In Situ Remediation
Pilot Study Summary and Path Forward
Area of Concern E (AOC E)

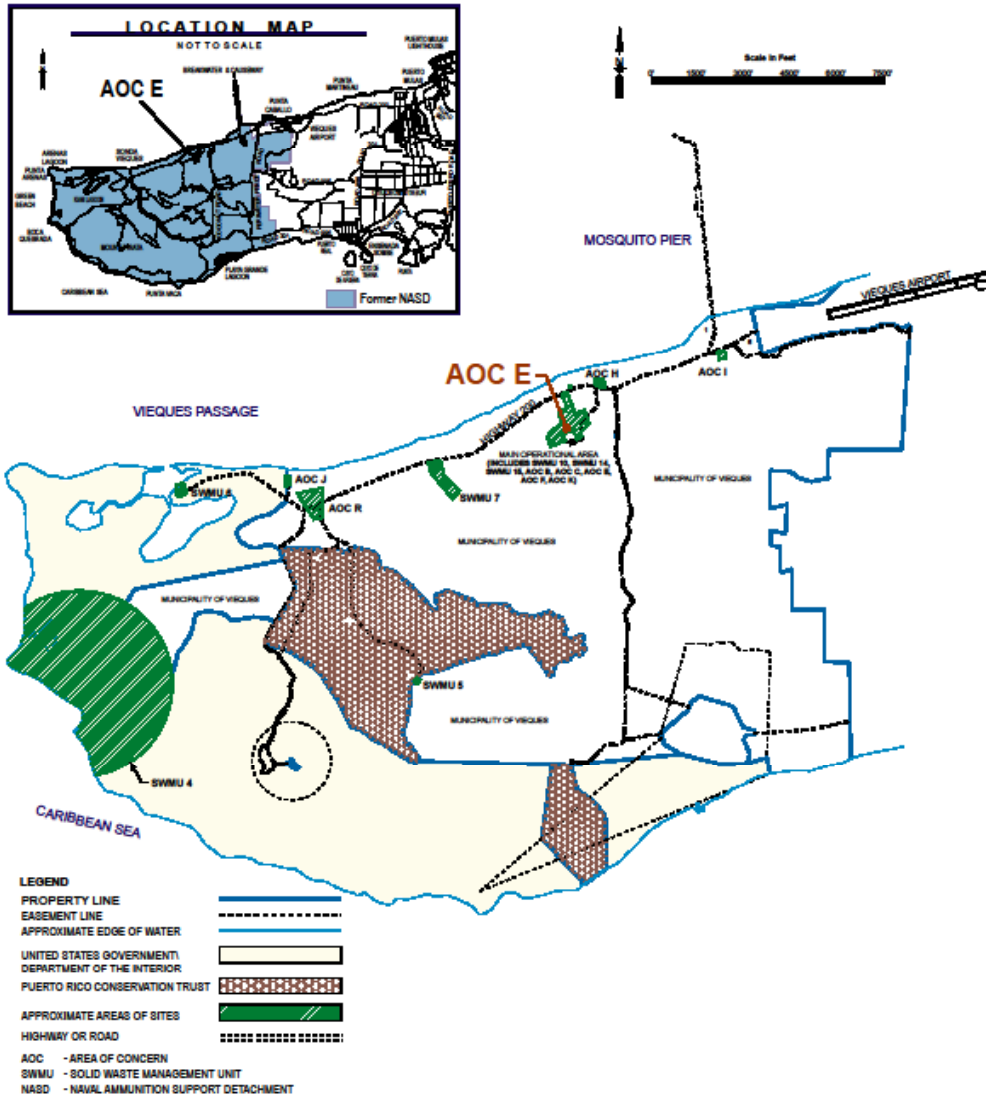
RAB Meeting

March 13, 2012

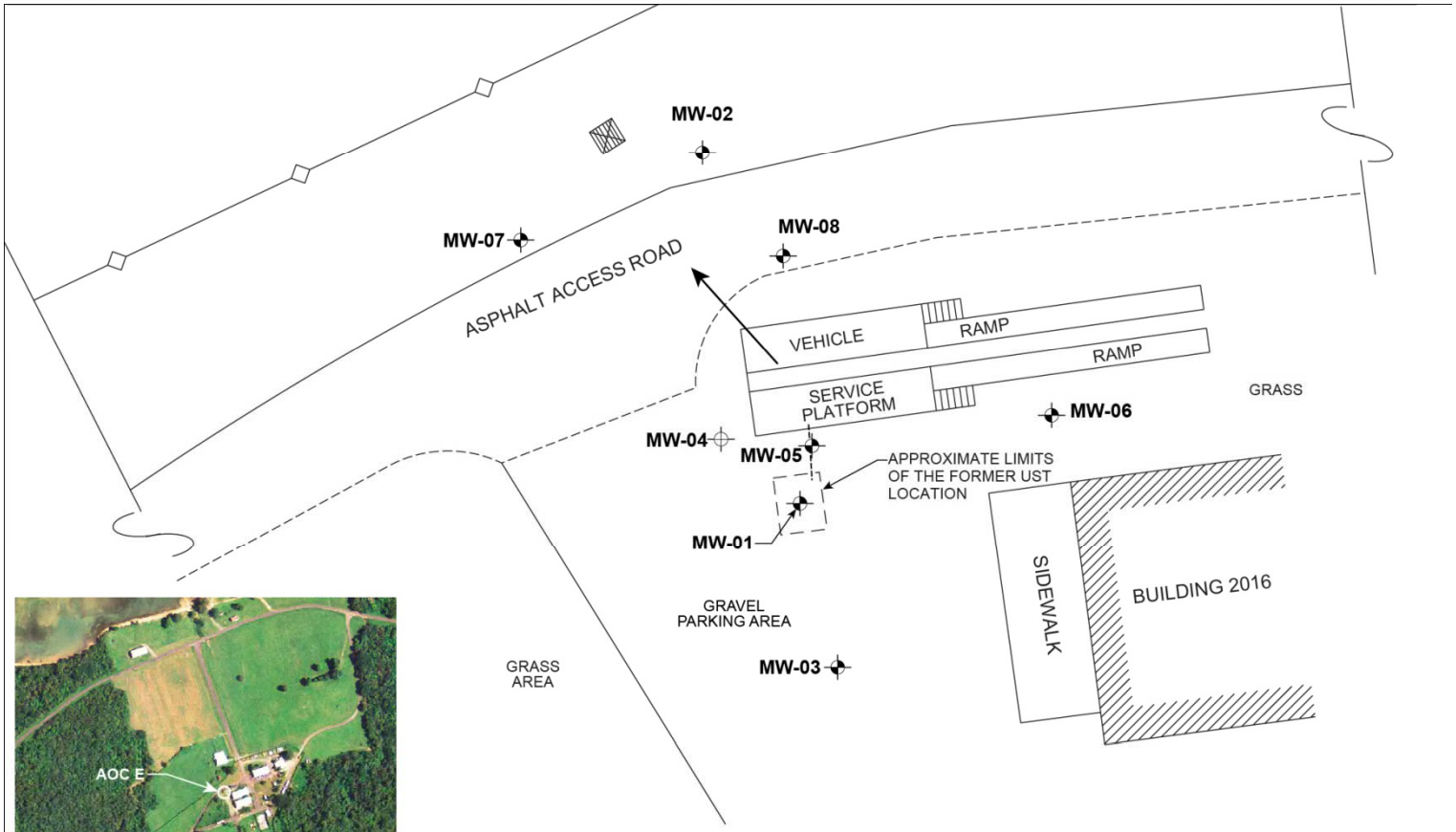
Objective

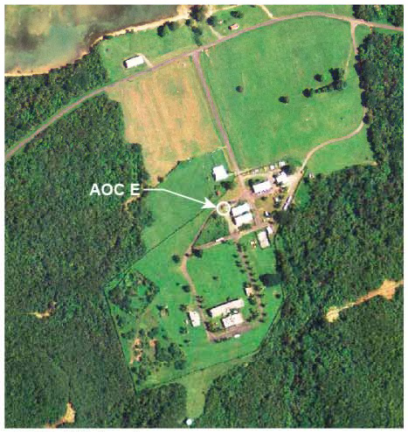
- **Summarize pertinent historical site information**
- **Summarize soil remediation pilot study approach**
  - **Denitrification-based Bioremediation (DBB)**
- **Summarize groundwater remediation pilot study approach**
  - **In-situ Chemical Oxidation (ISCO)**
- **Summarize data (Jul. 2008 – November 2011)**
  - **historical**
  - **baseline**
  - **post-DBB**
  - **post-ISCO**
- **Discuss path forward**

AOC E Location



Site Map





2004 Aerial Photograph

FIGURE 1
Site Map
Vieques, Puerto Rico

