Naval Air Station Fallon

Restoration Advisory Board Meeting
July 16, 2008

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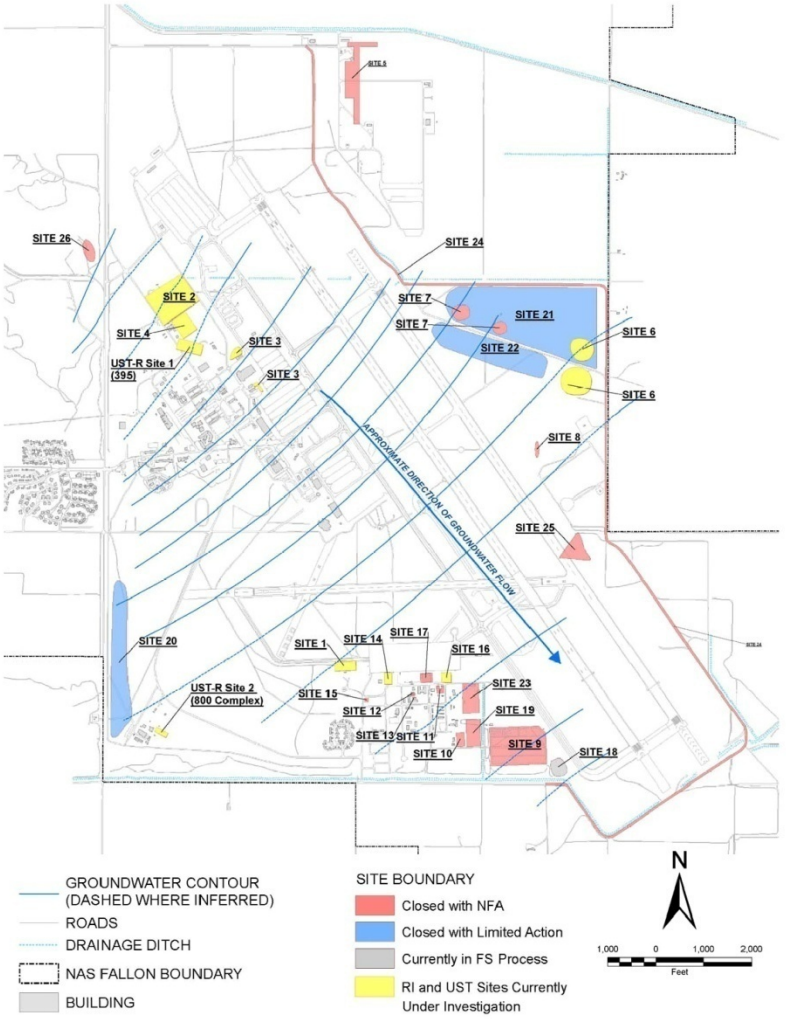
Naval Facilities Engineering Command, Southwest

Meeting Agenda

➢Welcome	7:00 – 7:05 p.m.
➢Installation Restoration Program Update	7:05 – 7:10 p.m.
➢Current Projects	7:10 – 7:45 p.m.
• Remedial Investigations	7:10 – 7:25 p.m.
• Removal Actions, Pilot Studies	7:25 – 7:35 p.m.
• Basewide Investigations	7:35 – 7:45 p.m.
➢Looking Forward	7:45 – 7:50 p.m.
➢Schedule & Budget	7:50 – 8:00 p.m.
➢Question & Answer	8:00 – 8:15 p.m.
➢Meeting Adjourns	8:15 p.m.

Installation Restoration Program Update – Site Status Map



➢CLOSED SITES:

- **Closed - No Further Action**
  - Sites 5, 7, 8, 9, 10, 11, 12, 13, 15, 17, 19, 23, 24, 25, 26, and 27
- **Closed with Limited Action**
  - Sites 20, 21, and 22
- **Pending Closure**
  - Site 4, removal action was completed in 2005
    - The soil portion of the site is administratively closed
    - Residual groundwater contamination at Site 4 is being addressed as part of remedial investigation at Site 2
  - Site 18, Finalizing feasibility study

- **ACTIVE SITES – Currently undergoing Remedial Investigations (RI)**
  - **Active Installation Restoration (IR) Sites**
    - Sites 1, 2/4, 3, 6, 14, and 16
  - **Active Underground Storage Tank Restoration (UST-R) Sites.**
    - UST-R Site 1 (395) and UST-R Site 2 (800 Complex)

Current Installation Restoration Program Projects

- **Remedial Investigation (RI), Active Sites**
- **Fuel Removal Action – Site 2**
- **Pilot Studies – Site 16**
- **Basewide Groundwater Investigation**

- **August 2007 – May 2008**

- **Primary Objectives**
  - **Confirm previous results**
  - **Better delineate soil and groundwater contamination**
  - **Obtain data to assess ecological and human health risk**
  - **Delineate areas for removal or remedial actions**
  - **Update conceptual site models**

