**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
NEW ENGLAND - REGION I
5 POST OFFICE SQUARE, SUITE 100 (OSRR07-03)
BOSTON, MASSACHUSETTS 02109-392023

April 12, 2012

Mr. John McHugh
U.S. Department of the Army
Environmental, Safety, & Health Office
Soldier Systems Center
Kansas Street
Natick, Massachusetts 01760-5049

***Re: Second Five-Year Review Report (2007-2011) for the Natick Soldier Systems Center***

Dear Mr. McHugh:

This office is in receipt of the Army's Second Five-Year Review Report for the Natick Soldier System Center (formerly known as Natick Laboratory Army Research, Development, and Engineering Center), dated March 2012. Because the only active remedy with waste left in place at this facility is a ground water extraction and treatment remedy, the statute does not require a Five-Year Review (FYR) as matter of policy or statute until 5 years after all remedial construction is completed at such a site. However, the Environmental Protection Agency (EPA) and the Army have agreed to conduct this review at their own discretion.

EPA reviewed this document in light of its compliance with the *Comprehensive Five-Year Review Guidance* (OSWER *Directive 9355.7-03B-P).* This policy review is consistent with the guidance provided in the OSWER directive. Upon review, EPA concurs with the findings that the CERCLA remedy for operable unit 1 (T-25 Area) is currently protective of human health and the environment. The remedy for the T-25 Area ground water is expected to be protective of human health and the environment upon attainment of the cleanup goals, as presented in the 2001 Record of Decision (ROD).

In the interim, exposure pathways that could result in unacceptable risks are being controlled through institutional controls, which restrict use of ground water on-site and off-site. These land use controls played a key role in EPA's determination that OU1 is protective. The Army must ensure that those institutional controls remain effective until such time that they are no longer necessary.

Consistent with EPA's *Comprehensive Five-Year Review Guidance*, the next five-year review should be finalized within five years of completing all construction required for clean up at the

entire site or within five years of the initiation of the first remedial action that leaves hazardous substances, pollutants or contaminants on site above levels that allow for unrestricted use, whichever comes first. EPA and the Army may also determine that another discretionary review is warranted at an earlier time.

EPA looks forward to working with the Army as we continue the cleanup at the Natick Soldier System Center. If you have any questions, please call Ms. Christine Williams, Remedial Project Manger, at (617) 918-1384.

Sincerely,

James T. Owens, Director
Office of Site Remediation and Restoration

cc: Bryan Olson, EPA-New England
Mary Sanderson, EPA-New England
Christine Williams, EPA-New England
Monica McEddy, EPA HQ
Robert Campbell, MassDEP

# FINAL
# SECOND FIVE-YEAR REVIEW REPORT
# FOR
# U.S. ARMY NATICK SOLDIER SYSTEMS CENTER

## CONTRACT NUMBER
## W912CG-05-D-0007


**U.S. ARMY NATICK SOLDIER SYSTEMS CENTER**
**NATICK, MASSACHUSETTS**

**March 2012**

**Five-Year Review Summary Form**

| SITE IDENTIFICATION | | |
|---|---|---|
| **Site Name:** Natick Laboratory Army Research, Development, and Engineering Center (Natick Soldier Systems Center) | | |
| **EPA ID:** MA1210020631 | | |
| **Region:** 1 | **State:** MA | **City/County:** Middlesex |

| SITE STATUS | |
|---|---|
| **NPL Status:** Final | |
| **Multiple OUs?**<br>Yes | **Has the site achieved construction completion?**<br>No |

| REVIEW STATUS |
|---|
| **Lead agency:** Other Federal Agency<br>**If "Other Federal Agency" was selected above, enter Agency name:** U.S. Department of the Army |
| **Author name (Federal or State Project Manager):** Prepared by ECC, Inc., and AMEC Environment & Infrastructure, Inc., under contract to U.S. Army |
| **Author affiliation:** Prepared by ECC, Inc., and AMEC Environment & Infrastructure, Inc., under contract to U.S. Army |
| **Review period:** January 1, 2007 – December 31, 2011 |
| **Date of site inspection:** December 7, 2011 |
| **Type of review:** Policy |
| **Review number:** 2 |
| **Triggering action date:** March 1, 2007 |
| **Due date *(five years after triggering action date)*:** March 1, 2012 |

## Issues/Recommendations

| **OU(s) without Issues/Recommendations Identified in the Five-Year Review:** |
|---|
| Only the T-25 Area Groundwater OU was reviewed. |

| **Issues and Recommendations Identified in the Five-Year Review:** |
|---|

No issues that affect the protectiveness of the T-25 Area remedy were identified.