ES063011201833TPA F1-AOC E Site Map.ai

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Site Background

- **AOC E is the former location of a 500-gallon waste oil underground storage tank (UST)**
  - **within former NASD**
  - **within active Municipality of Vieques Public Works Area**
- **In service from 1970 to 1996 during vehicle maintenance activities**
- **Remedial Investigation (RI) in 2008 identified six Contaminants of Concern (COCs)**
  - **Groundwater**

benzene	1,2-dichloroethane	Methyl tert butyl ether (MTBE)
xylenes	2-methylnaphthalene	naphthalene

  - **Soil: No COCs were identified**

Pilot Study Objectives

- **Determine if already low groundwater contaminant concentrations can be reduced to acceptable levels**
- **Determine if the groundwater cleanup timeframe can be reduced (relative to natural processes)**
- **Determine if the potential for soil contaminants (primarily naphthalene) to leach to groundwater can be reduced**

Pilot Study Approach

- **Collect baseline (pre-pilot study) soil and groundwater samples**
- **Pump nitrate solution into contaminated soil (DBB)**
- **Pump sodium persulfate mixture into contaminated groundwater (ISCO)**
- **Perform second ISCO event about 3 months later**
- **Collect groundwater samples for COC and residual persulfate evaluation about 7 months later**
- **Collect groundwater samples for COC and residual persulfate evaluation about 4 months later**
- **Collect soil samples for COC analysis about 2 years after DBB event**