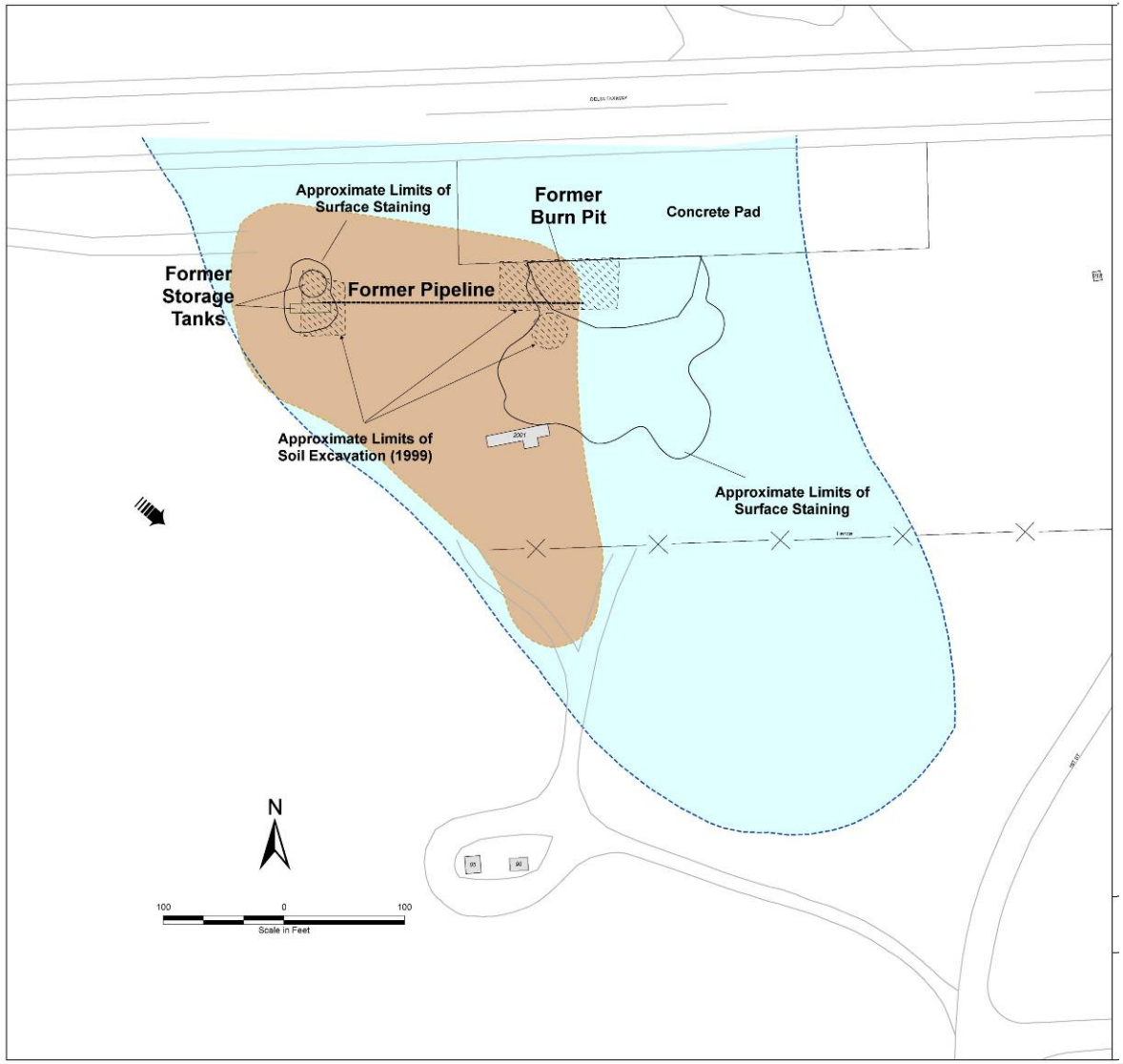
➢RI Activities

- **Installed monitoring wells**
- **Collected soil and groundwater samples**
  - – Primarily analyzed for fuel and solvents based on historical site operations
- **Collected geotechnical, lithologic, and hydrogeologic data**

Remedial Investigation Accomplishments

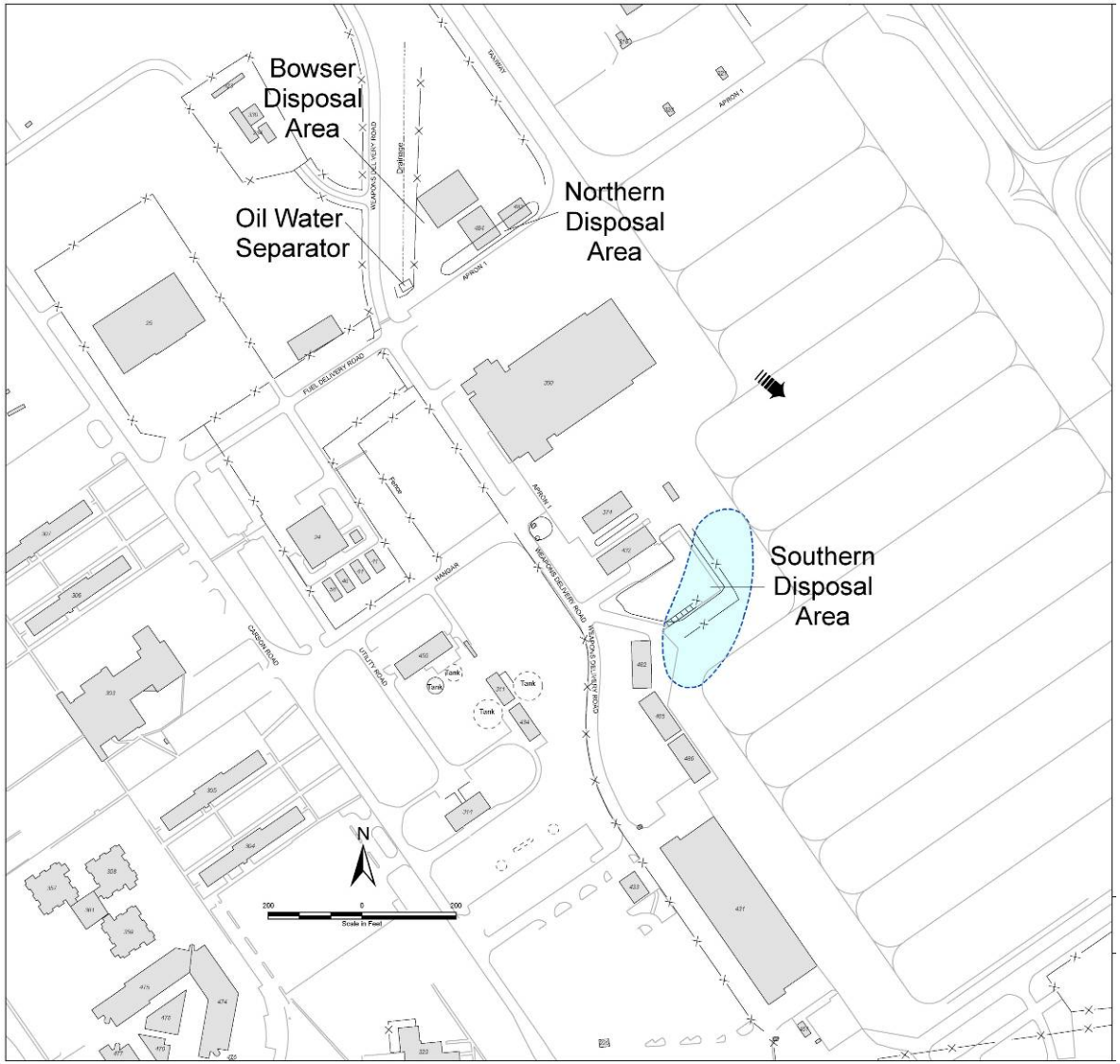
- **Delineated extent of floating fuel and soil smear zones**
- **Obtained current groundwater data**
- **Identified areas of concern**
- **Provided baseline of groundwater data for future evaluation of plume trends**
- **Obtained data to assess ecological and human health risks**
- **Obtained data to decide upcoming remedial actions**