## Protectiveness Statement(s)

| *Operable Unit:* | *Protectiveness Determination:* | *Addendum Due Date (if applicable):* |
|---|---|---|
| **OU 1 : T-25 Area Groundwater** | Will be Protective | Click here to enter date. |

*Protectiveness Statement:*
The T-25 Area Groundwater remedy is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

## Sitewide Protectiveness Statement (if applicable)

| *Protectiveness Determination:* | *Addendum Due Date (if applicable):* |
|---|---|
| Construction is not complete. Not applicable | Click here to enter date. |

*Protectiveness Statement:*
Not applicable

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AMEC E&I | AMEC Environment & Infrastructure, Inc. |
| ARAR | applicable or relevant and appropriate requirement |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CERCLIS | Comprehensive Environmental Response, Compensation, and Liability Act Information System |
| CFR | Code of Federal Regulations |
| CMR | Code of Massachusetts Regulations |
| COC | chemical of concern |
| COPC | chemical of potential concern |
| DCE | dichloroethene |
| ECC | ECC, Inc. |
| ENR CCI | Engineering News Record Construction Cost Index |
| ERA | ecological risk assessment |
| ESI | expanded site investigation |
| ETA | Engineering Technical Associates, Inc. |
| FFS | Focused Feasibility Study |
| GAC | granular activated carbon |
| gpm | gallons per minute |
| HHRA | human health risk assessment |
| HRC® | Hydrogen Release Compound |
| MassDEP | Massachusetts Department of Environmental Protection |
| MCL | maximum contaminant level |
| MCP | Massachusetts Contingency Plan |
| MDL | method detection limit |
| MEP | Master Environmental Plan |
| MNA | monitored natural attenuation |
| µg/L | micrograms per liter |
| mg/L | milligrams per liter |
| NARADCOM | Natick Research and Development Command |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NERI | New England Research Institute |
| NPL | National Priorities List |
| NRDEC | Natick Laboratory Army Research, Development, and Engineering Center |
| NSSC | U.S. Army Natick Soldier Systems Center |

| | |
|---|---|
| O&M | operation and maintenance |
| OU | operable unit |
| PCB | polychlorinated biphenyl |
| PCE | tetrachloroethene |
| PRG | preliminary remediation goal |
| RAB | Restoration Advisory Board |
| RAGS | Risk Assessment Guidance for Superfund Sites |
| RAO | remedial action objective |
| RA-O | remedial action operation |
| RI | remedial investigation |
| ROD | Record of Decision |
| RSL | Regional Screening Level |
| SSC | Soldier Systems Center |
| SSCOM | Soldier Systems Command |
| SVOC | semivolatile organic compound |
| TBC | to be considered guidance |
| TCA | trichloroethane |
| TCE | trichloroethene |
| TCZ | target capture zone |
| TS | treatability study |
| USAEC | U.S. Army Environmental Center |
| USATHAMA | U.S. Army Toxic and Hazardous Materials Agency |
| USEPA | U.S. Environmental Protection Agency |
| VOC | volatile organic compound |

## DETERMINATION OF PROTECTIVENESS

The U.S. Army has completed the Second Five-Year Review for Natick Soldier Systems Center (NSSC) in Natick, Massachusetts, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121(c). The review assesses the protectiveness of the selected remedy for T-25 Area Groundwater (Operable Unit 1). Based on information presented herein, it is my determination that the selected remedy for the T-25 Area Groundwater will be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risk are being controlled. The protectiveness of the remedy will continue to be evaluated informally as long-term monitoring data are generated and formally during subsequent Five-Year Reviews.

Frank K. Sobchak
LTC, SF
Commanding

4/12/12
Date

# 1.0 INTRODUCTION

This second five-year review for the U.S. Army Natick Soldier Systems Center (NSSC) in Natick, Massachusetts, has been prepared consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121(c) and the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan, NCP) as described below.

CERCLA §121(c), as amended, states:

> "If the President selects a remedial action that results in any hazardous substances, pollutants or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such a review is required, the results of all such reviews, and any actions taken as a result of such reviews."

The NCP, in 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii), states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action."

This five-year review focuses on Operable Unit 1 (OU-1), the T-25 Area Groundwater OU, at the NSSC. Although the remedial action for OU-1 will not leave groundwater contaminants preventing unlimited use and unrestricted exposure in place at its completion, achievement of unlimited use and unrestricted exposure conditions requires more than five years. Therefore, this review of OU-1 is being performed as a policy review at the request of the U.S. Environmental Protection Agency (USEPA) – Region 1. The trigger for this five-year review is March 1, 2007, which is the date of USEPA concurrence with the previous five-year review report.

NSSC is a Superfund site and was added to the USEPA National Priorities List (NPL) in May 1994. It is presently undergoing investigation and clean-up activities pursuant to CERCLA and the NCP. The

Comprehensive Environmental Response, Compensation, and Liability Act Information System (CERCLIS) ID number for the Site is MA1210020631. The U.S. Army is the lead agency responsible for environmental cleanup at this site.