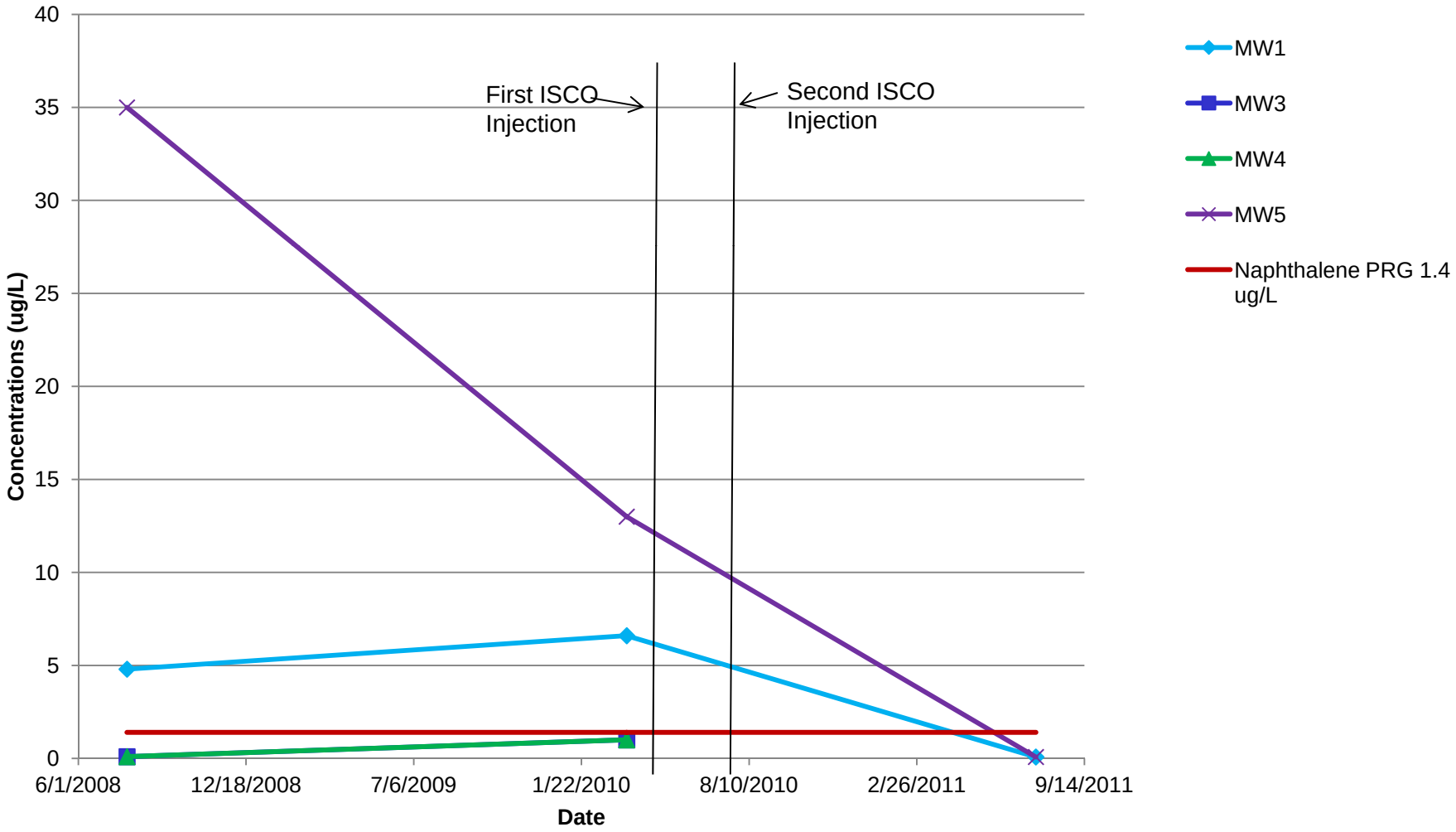
Groundwater Pilot Study Goals

- **Benzene – 5 ug/L (MCL)**
- **Naphthalene – 1.4 ug/L (tap water RSL)**
  - **Note: Selected solely as a conservative benchmark to evaluate the pilot study technology; EPA's Health Advisory Lifetime Value for naphthalene is 100 ug/L, which is a more realistic clean-up level**
- **1,2-Dichloroethane – 5 ug/L (MCL)**
- **2-Methylnaphathalene – 150 ug/L (tap water RSL)**
- **MTBE – 120 ug/L (tap water RSL)**
- **Total xylenes – 10,000 ug/L (MCL)**