Site 1 - Crash Crew Training Area



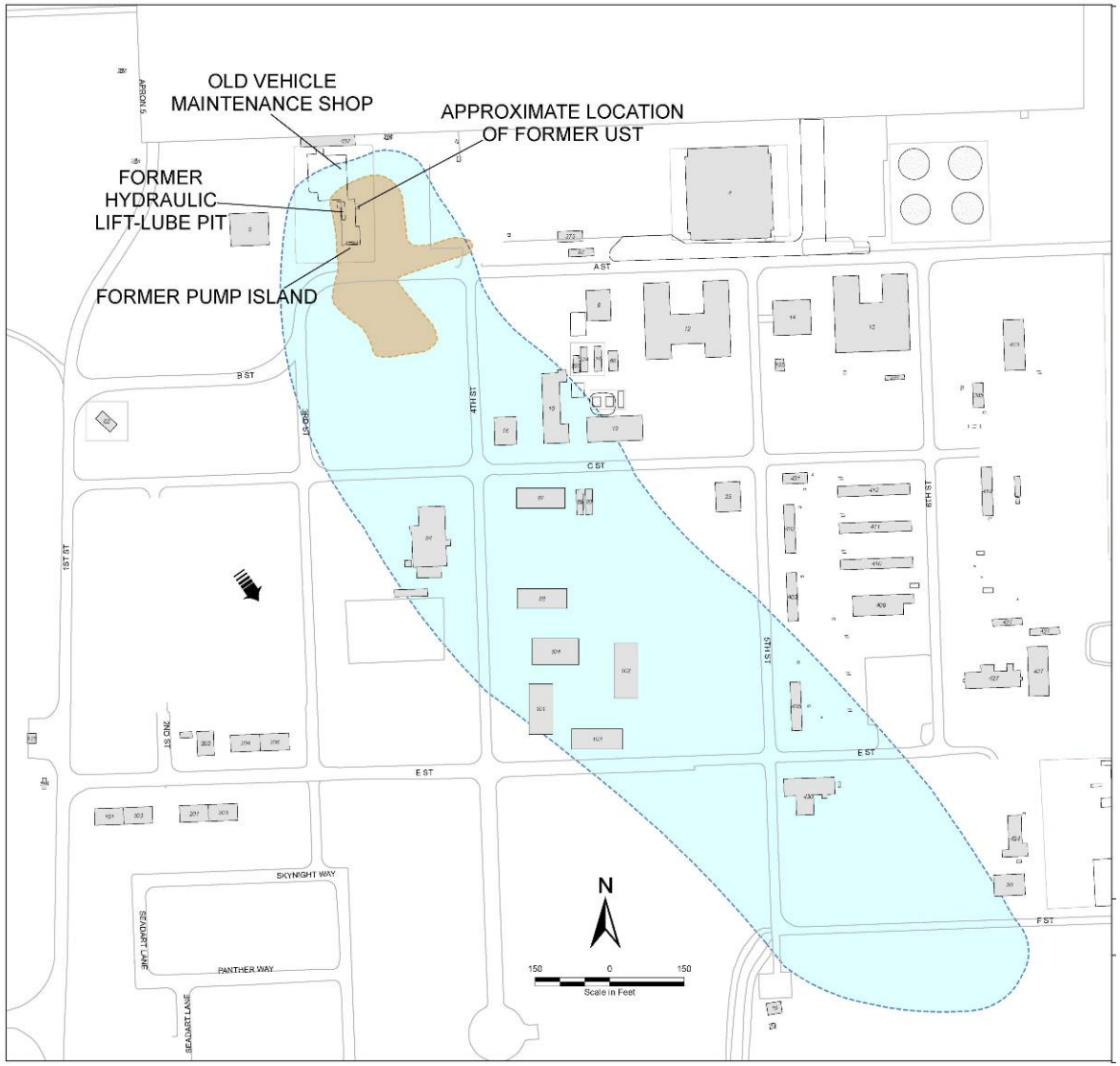
Site 2/4 – New Fuel Farm/Transportation Yard