This five-year review report was prepared for NSSC by ECC, Inc. (ECC), and AMEC Environment & Infrastructure, Inc. (AMEC E&I, fka MACTEC Engineering and Consulting, Inc.), and fulfills, in part, the requirements of Contract W912CG-05-D-0007. ECC is responsible for the monitoring, operation, and maintenance of the T-25 Area groundwater treatment system under Contract W912CG-05-D-0007. The review was completed in accordance with relevant U.S. Army and USEPA guidance, including *CERCLA Five-Year Reviews* (U.S Army, 2011) and the *Comprehensive Five-Year Review Guidance* (USEPA, 2001), between August 2011 and December 2011.

## 1.1 PURPOSE AND SCOPE OF THIS REVIEW

The purpose of five-year reviews is to determine whether the remedy implemented at a site is/remains protective of human health and the environment and to evaluate the implementation and performance of the selected remedy. The methods, findings, and conclusions of the five-year review are documented in the five-year review report. The review accomplishes these tasks by addressing three major questions:

- Is the remedy functioning as intended by the decision documents?
- Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?
- Has any other information come to light that could call into question the protectiveness of the remedy?

Five-year review reports identify issues that affect protectiveness, if any, found during the review, and make recommendations to address them.

Figure 1-1 shows the location of NSSC, and Figure 1-2 shows the location of the T-25 Area at NSSC.

## 1.2 NATICK SOLDIER SYSTEMS CENTER BACKGROUND

NSSC is an active U.S. Army research and testing facility located approximately 17 miles west-southwest of Boston in the Town of Natick, Massachusetts (Figure 1-1). The facility occupies a small peninsula extending from the eastern shoreline of the South Pond of Lake Cochituate and encompasses approximately 74 acres. Approximately 1,200 military and civilian personnel work at NSSC. The land surrounding NSSC supports residential, commercial/retail, and light industrial uses.

Approval for construction of NSSC was granted in October 1949, and the initial phase of construction was completed in October 1954. Interpretation of historical aerial photos from 1938 to 1986 indicates that prior to 1938 the majority of NSSC was wooded and undeveloped, although the northern portion (now referred to as the T-25 Area) was being used as a gravel pit. Clearing began in 1952 in preparation for the initial phases of construction at NSSC. Historical photos indicate that a water tower, Building 19 (Boiler Plant), and Building 3 were present as of the spring of 1954. Construction of most site buildings was completed during the 1950s and 1960s, although some construction continues to occur.

Much of the topography at the facility was modified during its construction and development. A considerable amount of the trees and vegetation was cleared, the high spots in the terrain graded down, and depressions in the surface filled. The highest ground surface elevation at NSSC is 171 feet above mean sea level along the northern boundary. The configuration of the area has changed little since 1969.

NSSC, previously called the Quartermaster Research and Engineering Command, the U.S. Army Natick Research and Development Command (NARADCOM), Natick Laboratory Army Research, Development, and Engineering Center (NRDEC), Soldier Systems Command (SSCOM), and Soldier Systems Center (SSC) has been a permanent U.S. Army installation since October 1954. NSSC is responsible for researching, developing, fielding, and managing food, clothing, shelters, airdrop systems, and Soldier support items.

The following table presents a chronology of events pertaining to the environmental restoration program at NSSC.

| **Chronology of Events at NSSC** | |
|---|---|
| **Date** | **Event** |
| 1954 | NSSC becomes permanent U.S. Army installation. |
| 1950s – 1960s | Construction of most NSSC buildings. |
| 1980 | The U.S. Army Environmental Center (USAEC) performed an installation assessment to determine whether the use, storage, treatment, and disposal of toxic and hazardous materials had resulted in environmental degradation, and to identify conditions that might adversely affect public health or the environment. The assessment included: review of records at NARADCOM (former designation of NSSC) and various governmental agencies; interviews with current and former employees; and a tour of the installation (USATHAMA, 1980). |
| 1993 | The SSC Master Environmental Plan (MEP) was prepared (Argonne, 1993). |
| May 1993 | NSSC, then known as NRDEC, was proposed for inclusion on the NPL. |
| May 1994 | NSSC was officially added to the NPL. |
| December 1995 | Preparation of Community Relations Plan (updated in July 1996). |
| 1995 | Formation of Restoration Advisory Board (RAB) with members from the public at large (including NSSC neighbors and town representatives), NSSC facility staff, and federal and state regulators. Members meet on a regular basis. |
| August 2006 | Finalization of Federal Facility Agreement between U.S. Army and USEPA. |

## 2.0 OU-1 CHRONOLOGY

The following table presents a chronology of remedial studies, investigations, and reports at OU-1.

