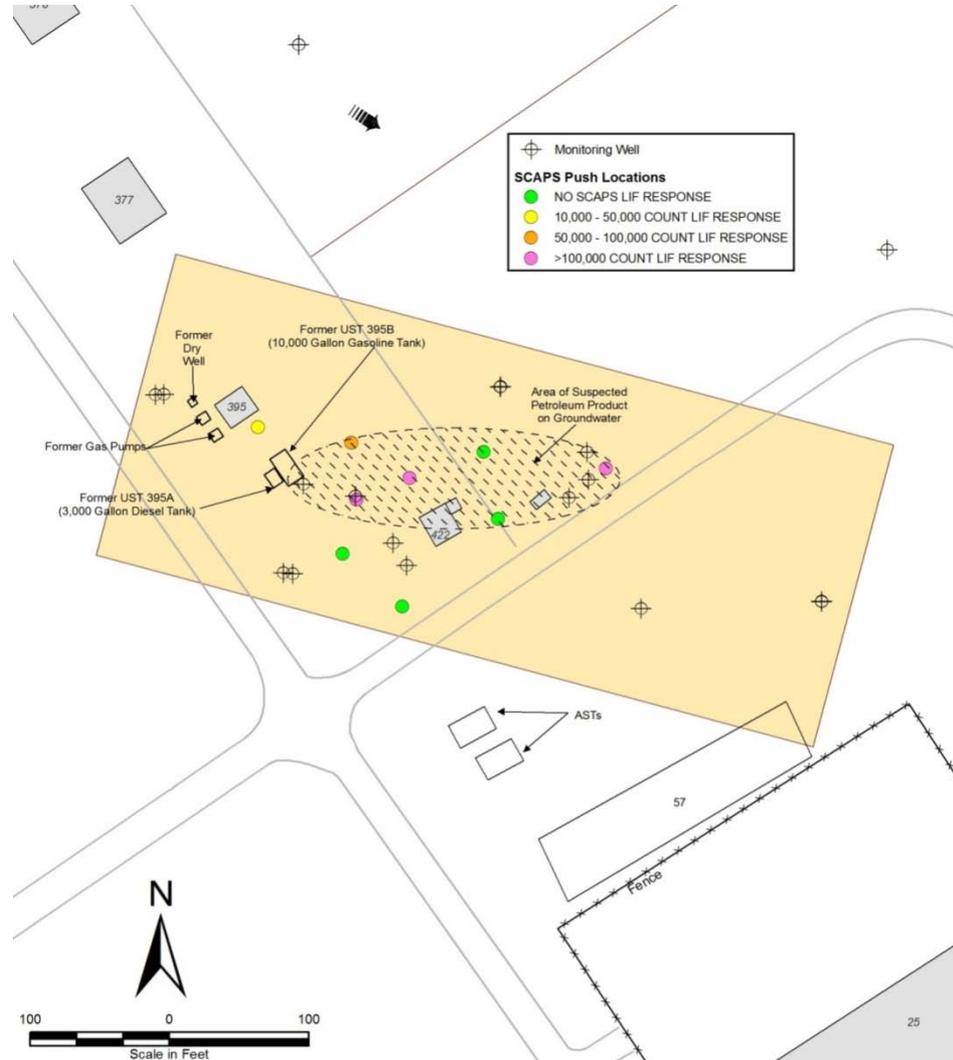
• Site Groupings, Operable Unit Identification (cont.)

- Northern OU
 - Site 2
 - Site 4
 - Site 3
- Southern OU
 - Site 1
 - Site 14
 - Site 16