Site 3 – Hangar 1 Area

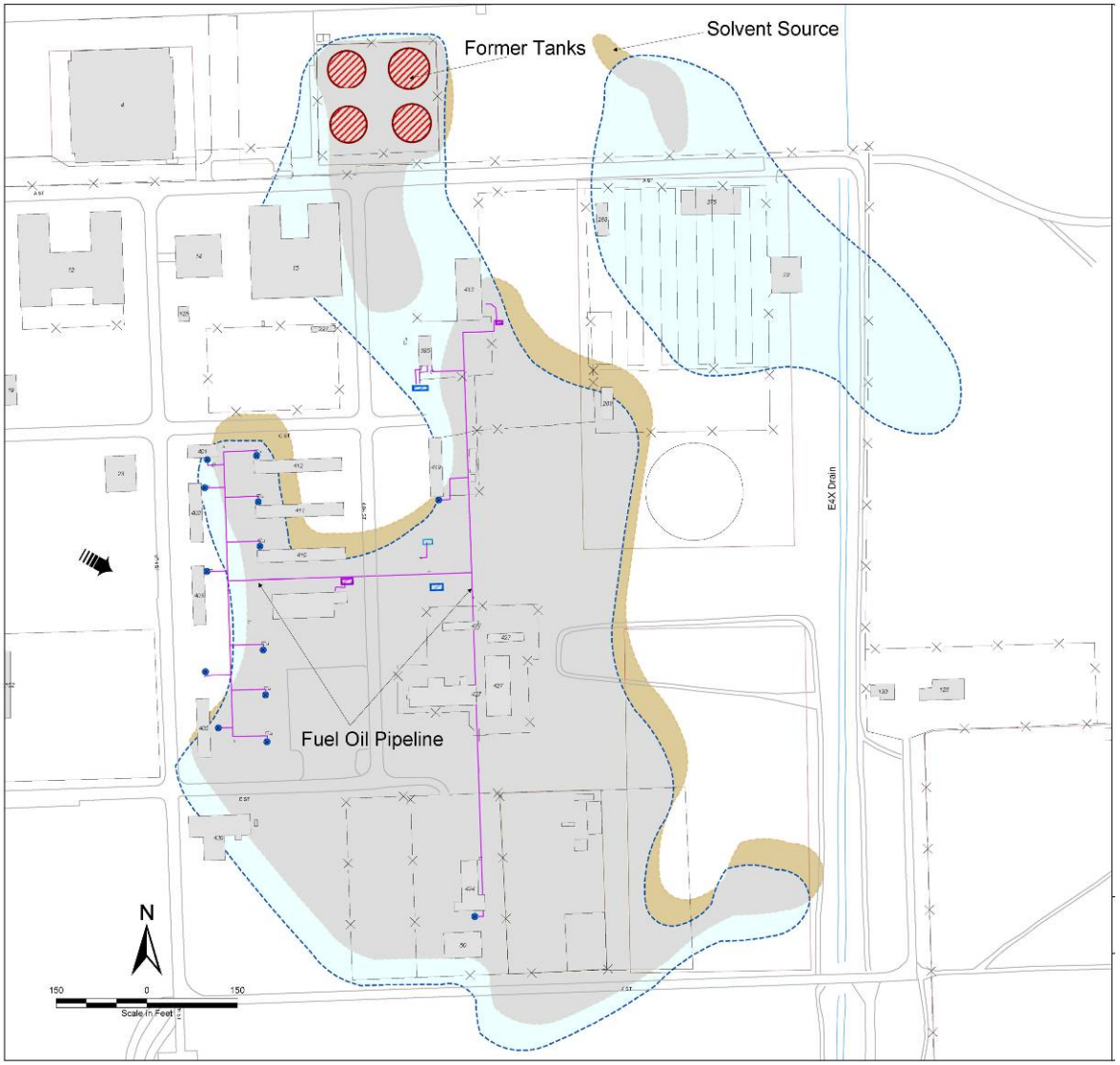


Site 6 – Defuel Disposal Area

Site 14 – Old Vehicle Maintenance Shop



Site 16 – Old Fuel Farm



Installation Restoration Program Update – Status Of Site 16 Fuel Plume Containment System

- **Fuel Plume Containment System - Operated from 2004 to 2007**
- **Navy evaluated system in 2007 for**
  - **Hydrologic characteristics of natural groundwater and surface water flow patterns**
  - **System effectiveness, both hydraulically and in moving contaminants away from E4X drain**
- **Navy shutdown system in fall 2007**
- **NDEP concurred with Navy's recommendation in February 2008**
- **Navy currently monitors groundwater and surface water interactions at Site 16 to ensure no adverse effects**