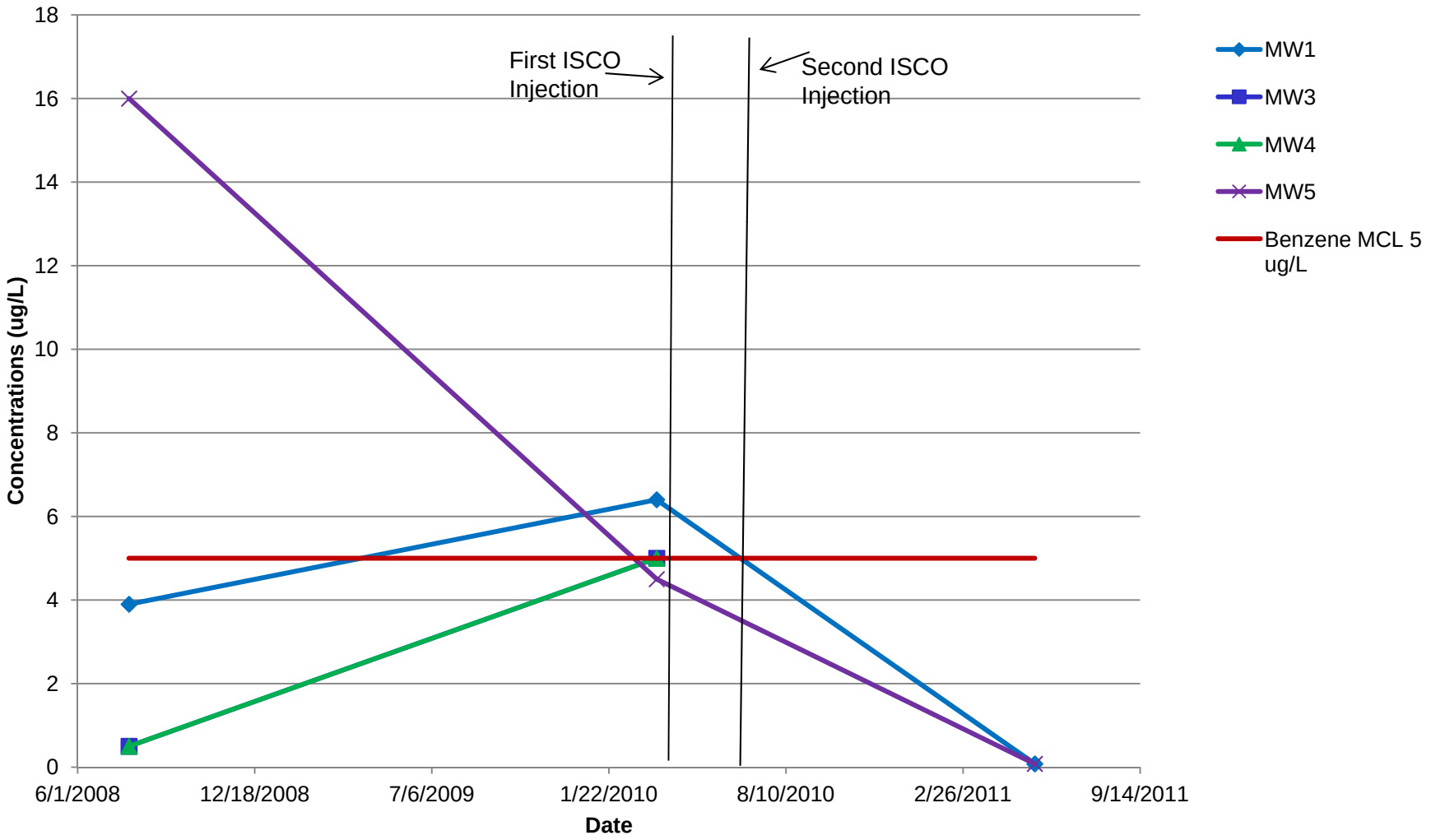
MCL – Maximum Contaminant Level

RSL – Regional Screening Level

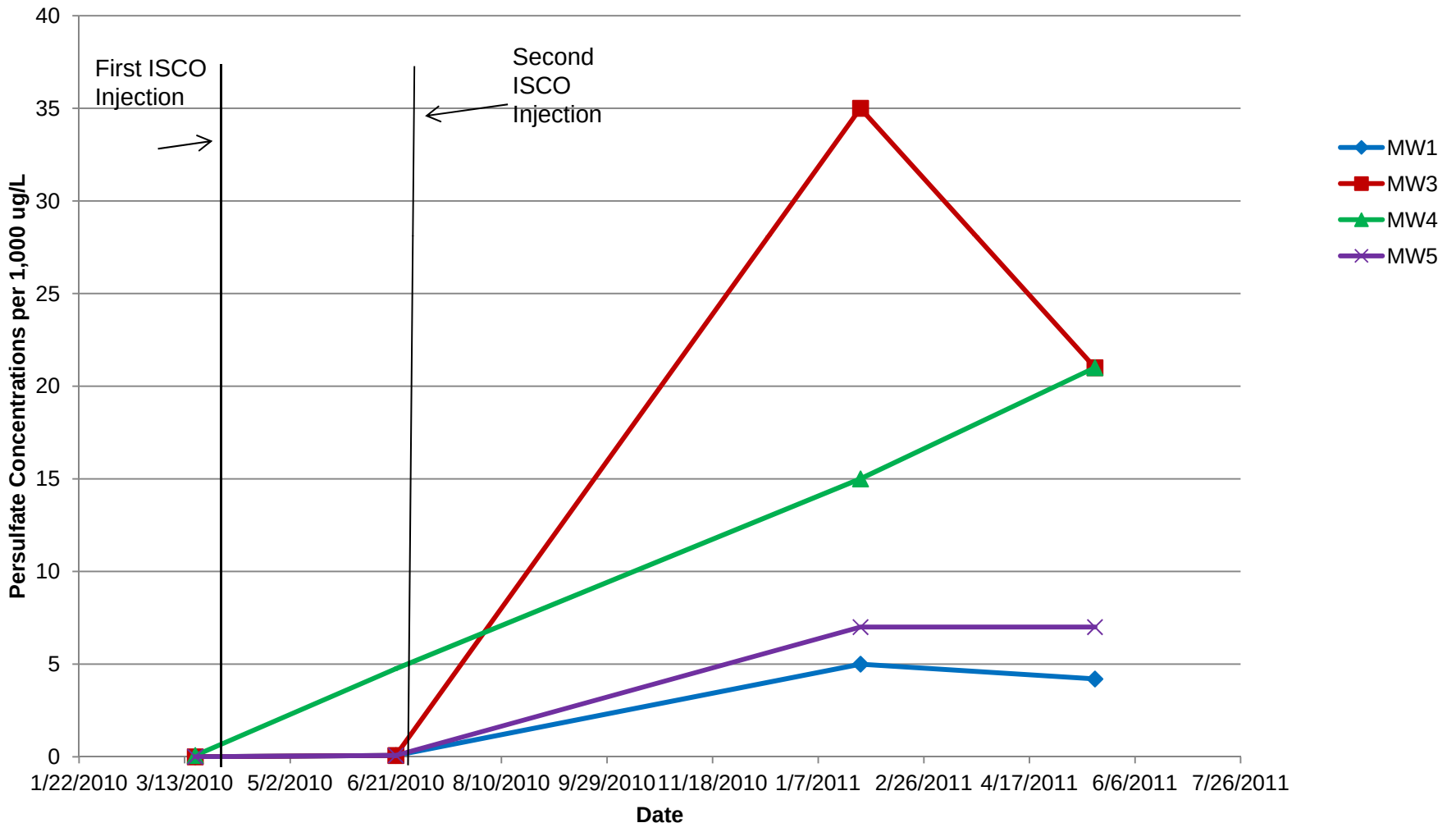
Groundwater COC Trends: Naphthalene



Groundwater COC Trends: Benzene



Groundwater Persulfate Trends



Soil Sampling Results

- **Pre-DBB**
  - **Five soil samples collected from two locations below former UST and associated piping and analyzed for leaching concentrations**
  - **Concentrations of all six groundwater COCs below likely clean-up levels (naphthalene above pilot study goal)**
- **Post-DBB**
  - **Four soil samples collected from generally same locations and analyzed as above**
  - **Concentrations of all six groundwater COCs below likely clean-up levels (naphthalene above pilot study goal)**

Conclusions

- **ISCO injections appear to have been successful at reducing contaminant concentrations to below cleanup goals**
- **Residual persulfate levels are requiring longer period than anticipated to decline, which will allow for additional reaction with contaminants, if present.**
- **Pre-DBB and Post-DBB soil data suggest potential leaching of COCs would not contaminate groundwater above acceptable levels**

Path Forward

- **Although pilot study results suggest site groundwater has been remediated to acceptable levels, elevated levels of persulfate warrant monitoring to ensure they return to normal and contaminant rebound does not occur.**
- **The Navy is preparing a Feasibility Study to evaluate continued monitoring and various remedial alternatives should contaminant concentrations rebound.**
- **Anticipate Record of Decision by mid-2013.**