Results – Floating Product/Soil Smear Zones



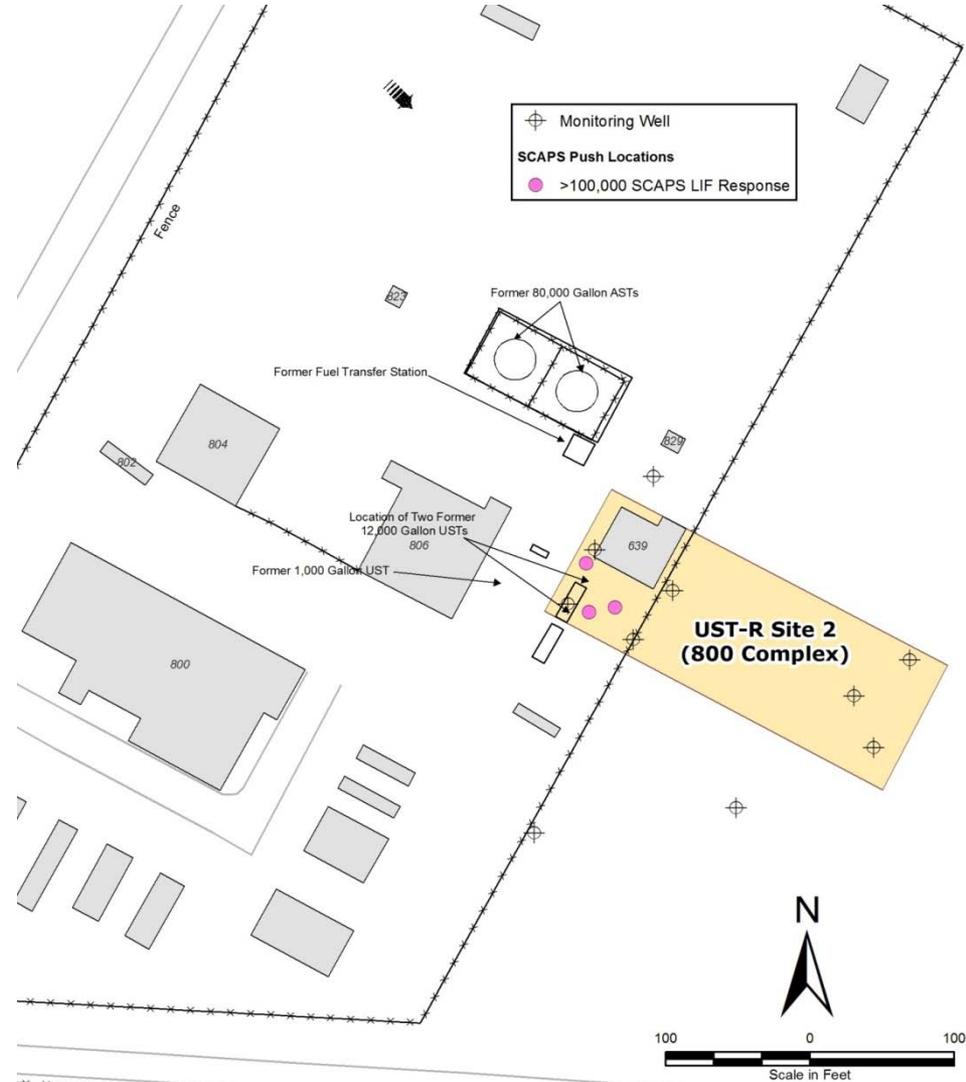
•UST-R Site 1



Results – Floating Product/Soil Smear Zones



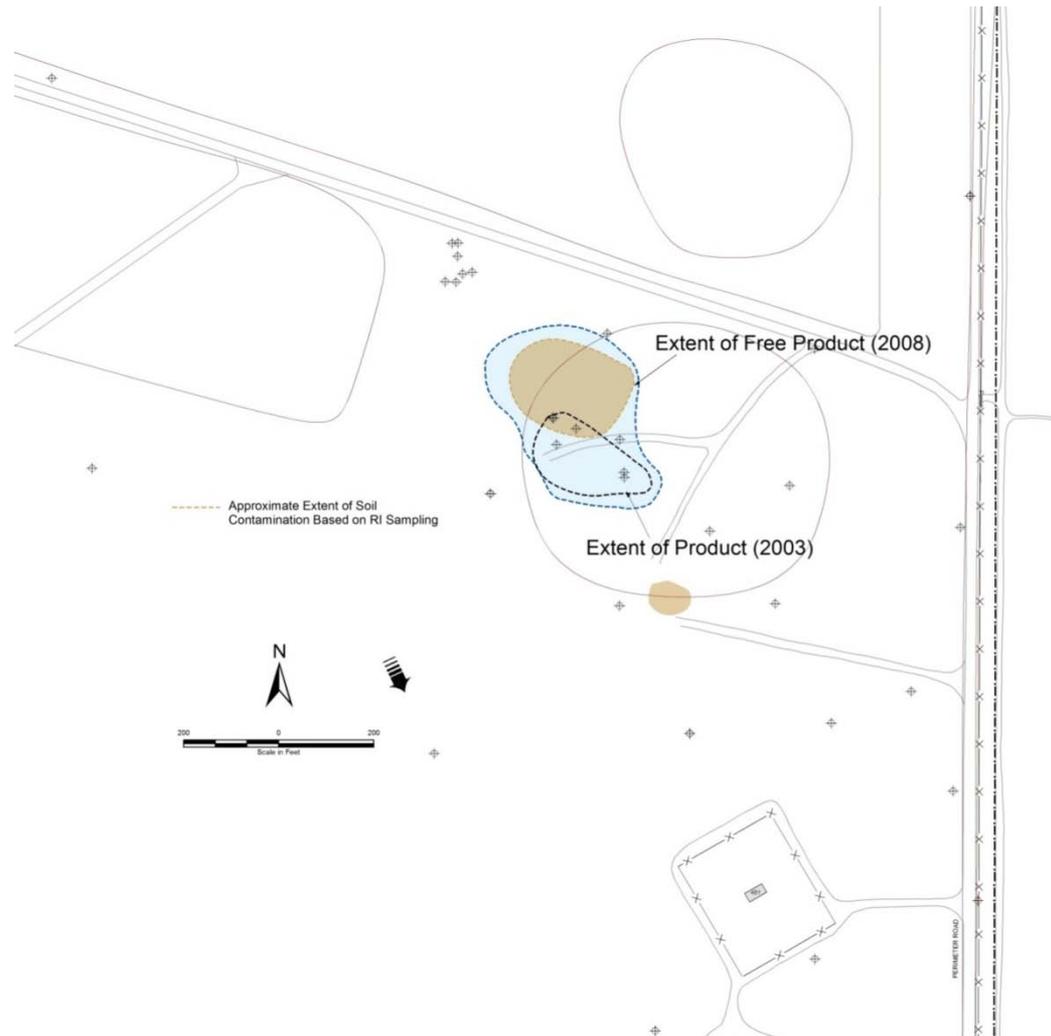
•UST-R Site 2



Results – Floating Product/Soil Smear Zones



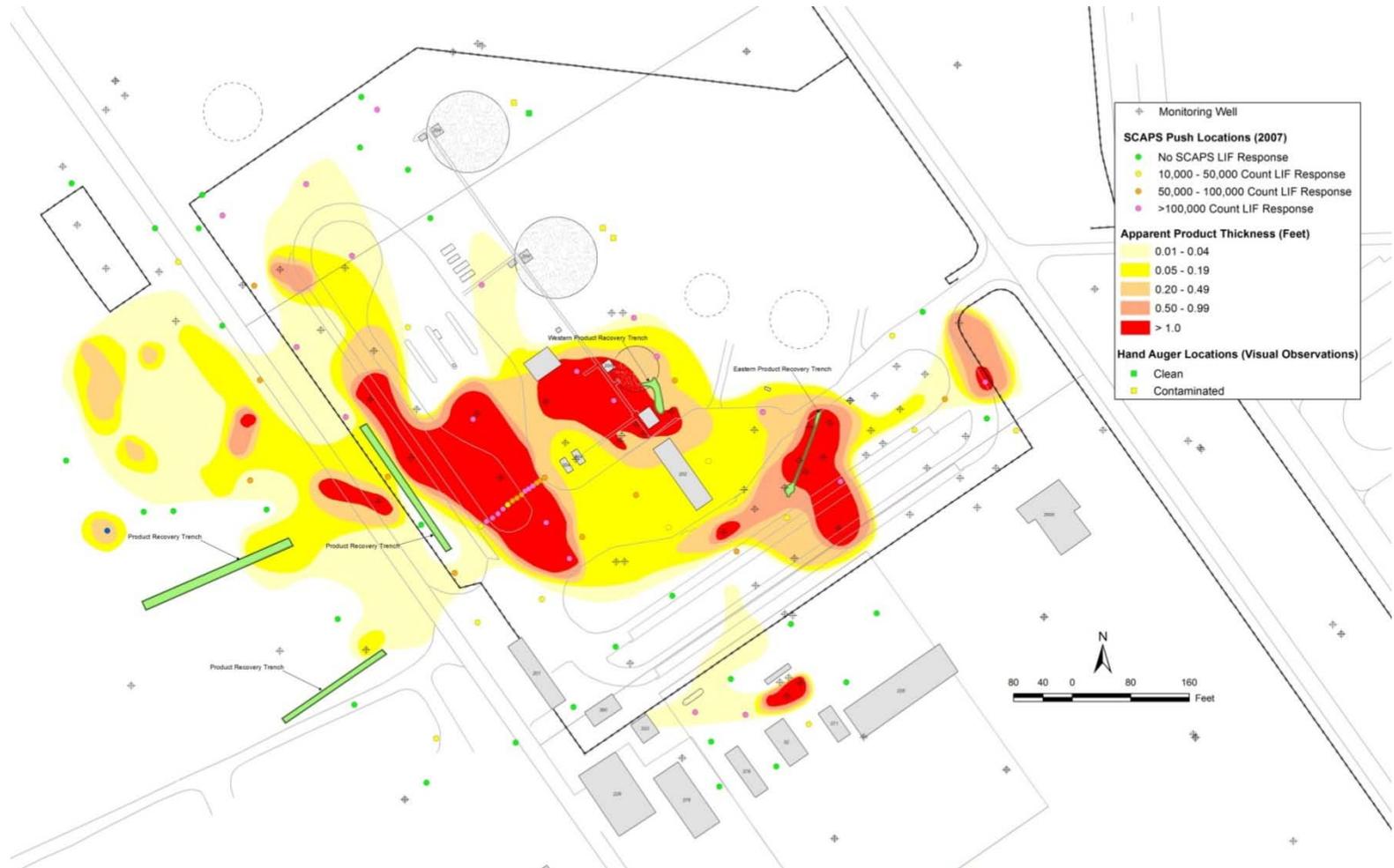
•Site 6



Results – Floating Product/Soil Smear Zones



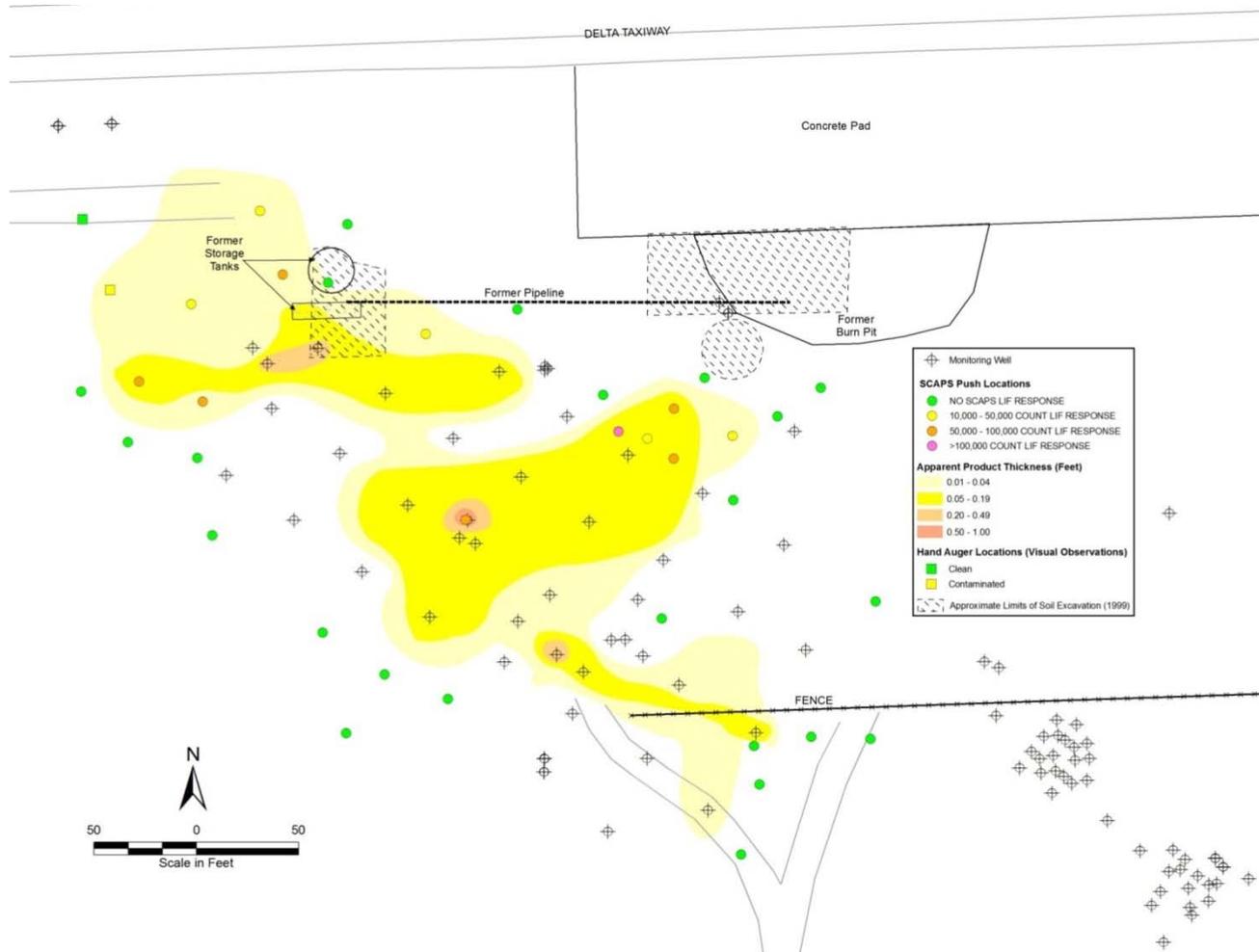
•Northern OU – Sites 2 and 4



Results – Floating Product/Soil Smear Zones



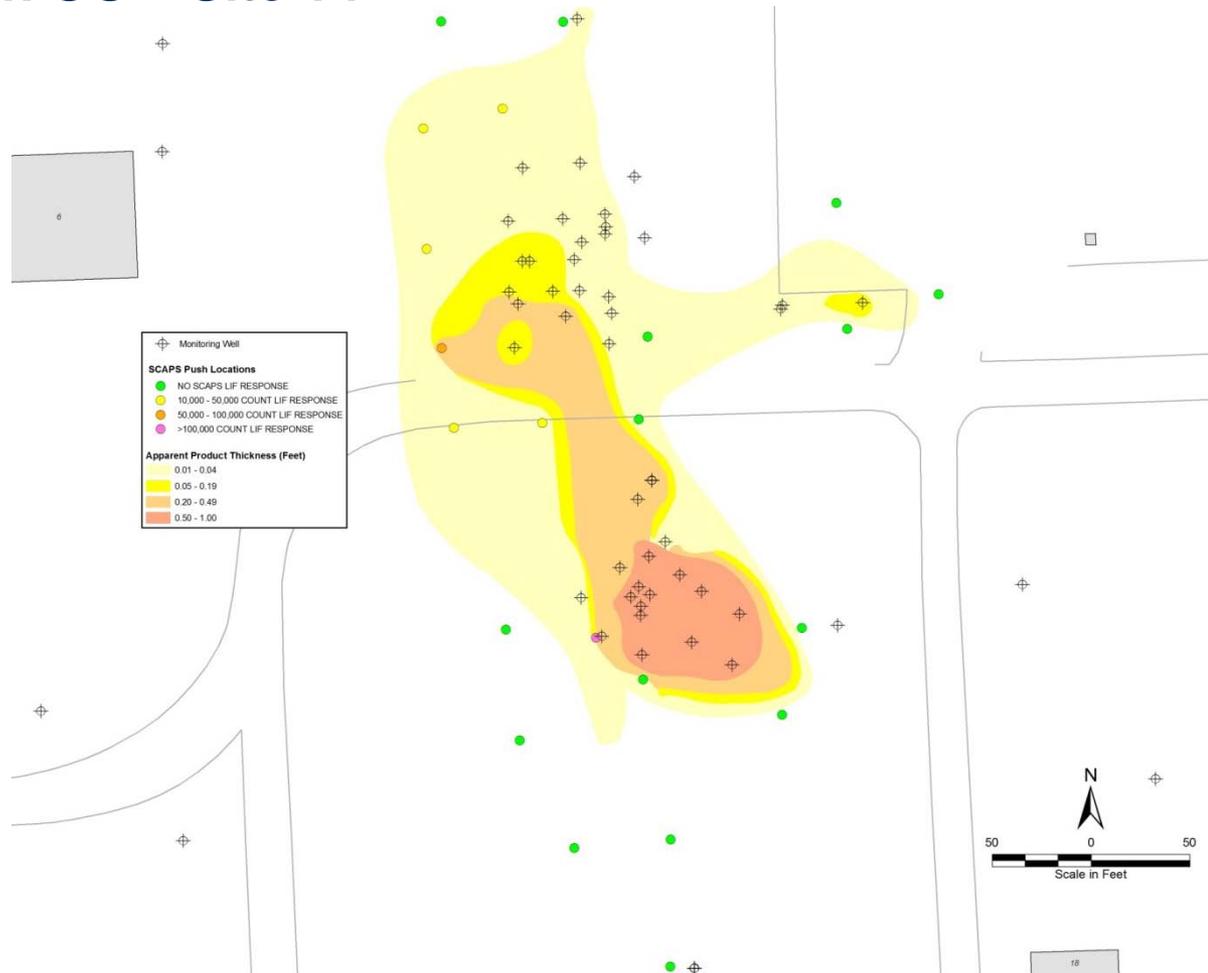
• Southern OU – Site 1



Results – Floating Product/Soil Smear Zones



•Southern OU – Site 14



Soil Gas/Vapor Intrusion Results



- **Active soil gas sampling program added to RI Addendum sampling in 2010 to aid in evaluation of risks**
 - **Soil gas well points installed in areas where groundwater plumes identified near currently occupied buildings**
 - **Well points constructed just above the groundwater table**
 - **Soil gas purged from all well points into Summa canisters, monitored for leaks and short circuiting with atmospheric air**
 - **Samples analyzed by off-site laboratory for VOCs**

Soil Gas/Vapor Intrusion Results (cont.)



- **Soil gas results used for vapor intrusion evaluation as part of baseline human health risk assessment, and results included in upcoming investigation reports.**

- **Petroleum Sites (UST-R Site 2, Building 806 Area)**

- 8 samples collected
- Results and evaluation indicated no current or future risks associated with vapor intrusion

- **Northern OU**

- 60 samples collected
- Results and evaluation indicated no current or future risks associated with vapor intrusion

- **Southern OU**

- 72 samples collected
- Results and evaluation indicated no current or future risks associated with vapor intrusion

Results of Human Health Risk Assessment



Summary of Human Health Risk Results

Site	Soil					Groundwater		Soil Gas
	Current Industrial Worker	Future Industrial Worker	Future Construction Worker	Future Resident		Future Construction Worker	Future Resident	Current Industrial Worker
	Direct Contact, Surface Soil	Direct Contact, Subsurface Soil	Direct Contact, Subsurface Soil	Direct Contact, Surface Soil	Direct Contact, Subsurface Soil	Construction Trench	Domestic Use	Vapor Intrusion
Petroleum Sites								
UST-R Site 1	●	●	●	●	●	●	●	—
UST-R Site 2	●	●	●	●	●	●	●	●
Site 6	●	●	●	●	●	●	●	—
Southern Operable Unit								
Site 1	●	●	●	●	●	●	●	—
Site 14	●	●	●	●	●	●	●	●
Site 16	●	●	●	●	●	●	●	●
Northern Operable Unit								
Site 2	●	●	●	●	●	●	●	●
Site 3	—	—	—	—	—	●	●	●
Site 4	●	●	●	●	●	●	●	●

●	Cancer risk less than or equal to 1×10^{-6} (de minimis risk level)
●	Cancer risk between greater than 1×10^{-6} but does not exceed 1×10^{-4} (risk management range)
●	Cancer risk greater than 1×10^{-4} (risk level above which remedial action is generally needed)
○	Noncancer hazard greater than 1 (threshold level)
—	Not evaluated; no complete exposure pathways

Draft - For Discussion Purposes Only

- **Investigation Reports Currently Being Developed**

- **Contaminant Investigation Report for Petroleum Sites (Oct. 2011)**

- To be followed by Corrective Action Plan (CAP) at later date

- **RI Addendum/FS for the Northern OU (Jan. 2012)**

- **RI Addendum/FS for the Southern OU (Dec. 2011)**

Questions About Site Investigations?