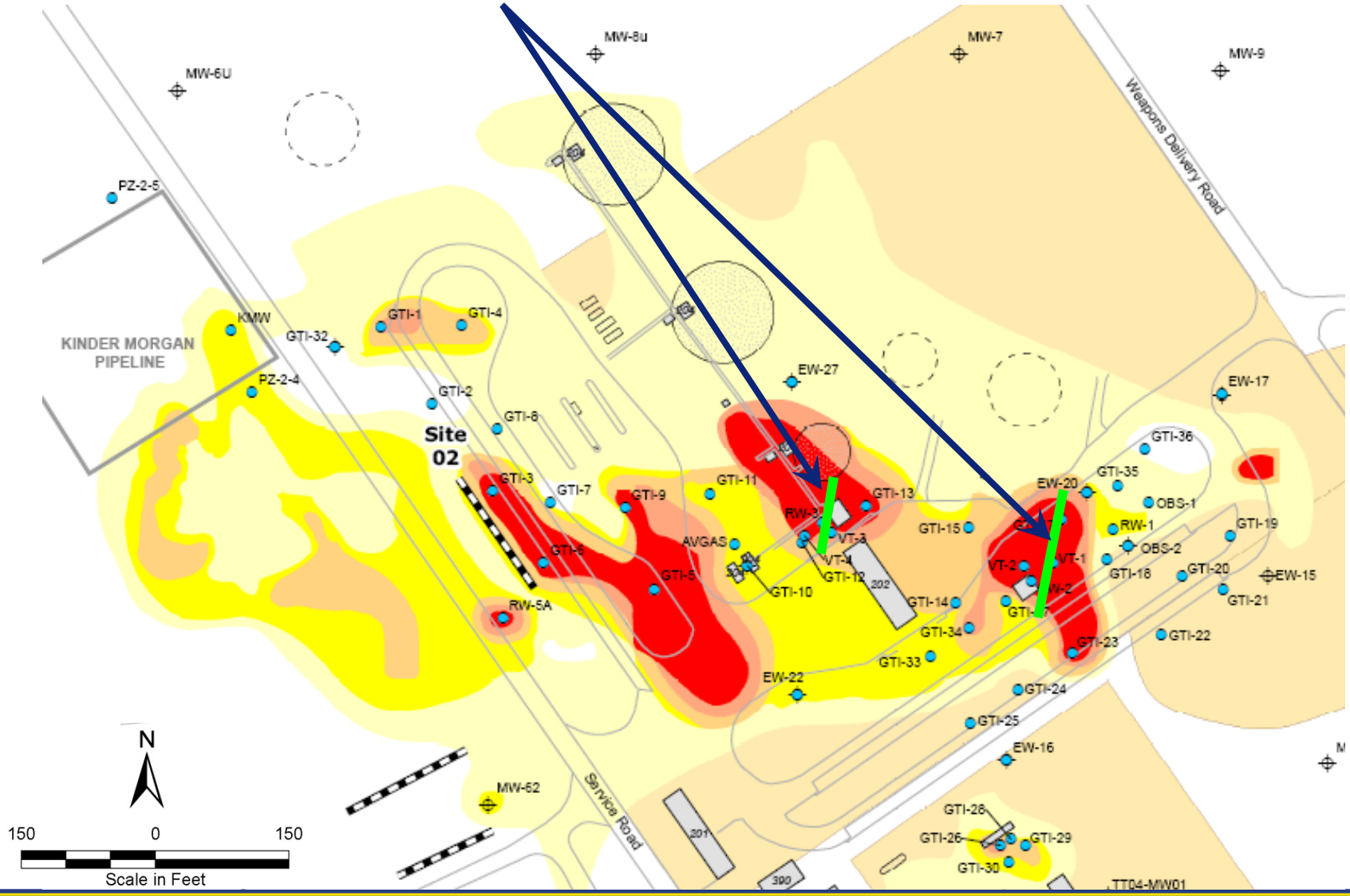
UST-R Site 1 (UST 395)

UST-R Site 2 (800 Complex)

Current Projects – Site 2 Fuel Removal

- **Fuel Removal Update**
  - Skimmer pumps operating in several existing wells
  - More than 1,600 gallons of fuel removed
  - Fuel skimming is labor intensive
  - Achieves mixed results because of variable soil types
- **Trenches installed to optimize fuel removal rates**
  - Installed where fuel is thickest
  - Installed across variable soil types
  - Therefore intersect with higher-permeability soils
  - Improve fuel recovery rates

Current Projects, Site 2 – Trench Locations



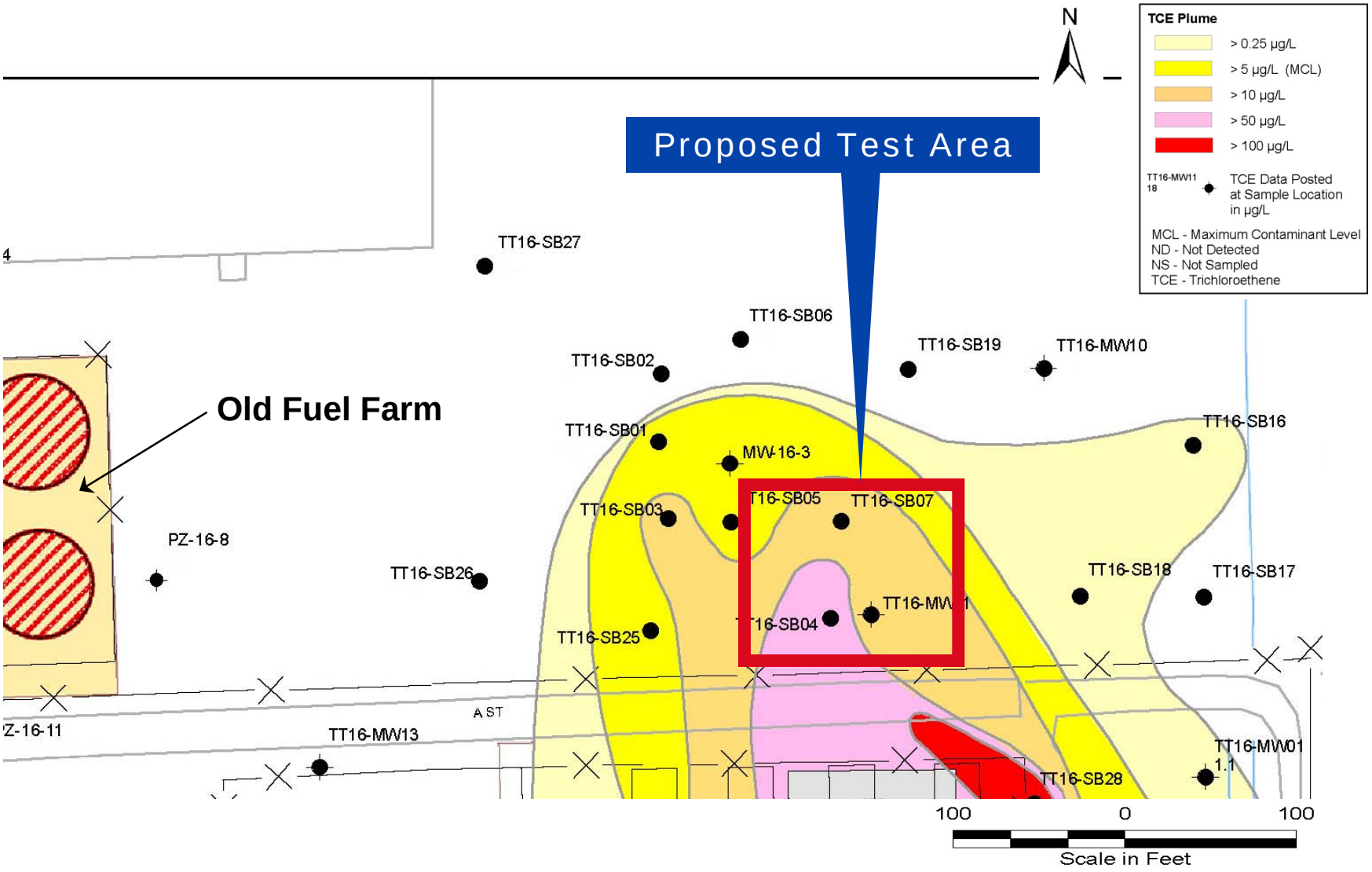
Current Projects – Site 16 Pilot Studies