| **Chronology of Events at OU-1** | |
|---|---|
| **Date** | **Event** |
| Prior to 1950s | The area was used as a gravel pit by the town of Natick. It was filled with soil and construction debris prior to the development of the T-25 Area. |
| 1970-1989 | A former outdoor bulk storage area was used for the outdoor storage of bulk waste, petroleum, solvents, antifreeze, and trichlorofluoroethane (Freon 113) in drums. This area was remediated and re-paved after 1989, and the storage area was moved to indoor storage structures (Argonne, 1993). |
| 1989 | The New England Research Institute (NERI) performed an initial soil gas survey around the T-25 Area building after an oil-like sheen was observed on the surface of storm water runoff during rain events (NERI, 1989). |
| 1990 | A second soil gas survey was performed for the entire T-25 Area (NERI, 1990). |
| 1991 | Dames & Moore performed an Expanded Site Investigation (ESI) and installed three groundwater monitoring wells (MW-1, MW-2, and MW-3) in the T-25 Area (Dames & Moore, Inc., 1991). |
| July 1991 | Stained soil was observed during the removal of a 1,000 gallon waste oil underground storage tank (Argonne, 1993). This area is designated NRDEC 04, Pit Area Waste Oil Storage Tank. |
| 1992 | USAEC performed an ESI Addendum at the request of the Massachusetts Department of Environmental Protection (MassDEP). The ESI Addendum included a third soil gas survey, the collection of surface water samples from Lake Cochituate, and the installation of two additional groundwater monitoring wells (MW-8 and MW-9) in the T-25 Area (USATHAMA, 1992). |
| 1992 - 1996 | USAEC initiated a Phase I Remedial Investigation (RI) in 1992. The results of the Phase I RI were reported in the Final Phase I T-25 Area RI Report (Arthur D. Little, Inc., 1996c), the Remedial Investigation Addendum (Arthur D. Little, Inc., 1995a), and the Fall 1994 and Spring 1995 Quarterly Ground Water Monitoring Report (Arthur D. Little, Inc., 1995b), and were based on data collected during field investigations performed between July 1993 and May 1995. The Phase I T-25 Area RI was completed in August 1996. |
| 1995 - 1998 | Completion of Phase II RI. The Phase II T-25 Area RI occurred from September 1995 until May 1996. During the Phase II RI, soil, groundwater, surface water, and sediment samples were collected and analyzed to evaluate data gaps from the Phase I investigation. The Phase II T-25 Area RI was completed in December 1998 (Arthur D. Little, Inc., 1998). |
| 1995 - 1997 | Engineering Technical Associates, Inc. (ETA), developed a groundwater flow and transport model to support evaluation of contaminant transport at NSSC. The model was used to estimate potential T-25 Area groundwater cleanup times (ETA, 1997). |

| **Chronology of Events at OU-1** | |
|---|---|
| **Date** | **Event** |
| 1996 - 1997 | The Storage Area Action Memorandum (Arthur D. Little, Inc., 1996b) was prepared, recommending a time critical soil removal action to remediate pesticide-contaminated soil within the T-25 Area. The removal action was completed in 1997. This subarea is designated NRDEC 15, Chlordane Storage Area. |
| October 1997 | Final Work Plan for a Treatability Study (TS) was completed (Arthur D. Little, Inc., 1997b). The full-scale TS for groundwater in the T-25 Area included groundwater extraction through two extraction wells and treatment via air stripping and carbon adsorption. |
| 1998 | Installation of the T-25 Area oil-water separator between Buildings 14 and 20 and its associated piping (Site 1 OWS) (Fawkes, 2006). |
| 1999 | Final Focused Feasibility Study / Treatability Study (FFS/TS) for T-25 Area groundwater (Arthur D. Little, Inc., 1999). |
| 1999 | The Proposed Plan detailing the Army's preferred remedial alternative (a pump-and-treat system based on the results of the TS) for the T-25 Area groundwater was finalized, followed by informational meetings and a public hearing (U.S. Army SSC, 1999). |
| 2001 | The Record of Decision (ROD) selecting the pump-and-treat system as the remedy for groundwater beneath the T-25 Area was signed (U.S. Army SSC, 2001). |
| 2002 | MassDEP approved the Town of Natick Zone II delineation for Springvale and Evergreen supply wells. The groundwater beneath the entire SSC facility was included within the delineated Zone II. |
| 2002 - 2003 | HydroGeologic updated the groundwater flow and transport model for the T-25 Area. (HydroGeologic, Inc., 2002) and used the model to optimize the groundwater extraction well and monitoring well networks for the T-25 Area. Three additional groundwater extraction wells were installed in September and 2002 to 2003 October 2002 and brought on line in April 2003. Four additional off-site groundwater monitoring wells were installed in September to October 2003 to augment the existing monitoring well network, and to more effectively monitor remediation of the T-25 Area groundwater (ICF Consulting, 2004). |
| 2004 | Installation of a second oil-water separator (OWS 9) between the ball field and Building 68 and draining to the T-25 Outfall (Fawkes, 2006). |
| 2006-2010 | Ground Water Remedial Optimization Study to evaluate the potential of in-situ biological enhancement to decrease tetrachloroethene (PCE) and trichloroethene (TCE) concentrations in groundwater in one of the subareas within the T-25 Area, and expedite the overall clean-up schedule. (ICF Consulting, 2010b) |
| 2007 | The T-25 began receiving and treating groundwater from the Buildings 2 and 36 Area and Buildings 63, 2, and 45 Area. |
| 2007 | No Further Action ROD signed for soil at Buildings 62 and 68 (MACTEC, 2007). |
| 2008 | No Further Action ROD signed for soil at the T-25 Area, Building 14 and Former Building 13 (ICF, 2008). |
| 2008 | An ex-situ wellhead treatment unit was installed to treat the groundwater from the new extraction wells in the Buildings 63, 2, and 45 Area to remove 1,4-dioxane. |
| 1992 to present | Groundwater sampling conducted across the T-25 Area and the rest of the NSSC facility to monitor contaminant extent. Groundwater sampling frequency changed from quarterly to semiannually in 2010. |