Site 16 Time Critical Removal Action (TCRA)

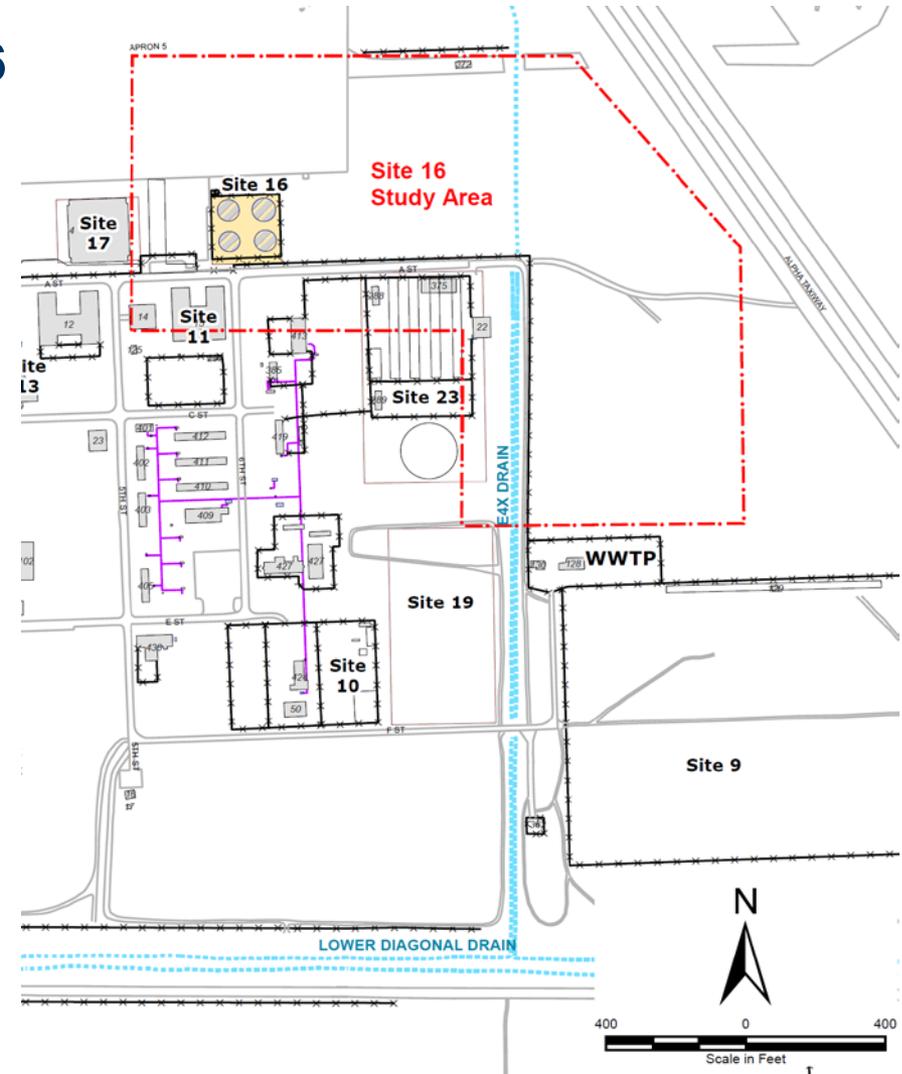


• Installation Restoration Site 16

- Old Fuel Farm
- Study area expanded
 - Chlorinated solvent plumes identified
 - Potential discharge of groundwater to surface water at E4X Drain

• Interim Removal Action or TCRA:

- The Navy has elected to implement a proactive interim removal action (TCRA)
- Target “hot spot” to complement natural degradation of lower concentrations

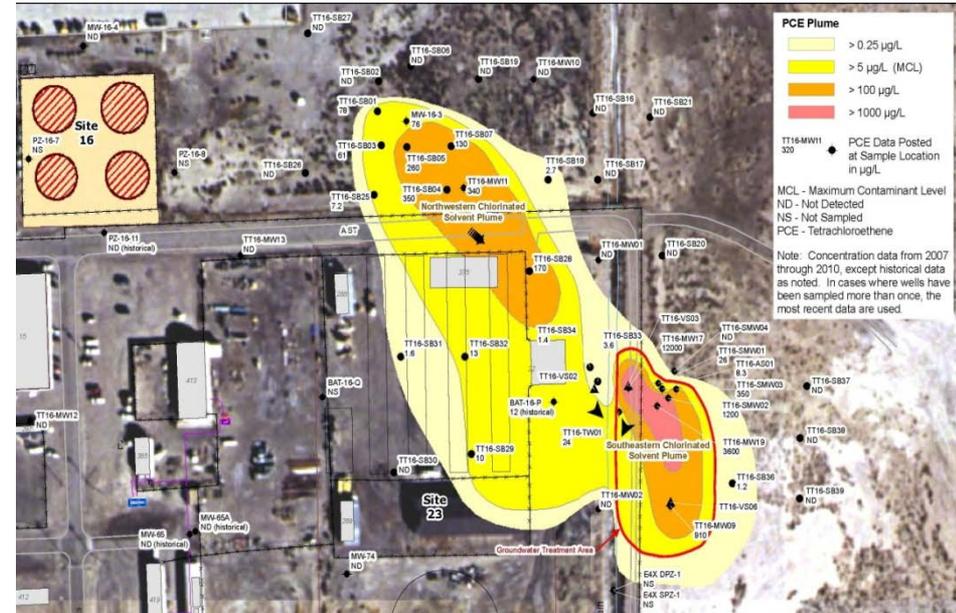
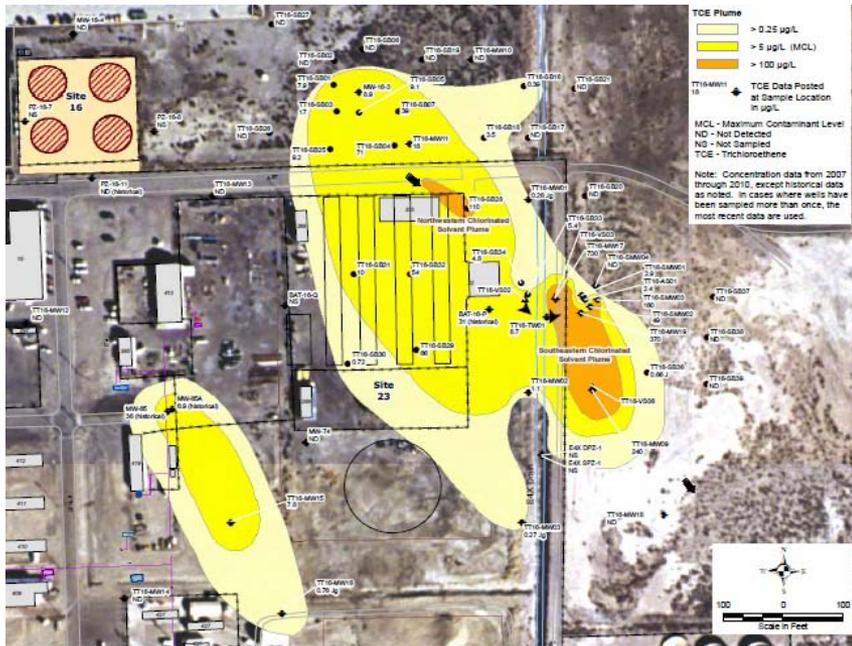


Site 16 Time Critical Removal Action (TCRA)



• Very low volume estimate

- 2.5 gal PCE; 0.4 gal TCE
- No chlorinated solvents detected in surface water over 15 years of sampling



Site 16 Time Critical Removal Action (TCRA)



- **TCRA - a Two Phased Approach**

- Phase 1, alteration to E4X drainage channel to prevent groundwater discharge to surface water

- Phase 2, chemically treat the highest concentration portion of the solvent plume near the drain

- **TCRA not intended to be the final remedy, additional evaluation to be conducted as part of the FS for the Southern Operable Unit**

Phase 1 - E4X Drain Alteration Options



- ➔ • **Alternative 1: Raise Channel Bed**

 - **Alternative 2: Installation of Constant Head Weirs**

 - **Alternative 3: Complete filling of E4X Drain north of WWTP**

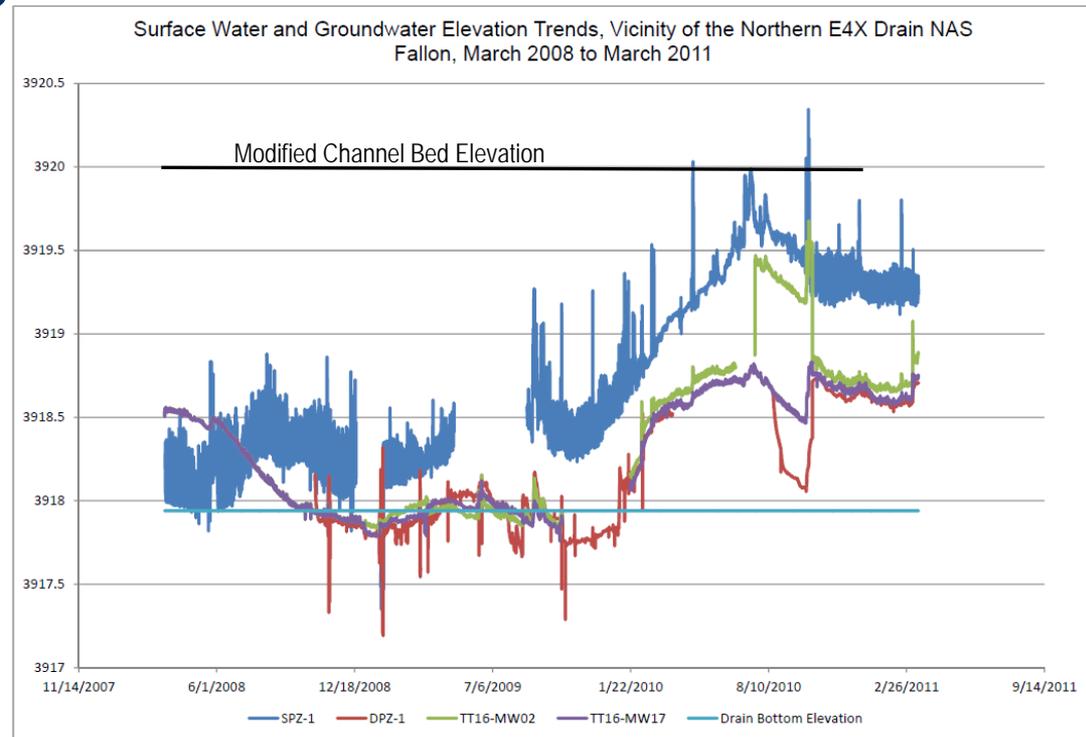
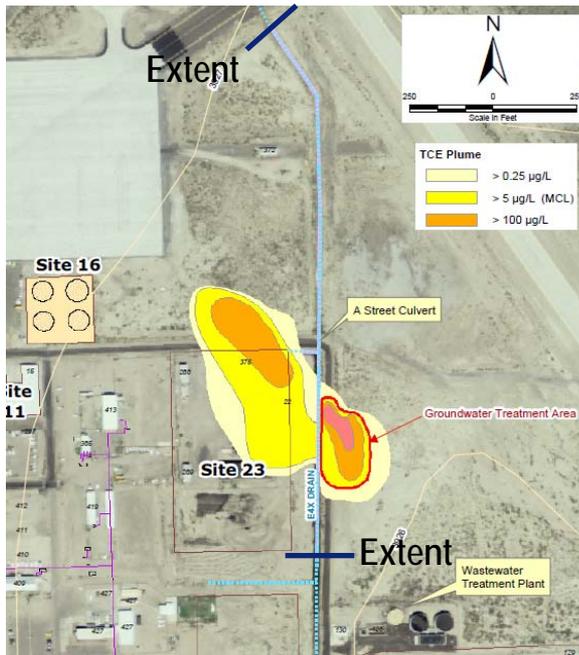
 - **Alternative 4: Concrete lining**
- Navy, in conjunction with regulatory agencies, selected Alternative 1 as the most effective alternative