- **Air Sparging Pilot Test**
  - **Proven technology to remediate chlorinated solvents**
    - – Inject air below water table through wells in the area of groundwater contamination
    - – Air flows through soil column
    - – As air rises through soil column, chlorinated solvents that are sorbed to soil or dissolved in groundwater are volatilized
    - – Vapors are either collected or allowed to vent to atmosphere

Current Projects – Site 16 Pilot Studies

- **Air Sparging Pilot Test**
  - **Purpose - obtain design parameters for a full-scale system**
    - Radius of influence of sparge wells
    - Well spacing
    - Number of wells
    - Air injection flow rate
    - Air injection pressure
  - **Current activities**
    - Developing work plan

Current Projects – Site 16 Air Sparge Pilot Test for Chlorinated Solvents



Current Projects – Site 16 Pilot Studies

- **Landfarming Pilot Test**
  - **Purpose - demonstrate the effectiveness of landfarming to remediate fuel-contaminated soils**
    - – Biodegradation rates
    - – Optimal moisture content
    - – Mixing frequency, bulking agents
    - –Estimate capital costs and operation and maintenance costs
  - **Current activities**
    - – Developing work plan and sampling plan

➢Purpose

- **Active Sites - Assess plume stability, characteristics, and trends**
- **Closed Sites - Provide post-closure monitoring**
- **Sentinel groundwater monitoring wells near base boundaries**

➢Scope

- **Semiannual groundwater quality and water monitoring**
- **Quarterly data-logger downloads**
- **Continuous pressure transducer measurements**
  - Water levels
  - Temperatures
  - Electrical conductivity and total dissolved solids adjacent to and in E4X Drain
- **Continuous groundwater flow sensor measurements**

Current Projects – Basewide Groundwater Investigation, Recent Field Activities

- **Redeveloped 80 existing wells**
- **Repaired 40 existing wells**
  - **Converted flush mount to stickup**
  - **Added protective casing and well locks**
  - **Repaired surface completion and replaced concrete pad**
- **Installed and sampled 16 basewide wells**
- **Installed 116 dedicated pumps in wells**

➢Installed 60 pressure transducers in selected basewide monitoring wells

- **Transducers to provide continuous measurements:**
  - Groundwater levels
  - Groundwater temperature
  - Six probes also measure electrical conductivity and total dissolved solids

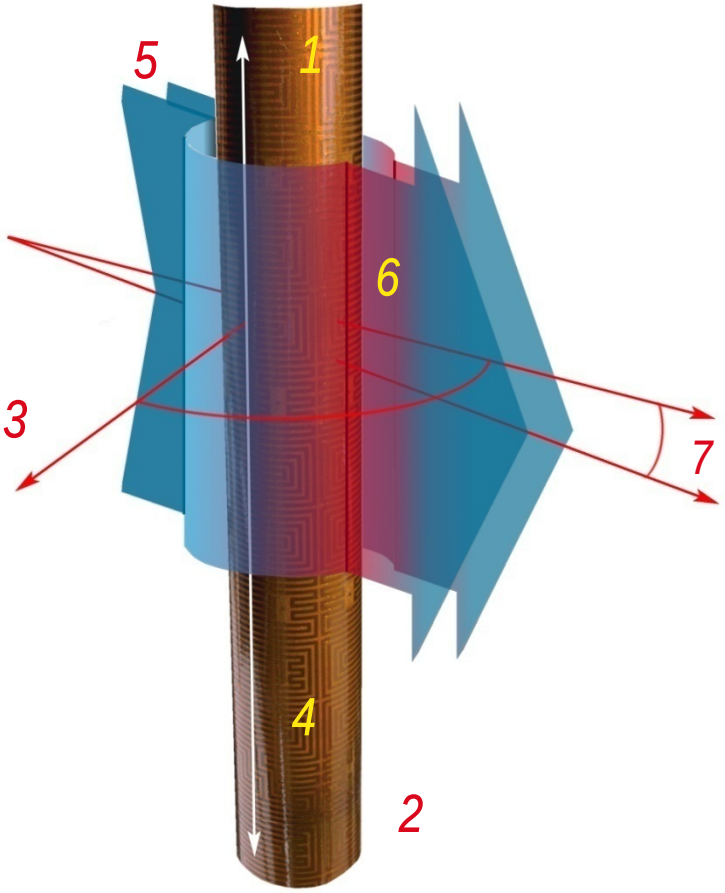
Current Projects – Basewide Groundwater Investigation, Recent Field Activities