| **Chronology of Events at OU-1** | |
|---|---|
| **Date** | **Event** |
| 1997 to present | Operation and maintenance of the T-25 Area groundwater pump-and-treat system, including optimization through the addition of extraction wells and adjustment of pumping rates. Long-term groundwater monitoring of on-site and off-site wells associated with the T-25 Area. |

# 3.0 BACKGROUND

## 3.1 PHYSICAL CHARACTERISTICS

The T-25 Area is a 15.6-acre rectangular area in the northwest portion of NSSC. Figure 3-1 shows major site features at the T-25 Area. Most of the area is paved with asphalt or occupied by closely spaced buildings. There are numerous Conex storage containers among the buildings. The largest unpaved portion consists of a baseball field in northwest corner. The T-25 Area is bounded to the west, north, and east by residential properties, and is bounded to the south by the rest of the NSSC facility. The area is ringed by an unpaved road on an earthen embankment approximately 5 to 10 feet above the rest of the site. An embankment rises an additional 10 feet above the dirt road and is topped by a chain-linked fence, which abuts residential properties.

## 3.2 LAND AND RESOURCE USE

The T-25 Area is presently used for indoor and outdoor storage of bulk items, warehouse operations (shipping and receiving); laboratory research activities including clothing and textile research; drop-testing; garage operations including spray painting, vehicle maintenance, metal parts and brush cleaning, battery charging, insect and rodent control, silk screening, and rubber adhesive thinning. The T-25 Groundwater Treatment facility is located in Building T-94.

NSSC is served by a public water supply, and there is no current use of groundwater at the T-25 Area. NSSC and the T-25 Area are, however, within an area that Massachusetts has designated as a Zone II for the Town of Natick Springvale Water Supply Wells, located approximately 2,200 feet to the northwest. Massachusetts regulations at 310 CMR 22.00 define a Zone II as that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be reasonably expected.

NSSC has no plans to alter current land use at the T-25 Area and no plans to extract or use site groundwater for potable purposes. NSSC currently obtains potable water from the Town of Natick, and it is unlikely that the T-25 Area groundwater will be used for residential use in the future. The NSSC Master Plan and Town of Natick ordinance prohibit future installation of groundwater wells or potable

use of groundwater at the T-25 Area. The NSSC Master Plan (The Urban Collaborative, LLC, 2012) states:

> "Installation of any new potable water supply well on SSC is prohibited. Installation of any new water supply well on SSC for the purpose of supplying non-potable water shall be evaluated with respect to potential impact on the operating groundwater treatment system and potential human- and environmental-health risk prior to installation or use. This restriction shall be in effect as long as site conditions pose an unacceptable risk to human health or the environment and until SSC has received USEPA Certification of completion of the response actions for contaminated groundwater."

The Town of Natick Board of Health Regulations Chapter 5 also prohibit potable use of groundwater in the vicinity of the T-25 Area, as follows:

> Section 31.1: "Private wells for drinking water shall not be allowed where a public water supply is available in sufficient quantity and pressure so as to meet U.S. and Massachusetts drinking water standards."
>
> Section 32.2: "Private drinking water wells shall not be allowed in any case in an area bounded North Main Street, Lake Cochituate, West Central Street, and the Massachusetts Turnpike."

In addition, a Cooperative Agreement between the Department of the Army and the Town of Natick (Cooperative Agreement Number DAAD16-01-2-0003, March 23, 2001) provides the following language:

> "Pursuant to a Memorandum of Understanding executed by the parties to this Agreement in December of 1999, the Town's Board of Health has enacted a regulation to prohibit the development of any private drinking water wells within the Town in the area bounded by Evergreen Road to the north, State Route 27 and Washington Avenue to the east, State Route 135 to the south, and Speen Street to the west. The Town will ensure that such regulation will remain in effect at least until remediation of the T-25 Site is completed as evidenced by the approval of the Remedial Action Completion Report by USEPA; or alternatively, the Army and the Town agree that such regulation is no longer required."