Potential Solvent Inflows to E4X Drain

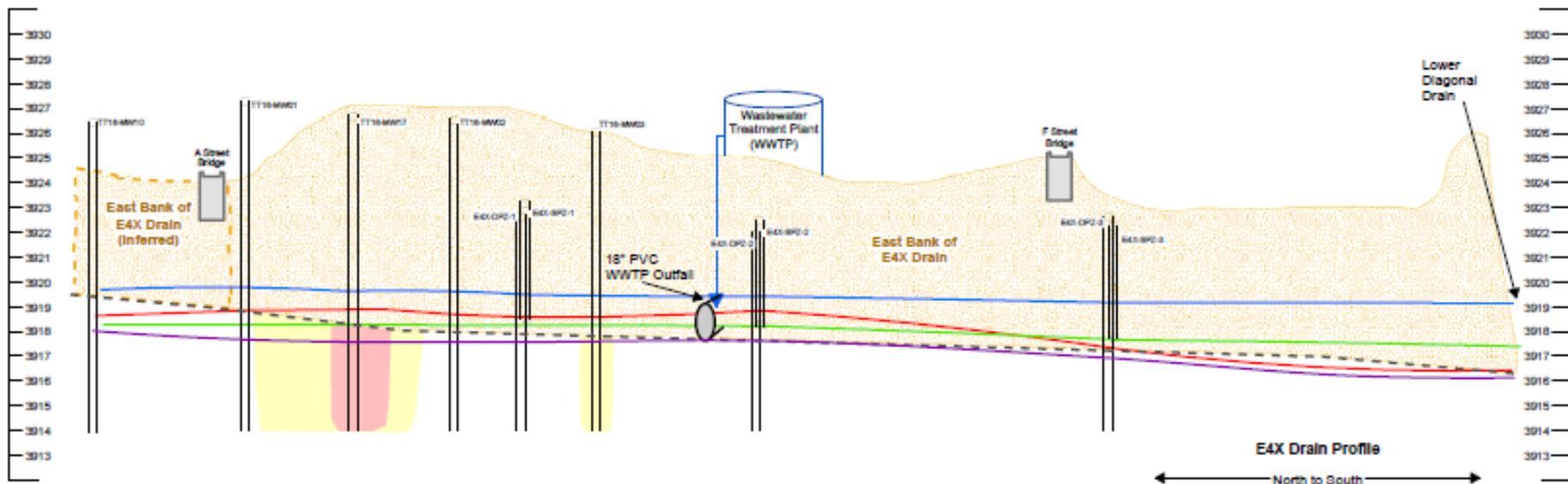


- **Modifications to the drain will be made to prevent the possibility of solvents entering.**

–Channel bed raised

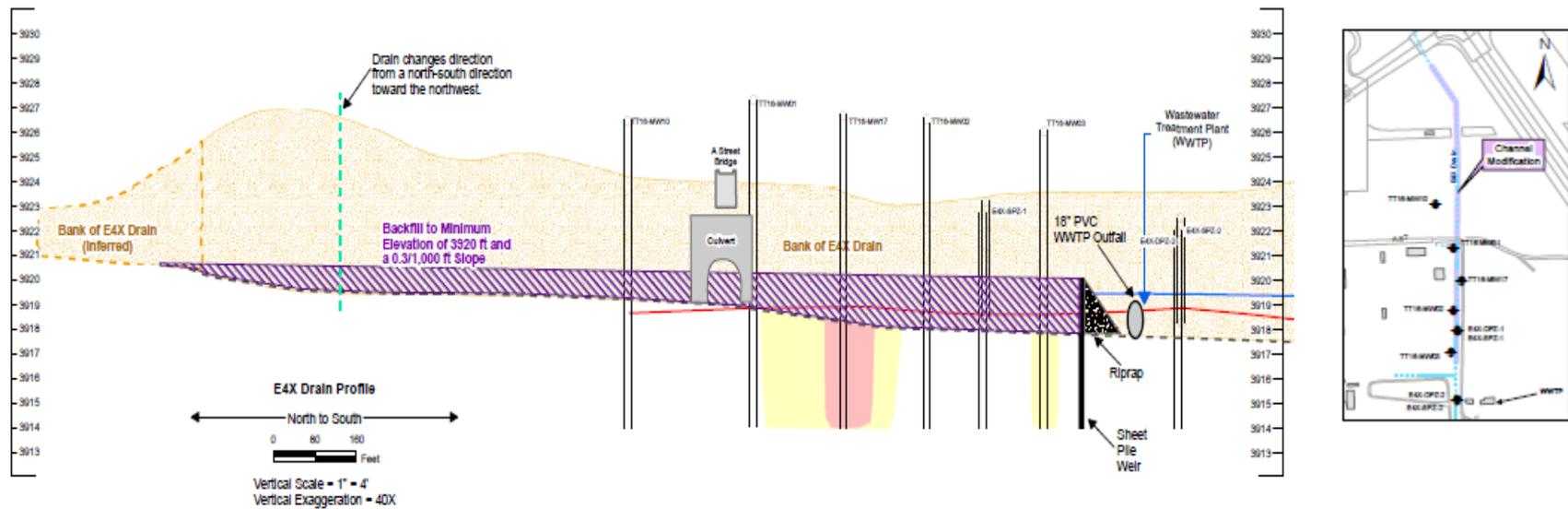


E4X Drain – Existing Profile



- Approximate Surface Water Elevation (High Water)
- Approximate Surface Water Elevation (Low Water)
- - - Approximate Bottom of E4X Drain (according to 2008 topographic survey)
- Approximate Groundwater Elevation (High Water)*
- Approximate Groundwater Elevation (Low Water)*

E4X Drain Proposed Modifications



- Partial backfilling of the drain to raise elevation above groundwater.
- Slope to maintain flow and prevent ponding of water.
- Weir constructed at downgradient extent to prevent upfilling from WWTP and Lower Diagonal.
- Impermeable fill used to eliminate preferential pathways for contamination to migrate along existing channel bed.

E4X Drain Modifications Conclusions

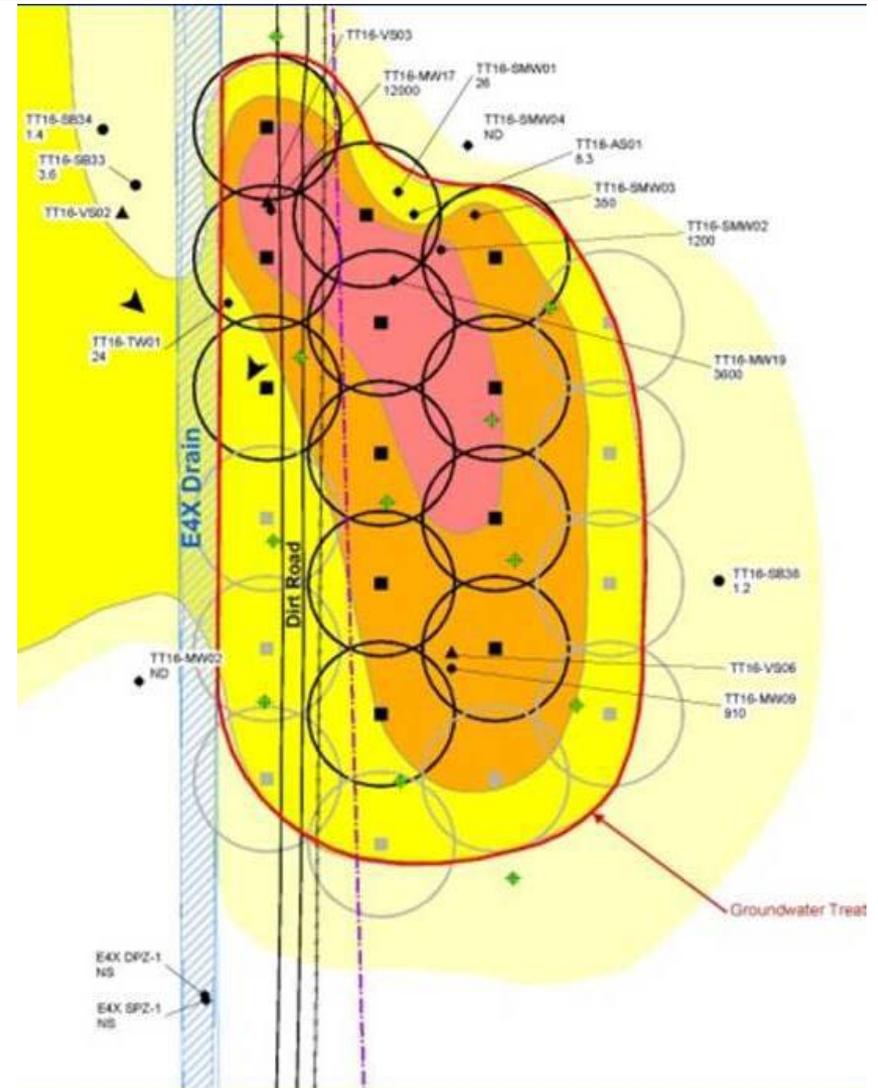


- **Conservative approach to analysis and design taken.**
 - Solvents have not been detected in surface water.
 - Design storm event exceeds FAA and DoD recommendations for airfields.
- **Drain modifications will raise the channel bed by 2.5 feet or less over about 1,700 foot length of channel.**
 - Prevent inflows of groundwater and potential solvent contaminants.
 - Backfill will prevent preferential groundwater flow and migration.
- **Weir installed at downgradient extent will prevent upfilling of the channel from the WWTP and Lower Diagonal Drain.**
- **Stormwater associated with a 25-year, 24-hour storm event will pass with significant excess capacity.**
 - Actual capacity exceeds what would be necessary for a 100-year storm.
 - Culvert will not restrict flow where water will accumulate upgradient during significant storm events.

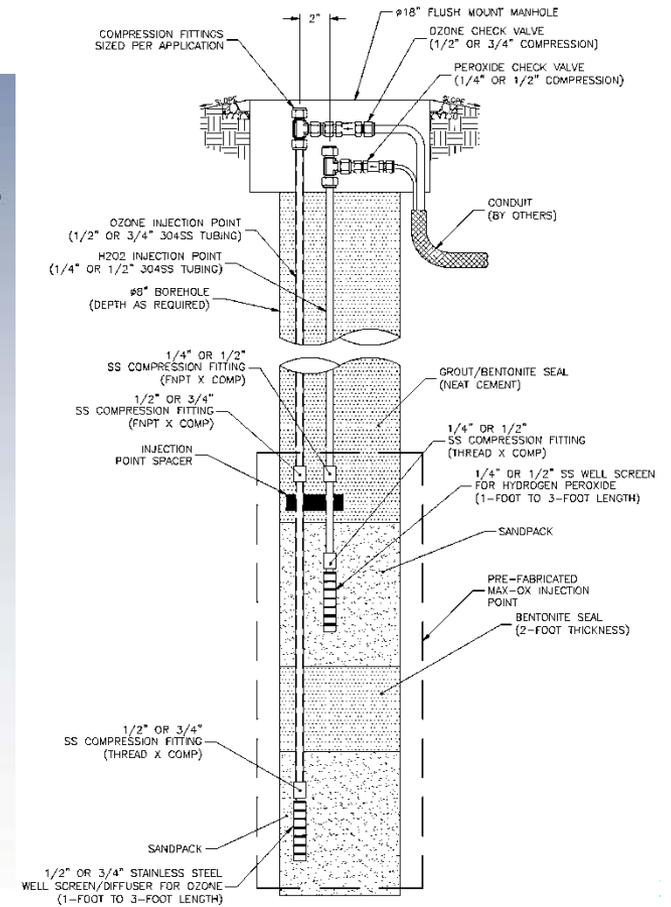
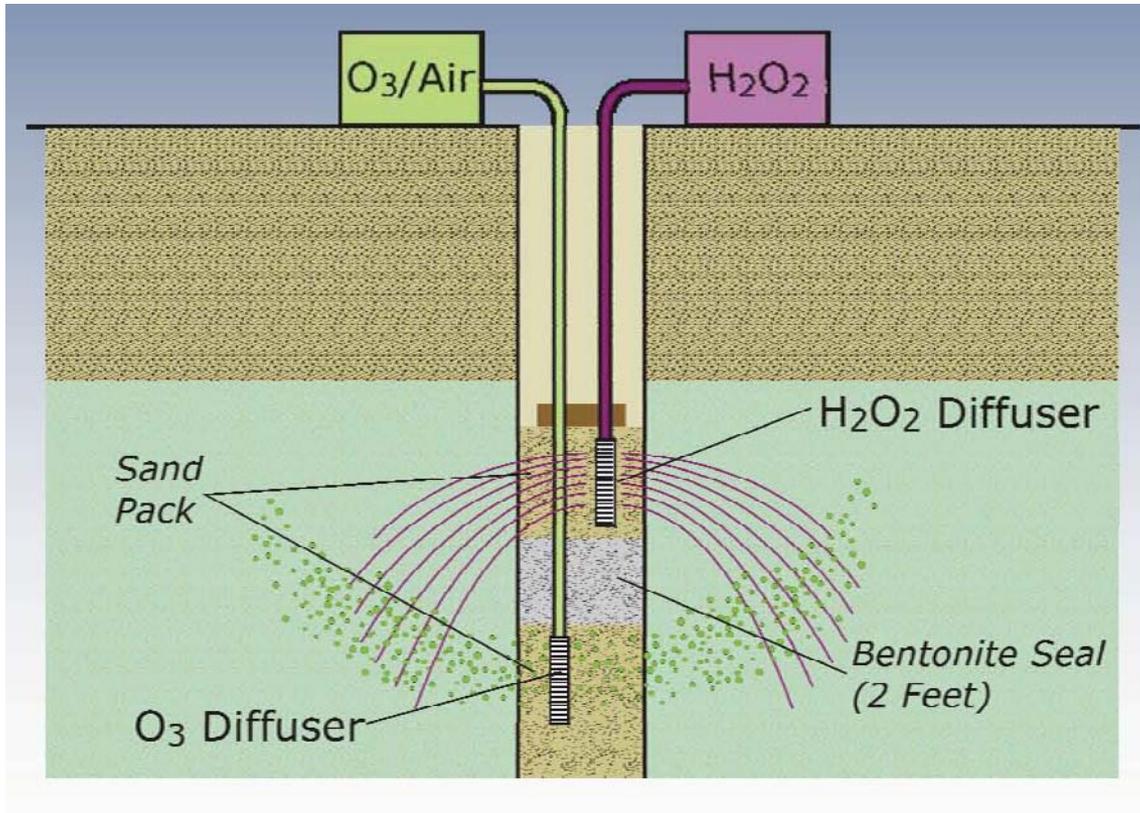
Phase 2 – Treatment of Chlorinated Solvent Plume Adjacent to the E4X Drain



- Highest concentrations (red and orange areas) are adjacent to the E4X Drain.
- Potential risks currently exist to anyone in the drain/drain area.
- TCRA goal is to remove highest concentration of chlorinated solvents using ozone-peroxide treatment.
- Installation of between 12 and 21 injections wells within hot spot.
- Quarterly groundwater sampling from existing and new monitoring wells to monitor progress of treatment.