- **Installed seven groundwater flow sensors**
  - **Two at Site 6**
  - **Five at Site 16**
- **Provide continuous measurements of:**
  - **Horizontal groundwater velocity**
  - **Vertical groundwater velocity**
  - **Groundwater flow direction**

Current Projects – Base-wide Groundwater Investigation
Recent Field Activities

➢ Flow Sensor Geometry

1. **Heater circuit wrapped around a cylindrical probe**
2. **Sensor surface in direct contact with sediments**
3. **Reference direction established on sensor surface with compass**
4. **Probe is heated to operating temperature and equilibrates**
5. **Moving groundwater is warmed as it passes by heated sensor coils; function of velocity**
6. **Moving groundwater is warmest on downstream side. Any vertical component means one end of the probe is warmer than the other.**
7. **Groundwater flow direction and magnitude is calculated from:**
   - ✓ **Probe direction**
   - ✓ **Spatial distribution of heating coils**
   - ✓ **Sampling rate to track changes over time**



Current Projects – Base-wide Groundwater Investigation, Recent Field Activities

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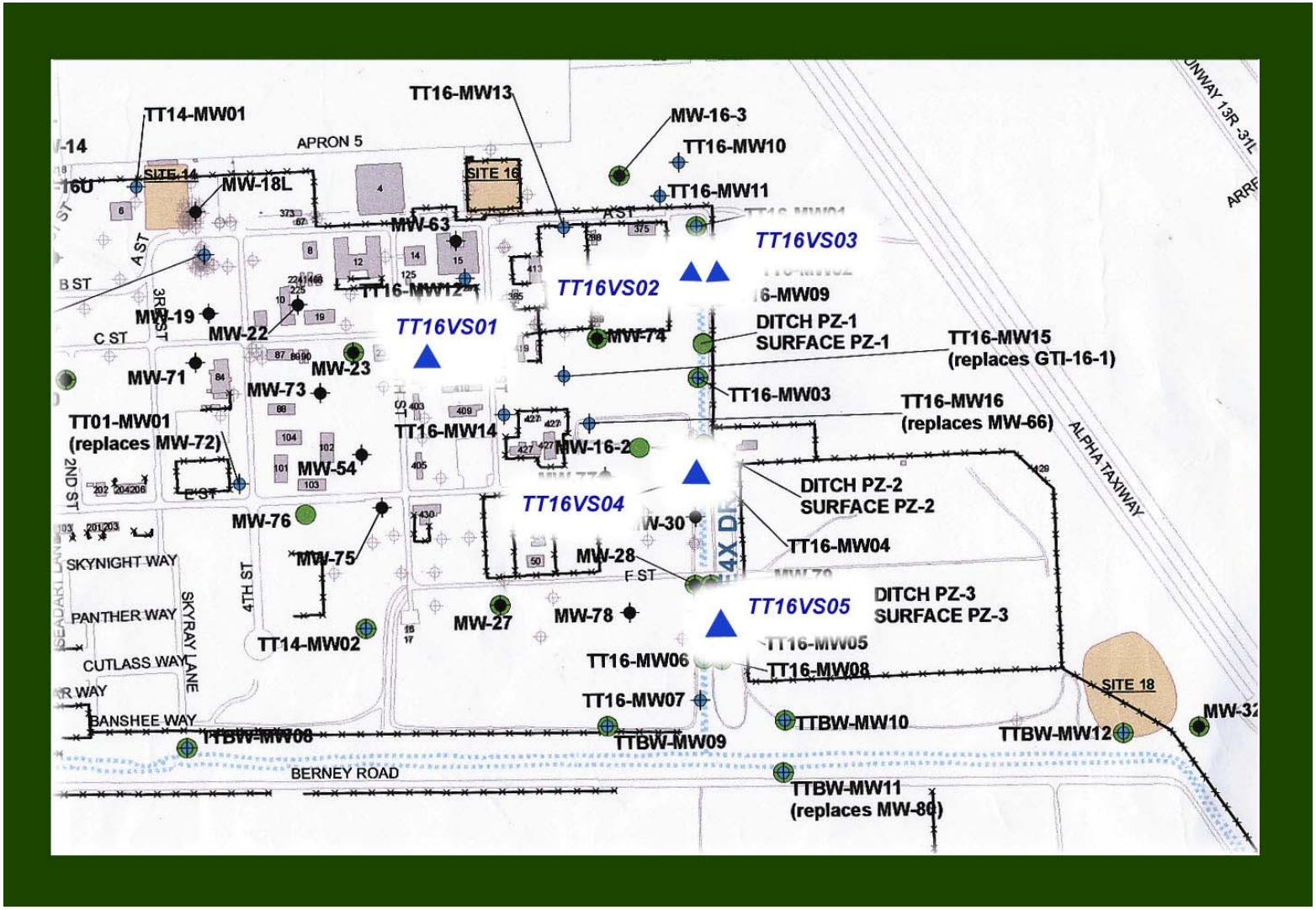
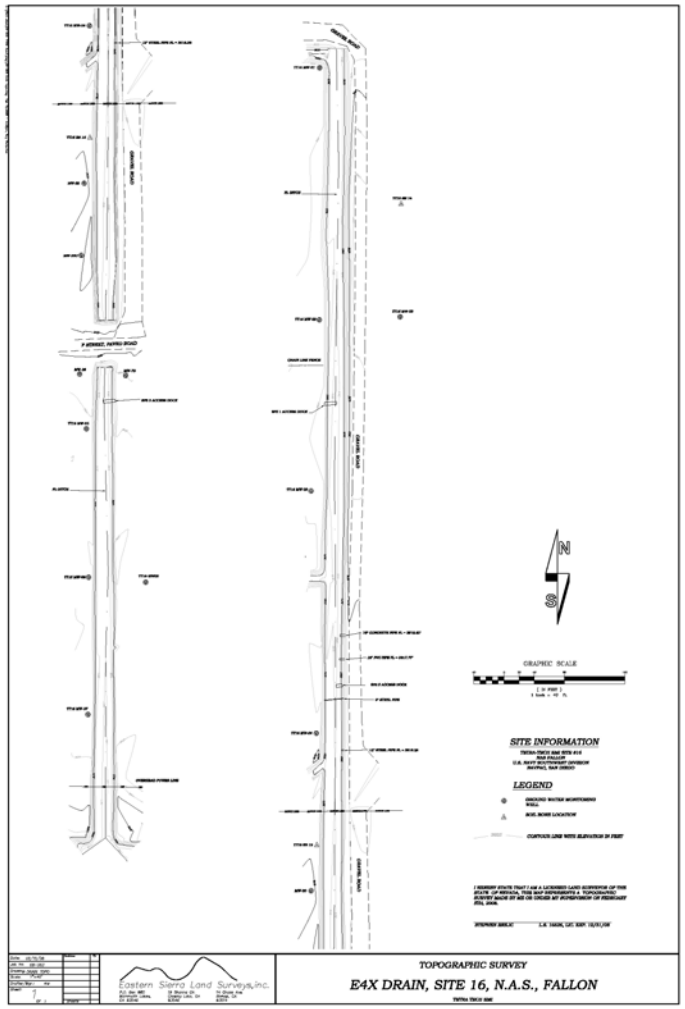