## 3.3 HISTORY OF CONTAMINATION

A soil gas survey was performed around the T-25 building in 1989 in response to leaks and spills at an outdoor drum storage area and indicated the presence of volatile organic compounds (VOCs) in the soil gas (NERI, 1989). A second soil gas survey in 1990 further delineated several soil gas anomalies and

identified trichlorofluoromethane (Freon II), trichlorofluoroethane (Freon 113), trichloroethane (TCA), benzene, toluene, xylene, and PCE in soil gas. Although TCE is a contaminant of concern in the groundwater, it was not detected in the soil gas of the T-25 Area (NERI, 1990).

In 1991, the ESI identified only low concentrations of several contaminants in the groundwater at the T-25 Area, and did not identify any significant contamination in the soil (Dames & Moore, 1991). The ESI Addendum in 1992 identified TCE concentrations in a new deep groundwater monitoring well (MW-8) at a concentration approximately 10 times greater than the TCE concentrations collected in original shallow ESI wells.

From 1992 to 1996, a Phase I and II RI were performed at the T-25 Area to further characterize contamination, identify potential sources, and assess the likelihood and potential impact of off-facility contaminant migration. The Phase II RI, combined with the Phase I results and the quarterly groundwater monitoring program, indicated that VOCs were present in the groundwater beneath the T-25 Area. The VOCs were limited primarily to TCE, PCE, and, to a much lesser extent, cis-1,2-dichloroethene (DCE), a potential break-down product of PCE and TCE. Only very low concentrations of VOCs were detected in surface and subsurface soil samples collected from the T-25 Area. Figure 3-1 illustrates the locations of monitoring wells and subareas of concern within the T-25 Area. No Further Action RODs were signed in 2007 for soil at Buildings 62 and 68 (MACTEC, 2007) and in 2008 for soil at the T-25 Area, Building 14 and Former Building 13 (ICF, 2008).

The highest PCE and TCE concentrations were found 30 to 65 feet below ground surface (bgs) above the clayey silt layer, primarily from the southwestern to north-central portions of the T-25 Area. PCE and TCE were generally not detected at concentrations greater than 10 micrograms per liter (µg/L) in groundwater samples collected less than 30 feet bgs or from below the clayey silt layer. TCE and PCE were not detected in any bedrock groundwater samples. The highest PCE concentrations observed during quarterly monitoring (up to 2,000 µg/L during Round 4 in summer 1994) were found in samples collected from the southwestern portion of the T-25 Area (MW-18B-HP2), immediately northeast of Building 20. The maximum concentration of TCE observed in quarterly groundwater samples from the T-25 Area wells is 1,100 µg/L, which was detected in a sample from MW-35B-M13 during Event 6 sampling (spring 1995). Other high concentrations of TCE during quarterly monitoring have been found in samples collected from wells near Buildings T-24 and T-27 (MW15B in the northeast portion of the T-25

Area), as well as in samples from the southwestern portion of the T-25 Area near Buildings T-62, T-68, and 20 (MW-18B-HP2 and MW-90B-4). TCE is more widespread than PCE, but is generally at lower concentrations. Prior to the treatment system operation (beginning in November 1997), PCE and TCE concentrations in groundwater associated with the T-25 Area had not changed significantly over six years of quarterly monitoring.

In general, semivolatile organic compounds (SVOCs) and pesticides were detected sporadically and at low concentrations in groundwater samples collected from the T-25 Area. Bis(2-ethylhexyl) phthalate and DDT exceeded their MCP GW-1 criteria. One polychlorinated biphenyl (PCB), Aroclor-1016, was detected at concentrations exceeding its federal drinking water maximum contaminant level (MCL) in five groundwater samples collected from the T-25 Area; however, each detection was directly associated with laboratory or field blank contamination. Bis(2-ethylhexyl) phthalate and Aroclor-1016 were also detected at concentrations exceeding GW-1 criteria or MCLs in samples from background wells.

Six metals exceeded their MCL or GW-1 criteria in unfiltered groundwater samples collected from both the T-25 Area and background monitoring wells. These include beryllium, chromium, lead, nickel, thallium, and vanadium.

In addition to the on-site groundwater contamination discussed above, eight permanent off-facility monitoring wells were installed during the Phase I and Phase II RIs, and four additional permanent off-facility monitoring wells were installed in 2003. All of these off-facility wells have been monitored routinely (on a quarterly schedule for most wells) to assess the extent of groundwater contamination present downgradient of the T-25 Area. Quarterly groundwater samples from these wells have contained VOC concentrations that are significantly lower than on-facility concentrations. However, PCE and TCE concentrations detected in some off-facility wells do exceed MCLs. The PCE and TCE plume geometries extend to the west and northwest beyond the T-25 Area boundary, and reflect general groundwater flow directions. TCE concentrations extend farther north (to MW-202B) than PCE concentrations.

Despite extensive soil and groundwater sample collection, the source(s) of contamination to T-25 Area groundwater has not been identified. Contamination may have been contributed from various historical activities throughout the T-25 Area over the approximate 40 year period preceding the Phase I and Phase

II RIs. These activities included metals parts washing, mobile dry cleaning, laboratory usage, and storage and transport of cooling brine containing TCE.