MaxOx[®] Injection Points



- **Collect groundwater samples and field parameters to monitor system performance**
 - Baseline sampling; direct installation of injection wells
 - Quarterly groundwater sampling
 - Measure field parameters at least monthly (more frequently at beginning of operation)

- **Expect 8 - 12 months of operation**
 - Shutdown if mass removal reaches asymptote
 - Shutdown if not cost-effective or sustainable

Anticipated Schedule - TCRA



- | | |
|--|------------------------------|
| •Draft Action Memorandum | September 2011 |
| •Final Action Memorandum | October 2011 |
| •Draft Work Plan/SAP | September 2011 |
| •Final Work Plan/SAP | October 2011 |
| •Begin Construction | October 2011 |
| •Operation of Groundwater Treatment System | January 2012-
August 2012 |
| •Removal Action Completion Report | TBD |

➤ 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
- Three years of basewide monitoring completed
- Completed Final Well Utilization Plan in February 2011

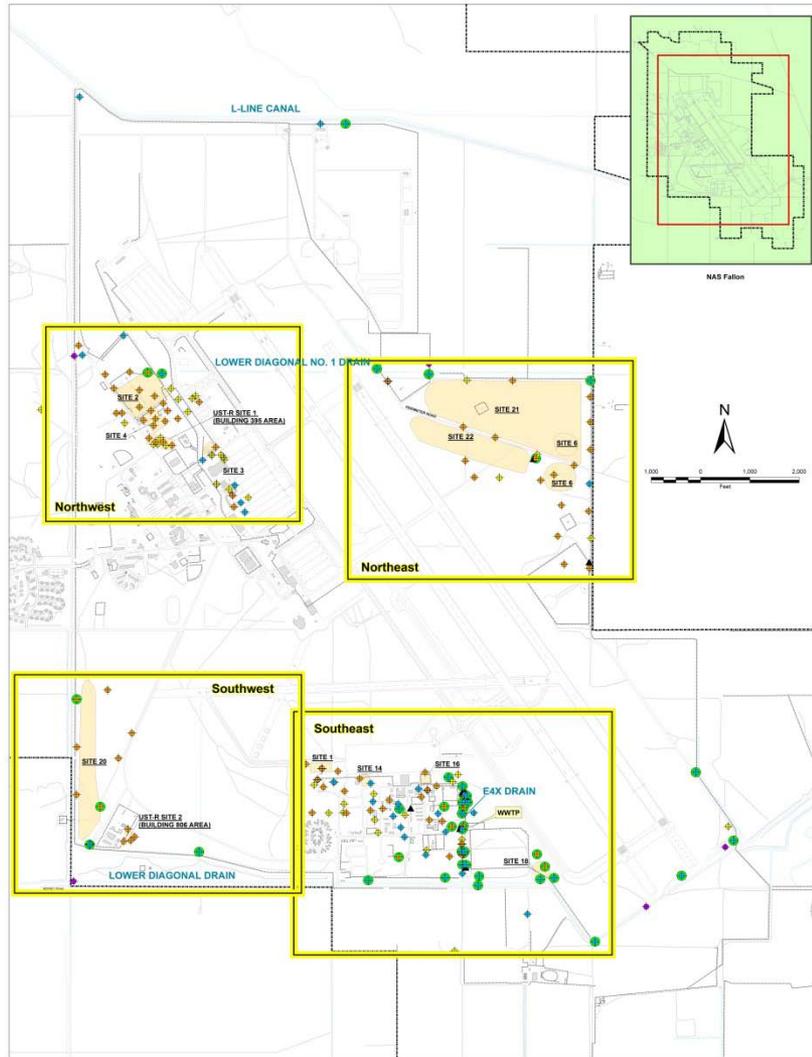
- **Specific uses for wells included in the network for 2011:**
 - 49 wells sampled for basewide water quality (March and October)
 - 38 wells in the basewide network available for water quality sampling if needed to support future remediation efforts
 - 99 wells used for semiannual water level monitoring 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



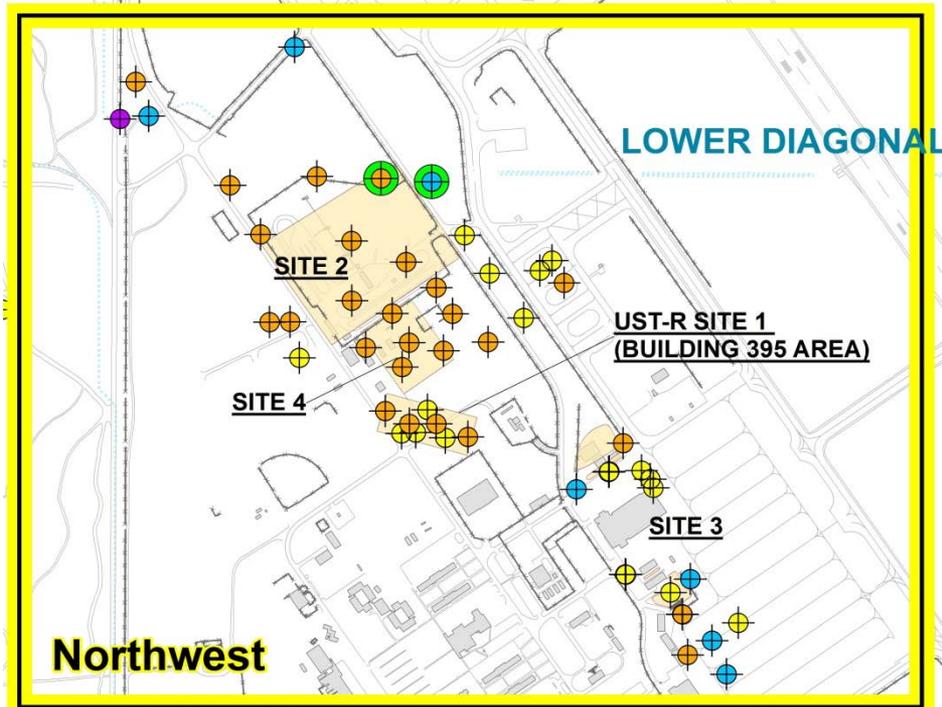
- ROADS
- FENCES
- DRAINAGE DITCH
- ⬡ NAS FALLON BOUNDARY
- BUILDING
- ⬢ SITE 16 SITE BOUNDARY
- WWTP - WASTEWATER TREATMENT PLANT

- ◆ 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

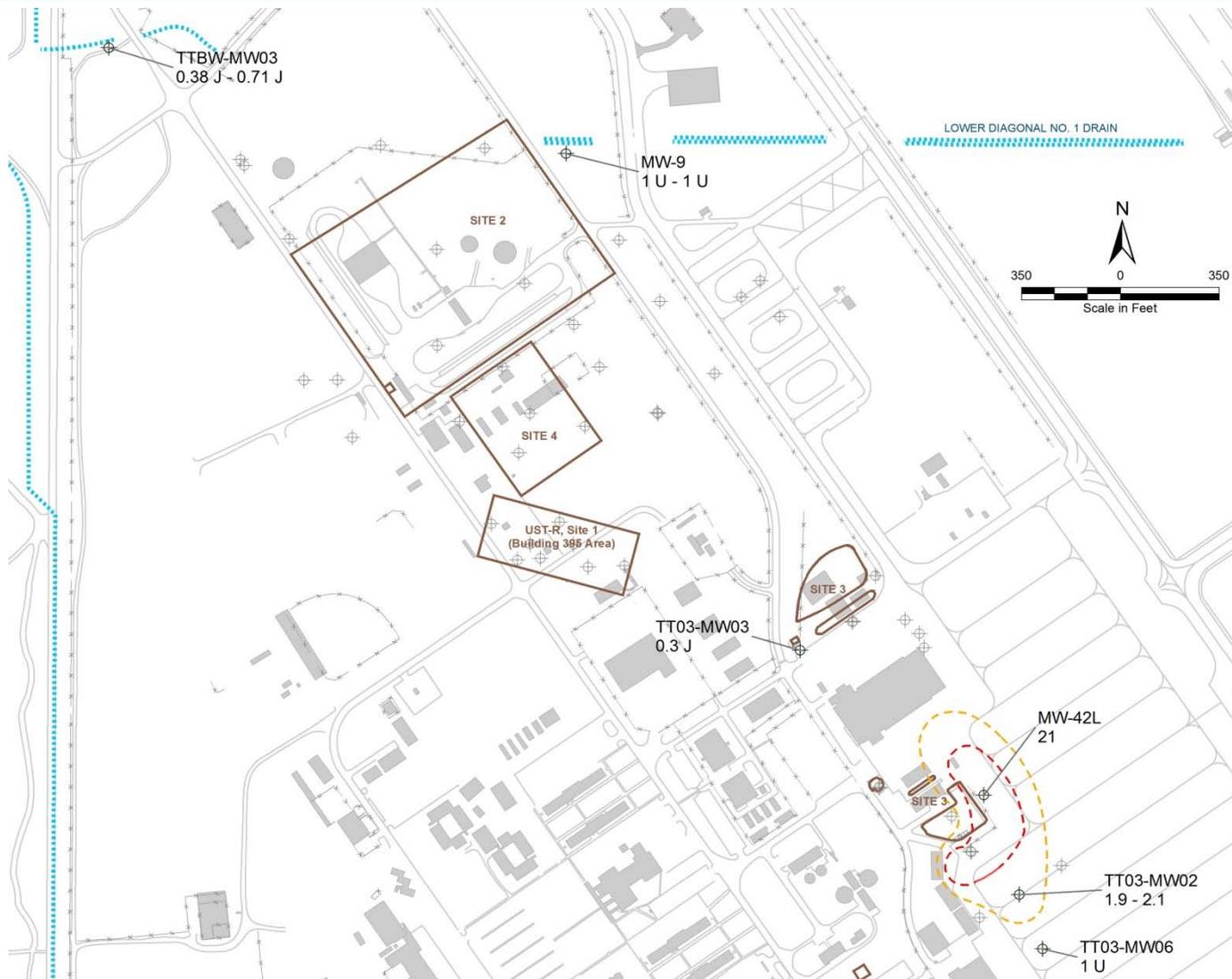
Results – 2010/2011 Groundwater Monitoring, Northwest Quadrant



- 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 $\mu\text{g/L}$) in northwest quadrant groundwater samples
 - Maximum concentration of TCE was 21 $\mu\text{g/L}$ in March 2011 at Site 3
 - No exceedances in 2010



2010/2011 Results – Trichloroethene (TCE) in Groundwater Northwest Quadrant (Northern OU)



- ⊕ Sampled Well
- ⊕ Other Well (Not Sampled)