Current Projects – Basewide Groundwater Investigation Recent Field Activities

➢Conducted land survey

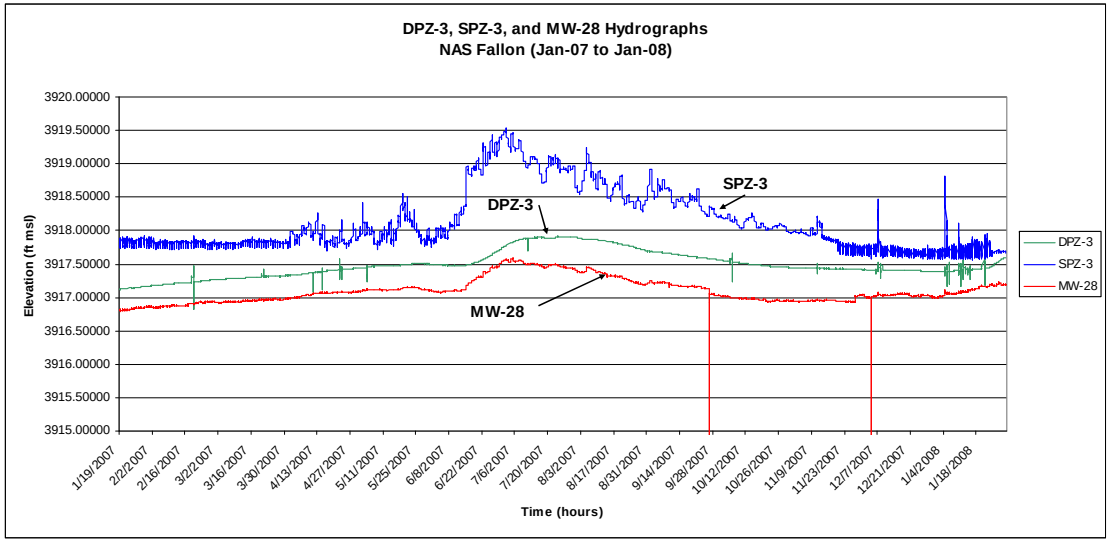
- Surveyed all RI sampling locations
- Surveyed all wells in the basewide monitoring well network
- Produced topographic map of E4X Drain
- Surveyed topographic cross-sections from basewide wells along drains to other side of drains
- Survey data along drains will be used for future comparisons of water level elevations to drain bottom elevations



Current Projects – Basewide Groundwater Investigation, Upcoming Activities

➢Prepare Spring 2008 Basewide Groundwater Monitoring Report

- Basewide groundwater level contour map
- Groundwater quality results from May 2008 sampling
- Hydrographs
- Isoconcentration maps - TDS
- Recommendations for fall 2008 sampling



➢Conduct Fall 2008 Basewide Groundwater Monitoring

- Sample 116 monitoring wells basewide
- Measure water levels and product thicknesses in 150 monitoring wells
- Download and calibrate pressure transducers and velocity sensors
- Collect groundwater samples before irrigation season ends

- **Complete RI – summer 2008**
  - **Complete final RI data gap investigation**

- **Complete RI Report – fall 2008**
  - **Update conceptual site models and provide:**
    - Known extent of soil and groundwater contamination
    - Human health risk assessment results
    - Ecological risk results at sites with habitat
    - Recommendations for remedial strategy

- **Basewide Groundwater Investigation – 2008 to 2011**
  - **Continue to obtain semiannual analytical data and quarterly hydrogeolgic data**
  - **Continue to evaluate groundwater and surface water at base boundaries**
  - **Complete semiannual groundwater reports**
- **Removal Actions – 2008 and 2009**
  - **Continue fuel removal at Site 2**

- **Conduct Pilot Studies - 2008 and 2009**
  - **Air Sparge Pilot Test - fall 2008**
  - **Landfarm Pilot Test - fall 2008 through spring 2009**

- **Feasibility Study/Corrective Action Plans – 2009**
- **Interim Actions – initiate in 2009, if appropriate**

Schedule and Budget

- **FY 08 - $825,000**
- **FY 09 - $1.3 Million**
- **FY 10 - $2.0 Million**
- **FY 11 -$2.1 Million**
- **FY 12 - $400,000**

Question and Answer - ??