There is no evidence of an active contaminant source(s). If there were a current source(s), the contaminant distribution would be different, that is, one would expect the shallow aquifer in the T-25 Area to contain high contaminant concentrations. If the release(s) was recent and to the ground surface, significant contaminant concentrations also would be found in the unsaturated zone, and shallow groundwater in relatively close proximity to the areas of elevated concentration. This is especially true because the majority of the site is currently covered by asphalt, preventing surface water infiltration and percolation through the unsaturated zone and, therefore, preventing the leaching of contaminants from the soil. A large number of soil samples from the unsaturated zone, and groundwater samples from the shallow portions of the aquifer, have been collected across the T-25 Area, specifically near suspected source areas. PCE and TCE have not been detected in any of the soil samples, and only low concentrations of PCE and TCE have been detected in shallow groundwater samples. These results do not indicate a current or recent source, active or inactive (U.S. Army SSC, 2001).

## 3.4 INITIAL RESPONSE

The only pre-ROD groundwater remedial action at the T-25 Area was construction of the groundwater extraction system and its subsequent operation beginning in November 1997.

Stained soil was observed during the removal of a 1,000-gallon waste oil underground storage tank east of the ball field in 1991 (Argonne, 1993). Additional information pertaining to this area, designated NRDEC 04, Pit Area Waste Oil Storage Tank, is available in the following references: Benioff, 1991; Fahey, 1989; MACTEC, 2005; and Roy F. Weston, 1999). In addition, a second removal action was completed in 1997 at an approximate 48- by 60-foot open storage area east of the ball field where chlordane was detected in soil (MACTEC, 2005). Additional information pertaining to this area, designated NRDEC 15, Chlordane Storage Area, available in the following references: MACTEC, 2005; and Roy F. Weston, 1999).

## 3.5 BASIS FOR TAKING ACTION

As part of the Phase II RI, the Army, with input and oversight from USEPA and MassDEP, performed a Human Health Risk Assessment (HHRA) to estimate the probability and magnitude of potential adverse human health risks from contaminants associated with the T-25 Area (Arthur D. Little, Inc., 1998). The results of the HHRA were used to determine the need for cleanup at the T-25 Area. A separate HHRA was completed for the Chlordane Storage Area surface and subsurface soils, resulting in a removal action for the soils from this area in fall 1997.

The HHRA of the RI evaluated potential exposure risks for the following scenarios:

| Media | Exposure Scenario | Time Frame |
|---|---|---|
| Soil | • Facility employees using the ball field | Current and future |
| | • Trespassers on the ball field | Current and future |
| | • Residents near the site potentially exposed to windblown dust from the ball field | Current and future |
| | • Construction workers in the T-25 Area | Future |
| Groundwater | • Workers using site groundwater for industrial uses | Future |
| | • Potential residential users of groundwater from beneath the T-25 Area | Future |

The HHRA of the RI determined that for groundwater beneath the T-25 Area, estimated risks for PCE and TCE exceeded their drinking water standards and USEPA's cancer target risk range of $10^{-4}$ to $10^{-6}$ and noncancer hazard index of 1 for future residential groundwater use and for dermal contact during future industrial use. PCE and TCE contributed the majority of the site-related risk from exposure to groundwater and were designated as primary chemicals of concern (COCs). In addition, six metals (chromium, lead, manganese, nickel, thallium, and vanadium), bis(2-ethylhexyl) phthalate, and DDT, exceeded their respective drinking water standards and/or caused some increases in site-related risks. As described in the ROD, these chemicals were designated as secondary COCs, since it was unclear whether their presence was site related or attributable to either background conditions or turbidity resulting from the sampling technique (non-low flow procedures were used in the mid- to late-1990's when the RI was performed/completed).

The estimated incremental cancer and noncancer risks for surface soil contact for all potentially exposed populations were below or within the range considered acceptable by the USEPA. Because the maximum detected concentrations of contaminants in subsurface soil did not exceed screening concentrations or were detected at concentrations similar to background, human health risks associated with potential exposures to subsurface soils were not evaluated.

A Tier I ecological risk assessment (ERA) was conducted to assess the ecological impact and risks associated with the surface soils as part of the Phase II RI (Arthur D. Little, Inc., 1998). The Tier I ERA found no significant ecological risks for the surface soils in the T-25 Area. Ecological risks were not evaluated for the T-25 Area groundwater

The ROD concluded that response action was necessary to protect public health or welfare from actual or threatened releases of pollutants or contaminants in groundwater.

# 4.0 REMEDIAL ACTIONS

The ROD for T-25 Area Ground Water was signed in September 2001 documenting the selected remedy for cleanup of groundwater associated with releases at the site.