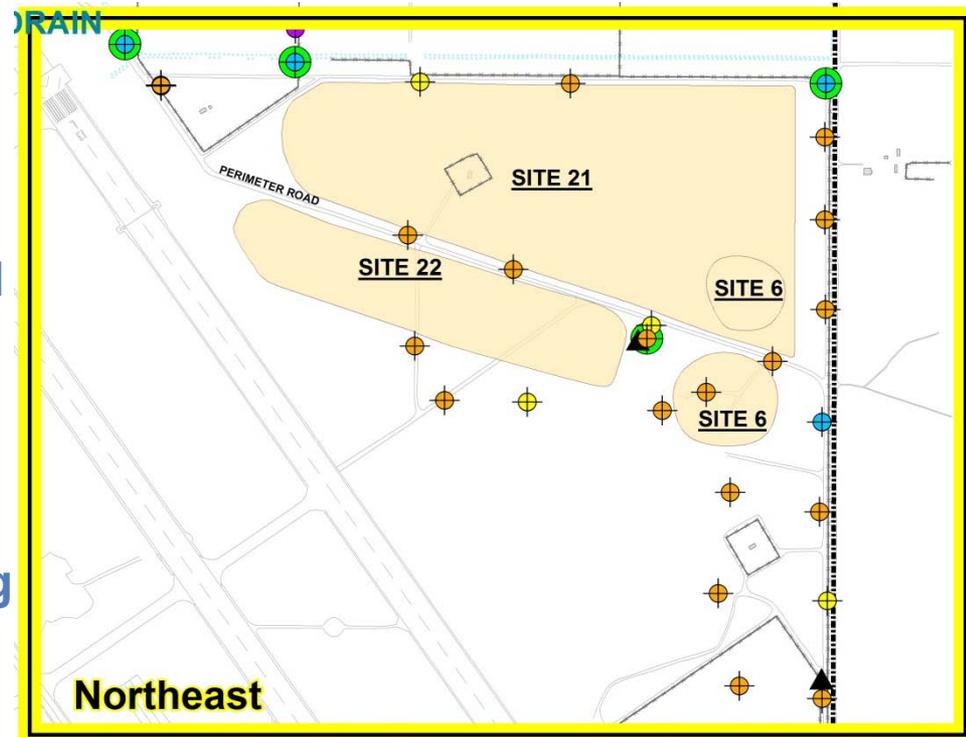
Trichloroethene Isoleths (dashed where inferred)

- 1 µg/L
- 10 µg/L

Results – 2010/2011 Groundwater Monitoring, Northeast Quadrant



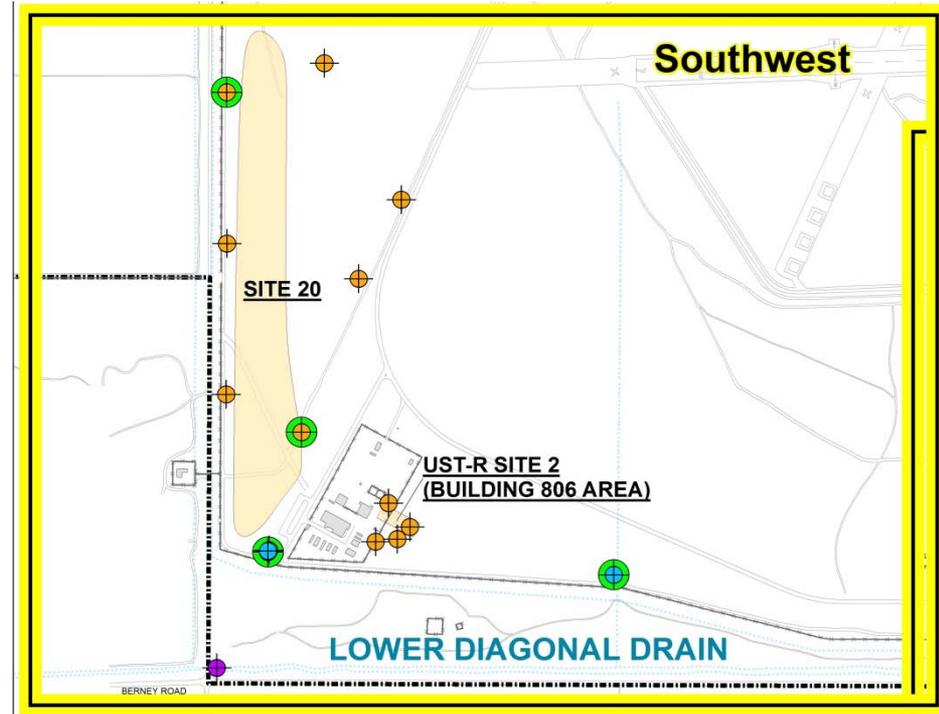
- Depths to groundwater range from about 3 to 12 feet bgs
- Groundwater levels and temperature trends indicate that groundwater and surface water from the Lower Diagonal No. 1 Drain are interconnected
- No organic compounds exceeded the MCLs in northeast quadrant groundwater samples in 2010 or spring 2011



Results – 2010/2011 Groundwater Monitoring, Southwest Quadrant



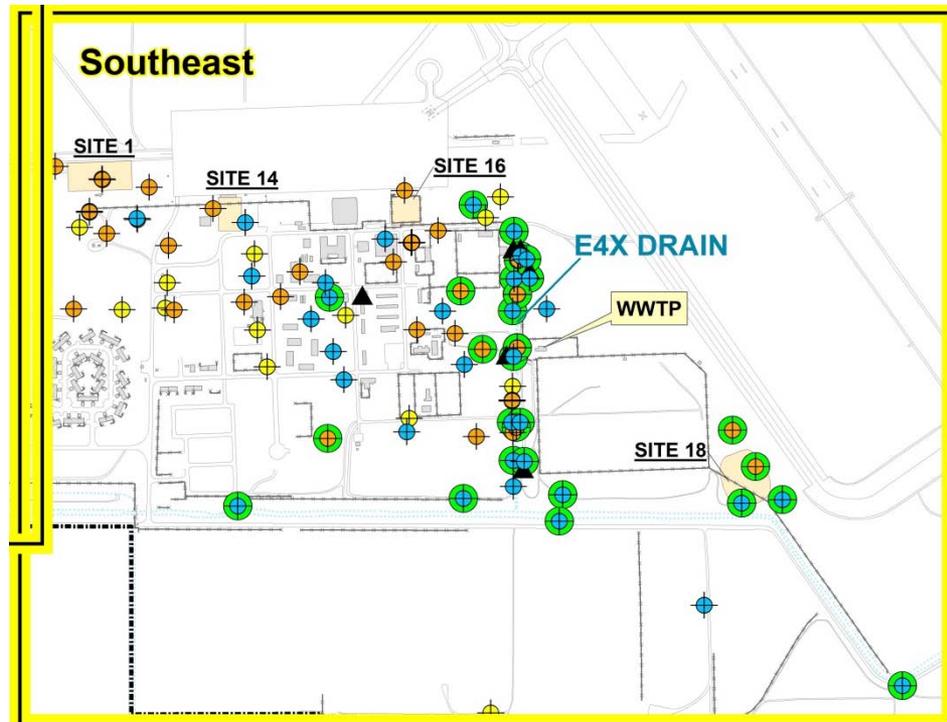
- Depths to groundwater range from about 4 to 8 feet bgs
- Groundwater temperatures range from 52 to 69 °F
- No organic compounds exceeded the MCLs in 2010 or 2011



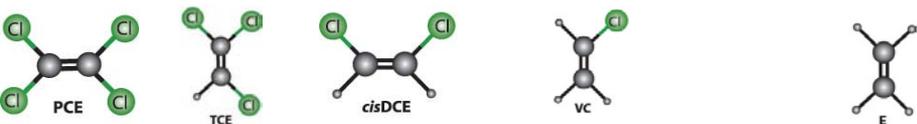
Results – 2010/2011 Groundwater Monitoring, Southeast Quadrant (Southern OU)



- 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 in 2010 and 2011 included:
 - Naphthalene, benzene, 1,2-DCA, PCE, TCE, DCE, and vinyl chloride

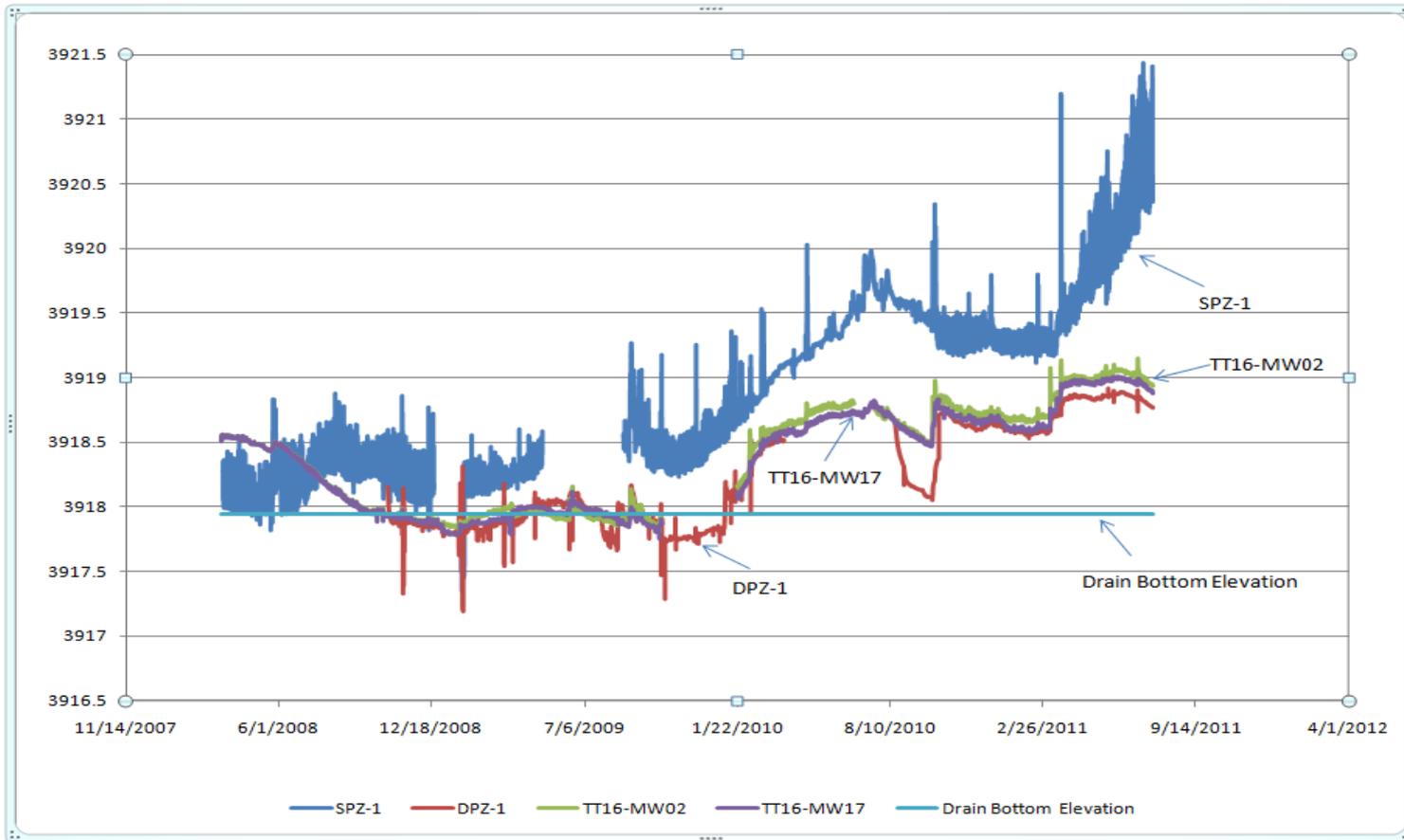


- Chlorinated solvent degradation sequence:
PCE → TCE → DCE → vinyl chloride → ethene

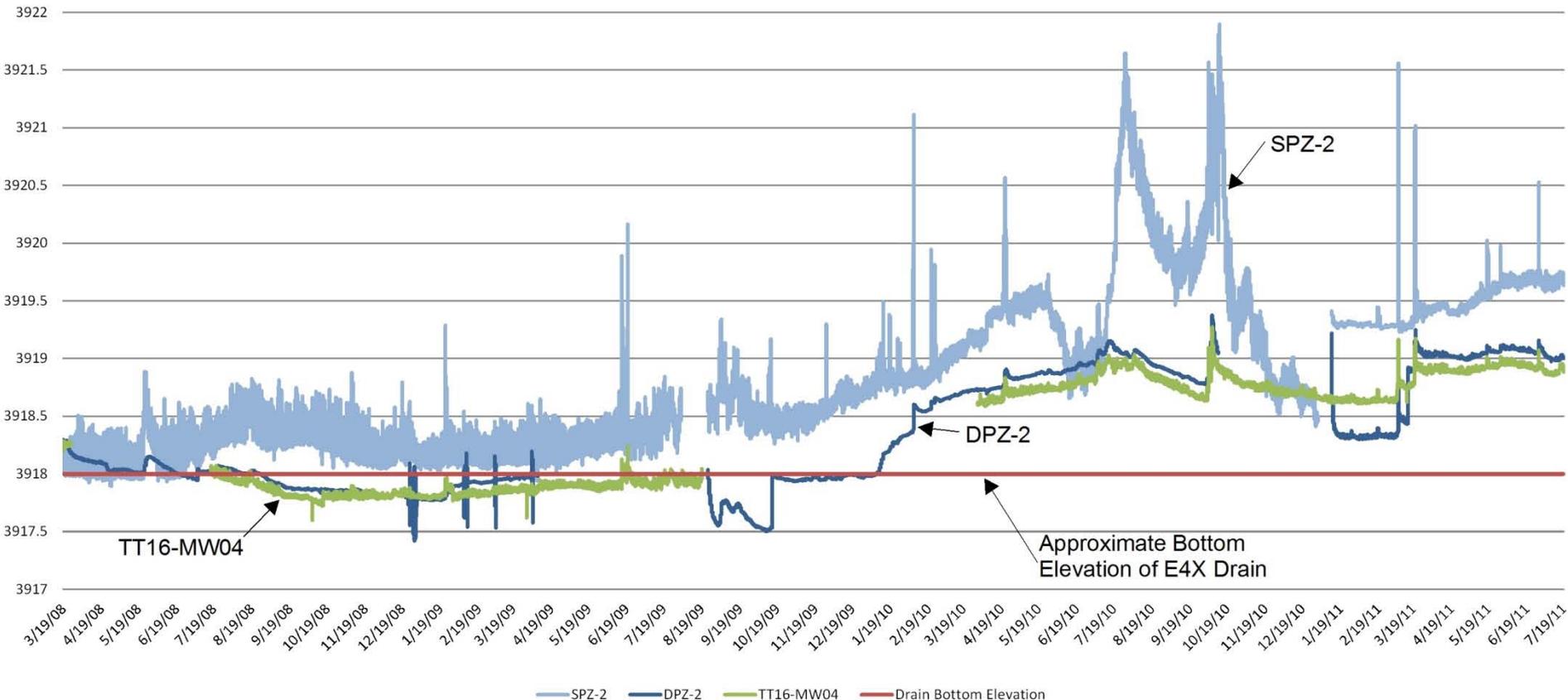


Molecule structures demonstrating the natural degradation of PCE to ethene. Illustrations by Monica D. Ramirez.

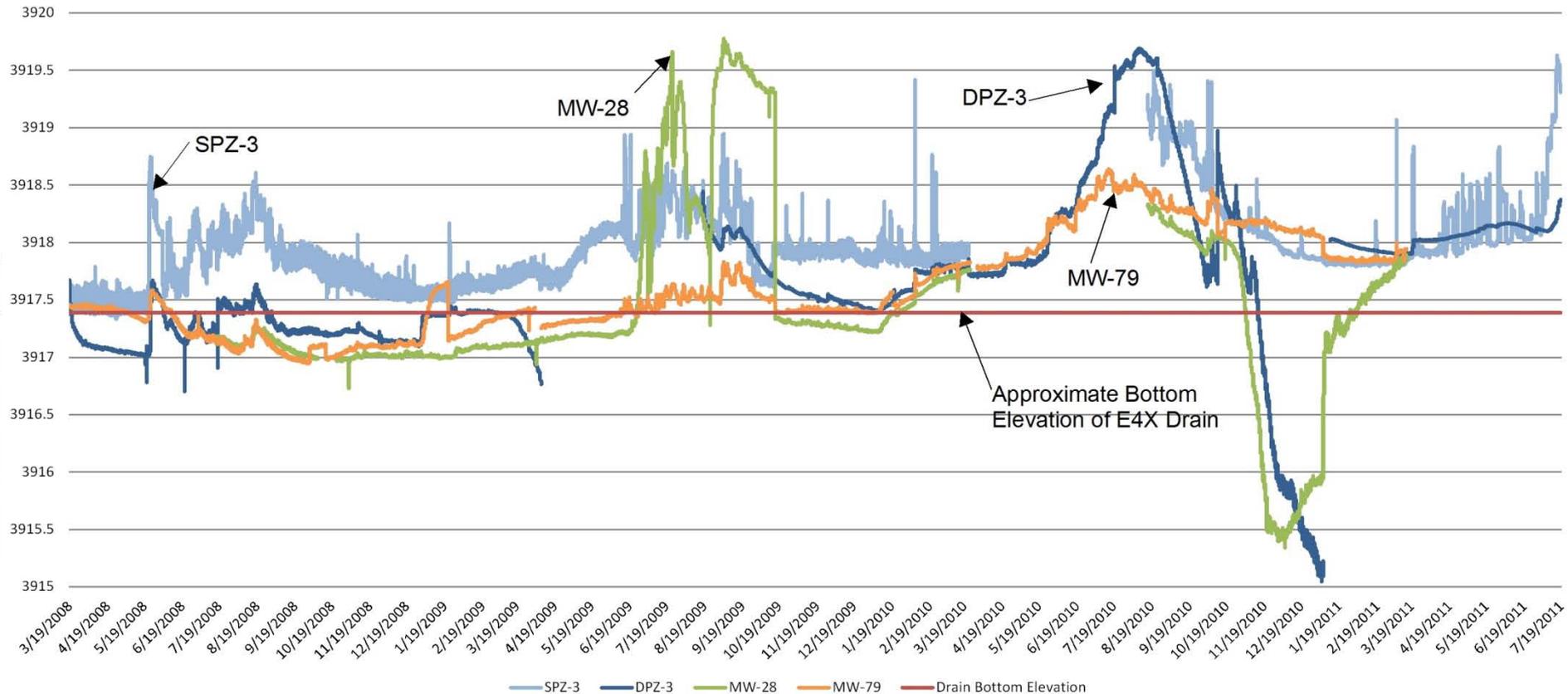
Groundwater and Surface Water Elevation Trends, Vicinity of the Northern E4X Drain, March 2008 to July 2011



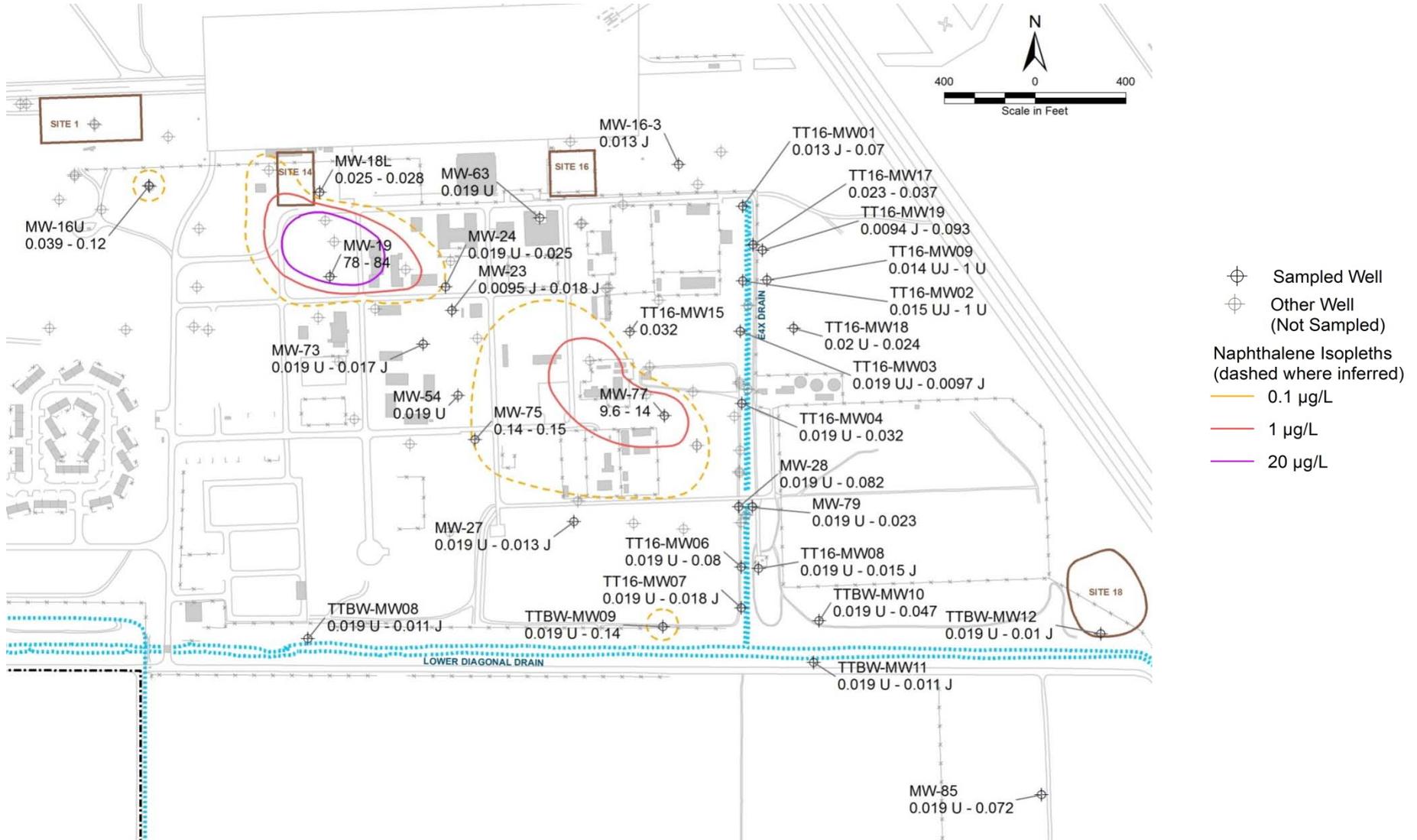
Groundwater and Surface Water Elevation Trends, Vicinity of the WWTP & E4X Drain, March 2008 to July 2011



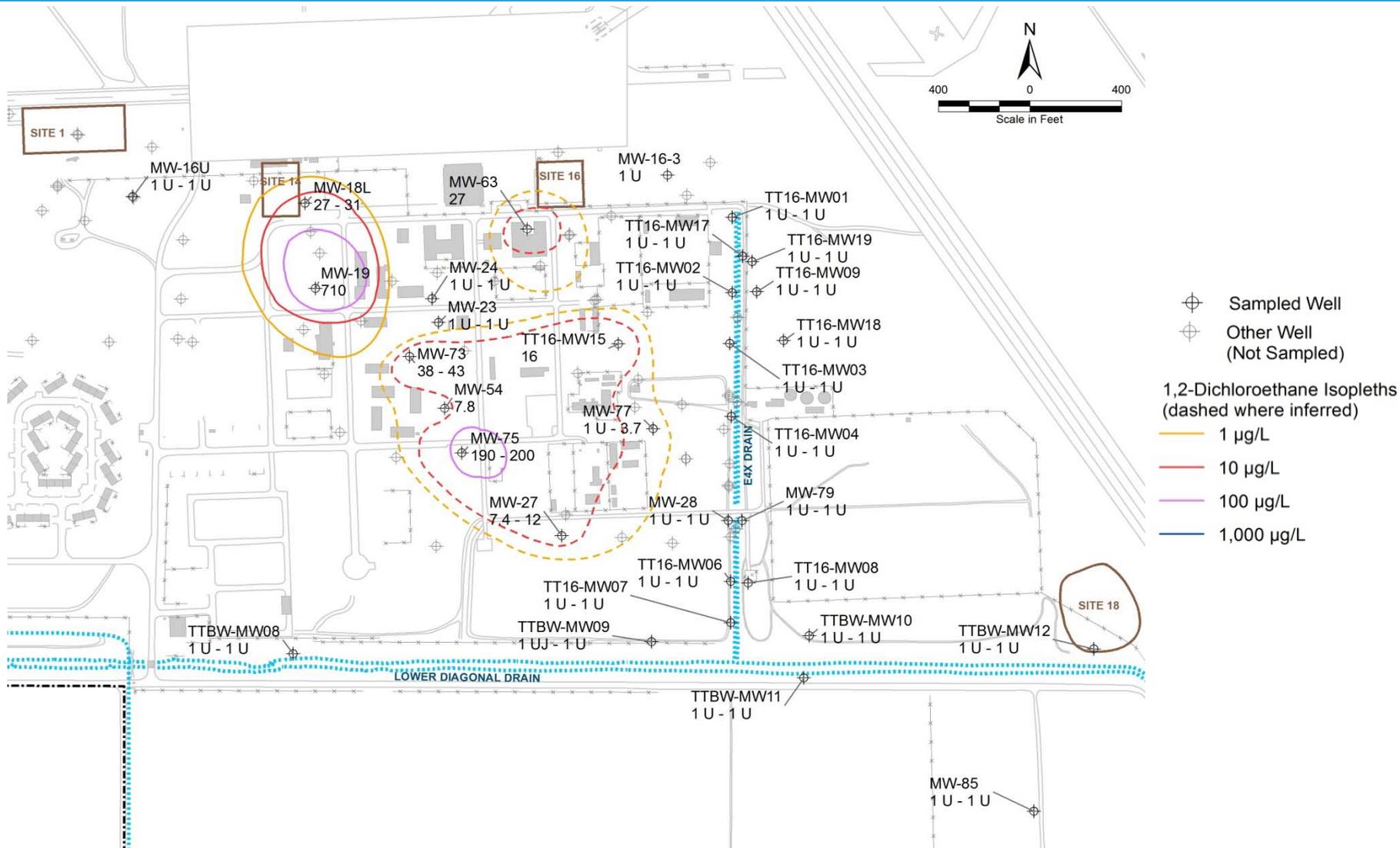
Groundwater and Surface Water Elevation Trends, Vicinity of the Southern E4X Drain, March 2008 to July 2011



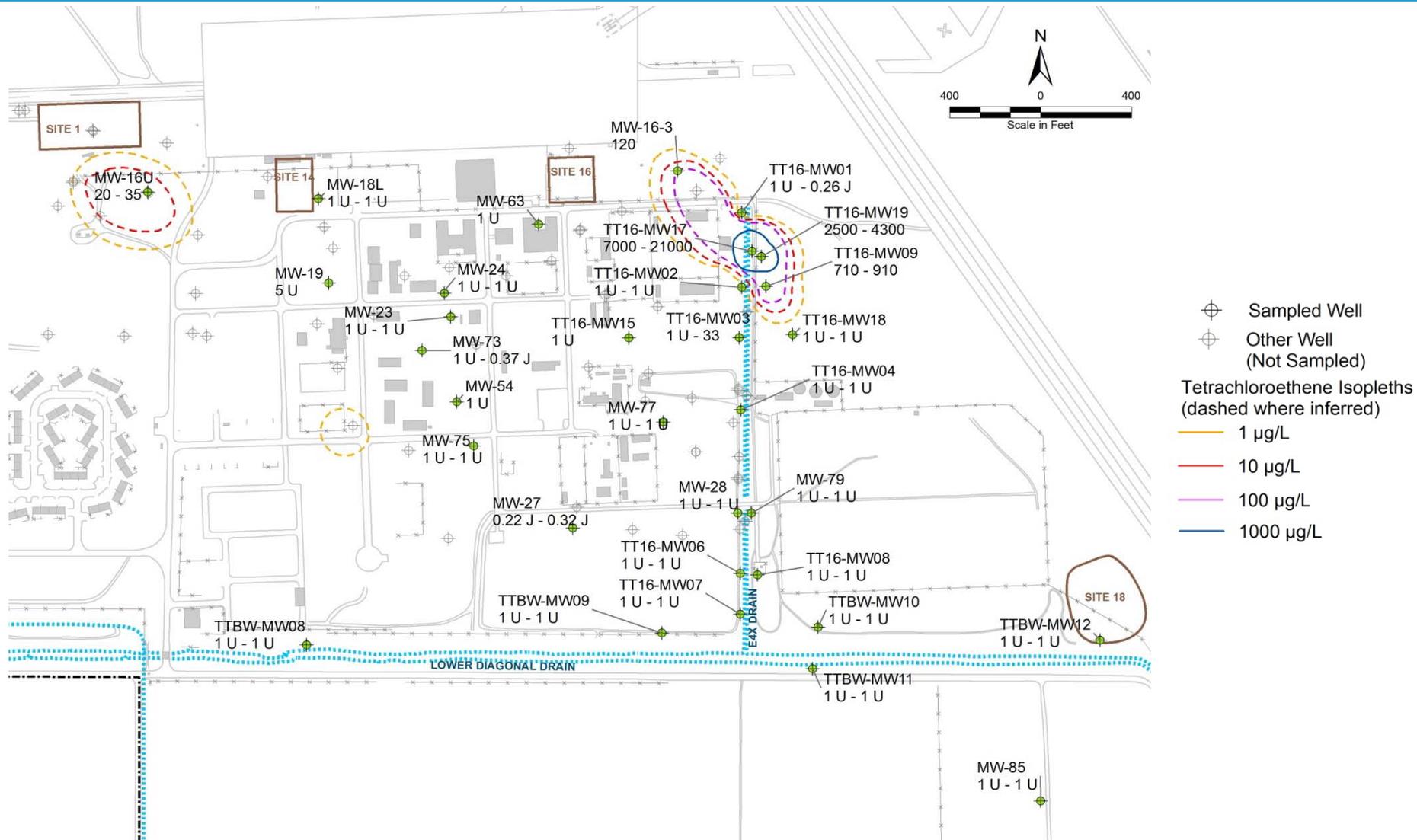
2010/2011 Results – Naphthalene in Groundwater Southeast Quadrant



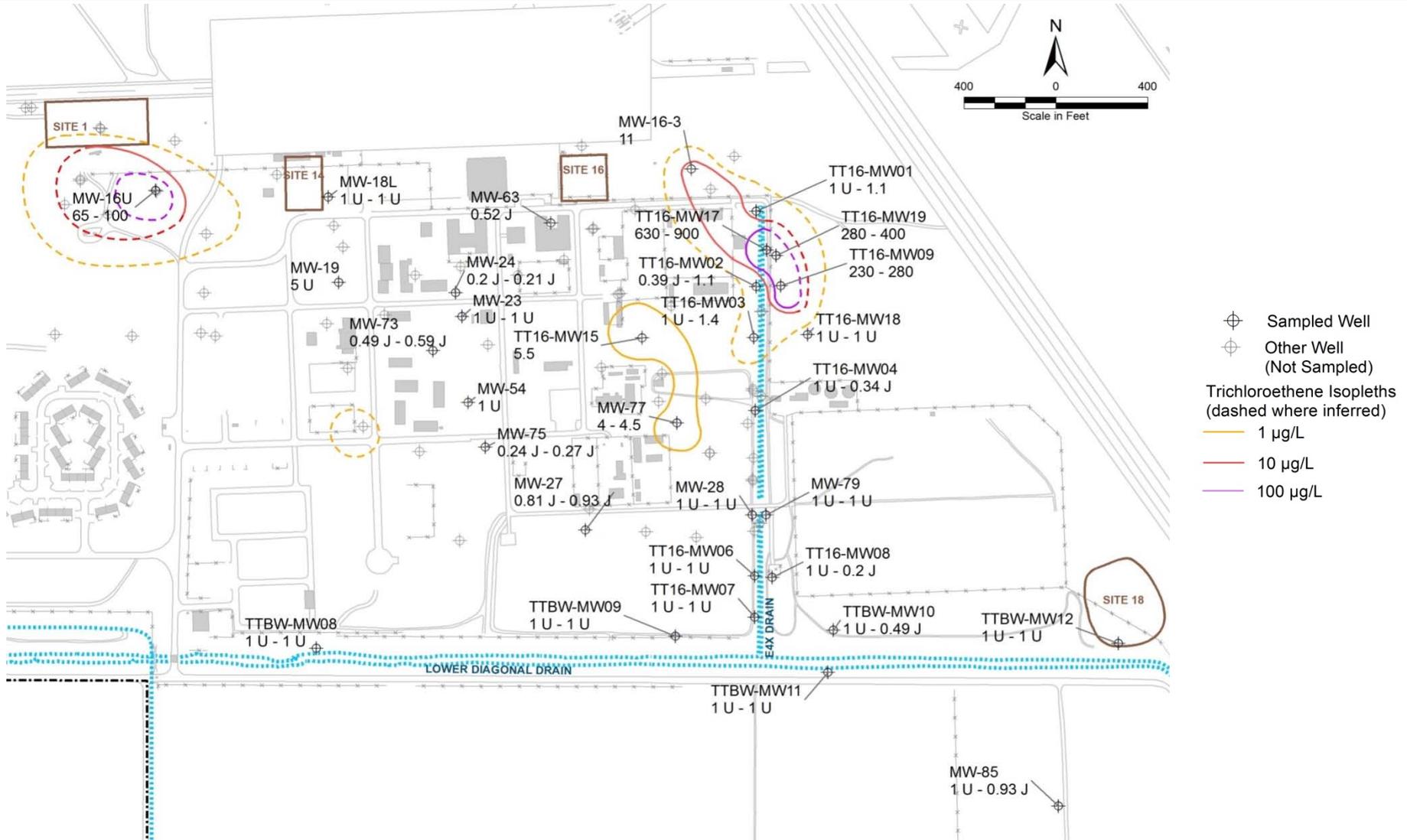
2010/2011 Results – 1,2-DCA in Groundwater Southeast Quadrant



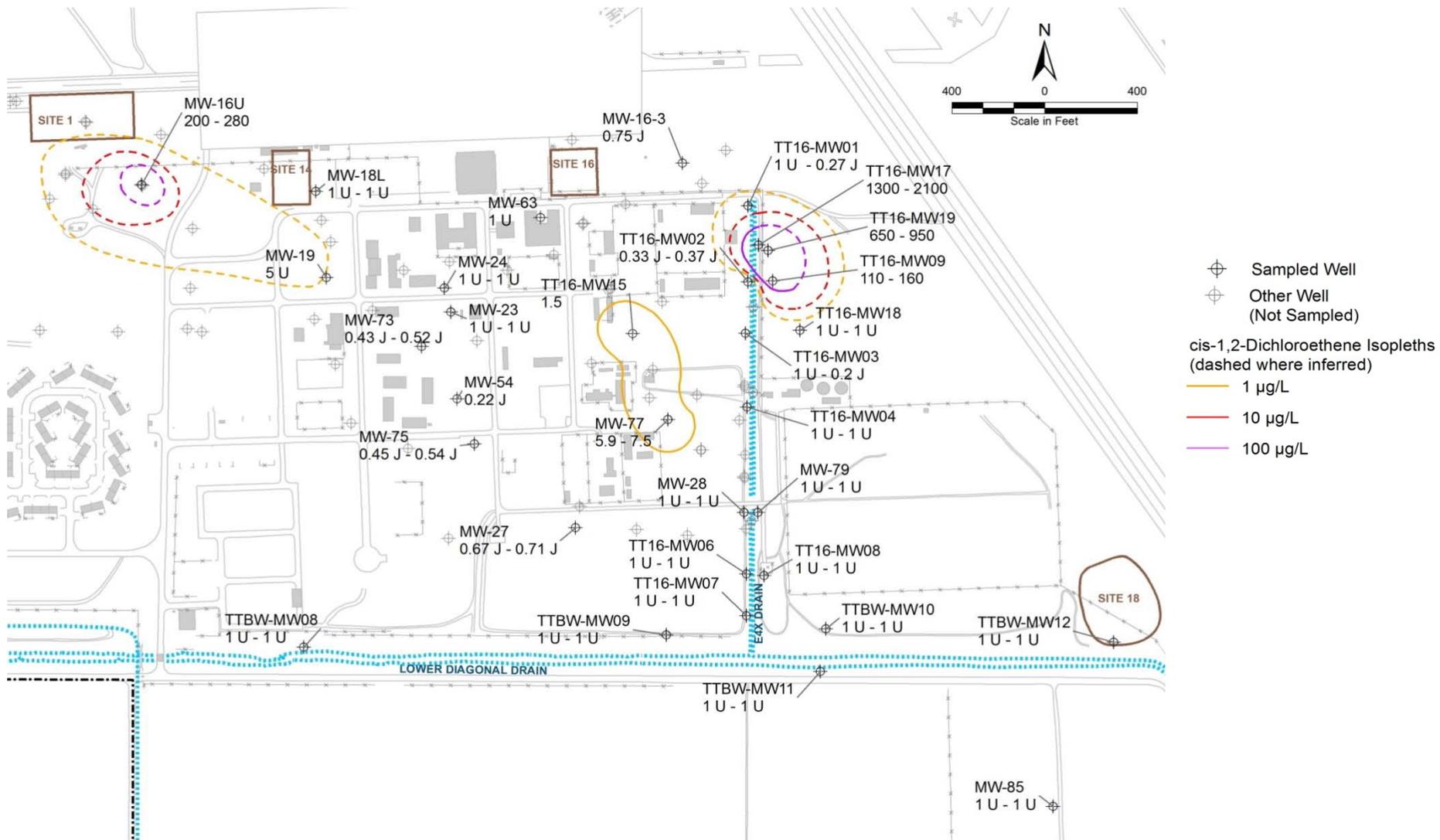
2010/2011 Results – PCE in Groundwater Southeast Quadrant



2010/2011 Results – TCE in Groundwater Southeast Quadrant



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



- **Continue surface water monitoring along Lower Diagonal Drain**
- **Continue annual groundwater quality monitoring during 2012 and 2013**
- **Focus groundwater monitoring efforts in the vicinity of the Southern Operable Unit, E4X Drain, and Lower Diagonal Drain**
 - Groundwater quality monitoring
 - Continuous groundwater level, temperature, and velocity measurements
- **Basewide Hydrologic Monitoring Reports**
 - Fall 2011 – Draft 2008/2009 Biannual Basewide Report
 - Spring 2012 – Draft 2010/2011 Biannual Basewide Report