## 4.1 REMEDIAL ACTION OBJECTIVES

Based on an evaluation of site conditions, an understanding of the contaminants, the results of the risk assessments, and an analysis of applicable or relevant and appropriate requirements (ARARs), the ROD identified the following RAOs for T-25 Area groundwater:

- Prevent contamination in the groundwater, above federal and more stringent state drinking water standards, from migrating outside of the T-25 Area toward off-facility receptors
- Prevent any potential exposure to groundwater beneath the T-25 Area and off-facility with contaminant concentrations in excess of federal and more stringent state drinking water standards
- Restore aquifer to drinking water standards within a reasonable time frame
- Monitor potential future migration of groundwater contamination to verify that elevated concentrations decrease over time

These RAOs were developed to prevent exposure to the contaminated groundwater and to restore the aquifer to meet federal and more stringent state drinking water standards.

Groundwater COCs, cleanup levels, and basis for the cleanup levels as listed in the ROD are shown in the following table.

| **T-25 Area Groundwater Cleanup Levels Established in Record of Decision** | | |
|---|---|---|
| **Chemical of Concern** | **Cleanup Level (µg/L)** | **Basis for Cleanup Level [1]** |
| Primary Chemicals of Concern | | |
| Tetrachloroethene | 5 | MCL |
| Trichloroethene | 5 | MCL |
| Secondary Chemicals of Concern | | |
| Chromium | 100 | MCL |
| Lead | 15 | USEPA Action Level |
| Manganese | 1,700 | USEPA Region 9 |
| Nickel | 100 | MCL |
| Thallium | 2 | MCL |
| Vanadium | 50 | MCP |
| DDT | 0.3 | MCP |
| Bis(2-ethylhexyl) phthalate | 6 | MCP |

**Notes:**
[1] MCL - Federal Safe Drinking Water Act, Maximum Contaminant Level
MCP - Massachusetts Contingency Plan Method 1GW-1 standard
USEPA Region 9 Preliminary Remediation Goal for drinking water

## 4.2 THE SELECTED REMEDY

The selected remedy for T-25 Area groundwater is FFS Alternative 3 - Ground Water Extraction with Air Stripping/Carbon Adsorption and Long-Term Monitoring, Institutional Controls, and monitored natural attenuation (MNA). This is a continuation of the groundwater extraction and treatment treatability study implemented at the T-25 Area in 1997. The remedy addresses groundwater contamination and potential future exposure to contaminated groundwater. The major components of the selected remedy consist of the following:

- Groundwater Extraction and Treatment System
  - Extraction of groundwater from extraction wells
  - Collection of extracted groundwater in an equalization vessel with aeration to precipitate metals
  - Filtration of groundwater to remove suspended solids and metals
  - Treatment of the contaminated groundwater in an air stripper to transfer volatile contaminants to an off-gas stream

  - Secondary treatment (polishing) of the air stripper's aqueous effluent by granular activated carbon (GAC) adsorption to further reduce organic contaminant concentrations to less than the cleanup levels
  - Reduction of the stripper off-gas relative humidity in a heater followed by treatment of the heated off-gas containing the stripped contaminants in a vapor-phase GAC adsorbent system
  - Discharge of treated groundwater to Lake Cochituate or other approved alternative uses
  - Off-facility treatment and disposal of solids collected in the equalization vessel
  - Off-facility regeneration of spent GAC from both aqueous- and vapor-phase GAC adsorbent systems
- Long-term groundwater monitoring including MNA parameters both on-facility and off-facility
- MNA evaluation
- Implementation of institutional controls
- Five-year reviews
- Participating in the operation and maintenance of the Springvale Treatment Plant air stripping system

## 4.3 REMEDY IMPLEMENTATION

### 4.3.1 Groundwater Extraction and Treatment System

The Army completed construction of the groundwater extraction and treatment system in 1997 and began operation of the system as a pilot study in November of that year. The ROD was signed in 2001 to document the system as the T-25 groundwater remedy. The system continues to operate.

**Treatment System Components.** The treatment system includes the following major components as illustrated in Figure 4-1: extraction well pumps and flow monitoring system, influent equalization tank, particulate filters, air stripper, carbon adsorption canisters, process blower and heater. A programmable logic controller controls the function of these treatment components. A detailed description of each of the treatment system's major components is presented in the Operation and Maintenance (O&M) Manual (ECC, 2010a). The treatment unit processes have not changed since system construction in 1997.

Since August 2007, the T-25 Area treatment facility has also received and treated PCE and TCE contaminated groundwater extracted from the Buildings 22 and 36 and Buildings 63, 2, and 45 areas. During August 2008, a small ex-situ wellhead treatment unit was installed at the Buildings 63, 2, and 45 Area to remove the contaminant 1,4-dioxane, which was found to occur in a portion of the TCE plume in this area. The extracted groundwater from the Buildings 63, 2, and 45 Area is discharged into the dioxane treatment unit to remove the 1,4-dioxane contamination before this groundwater is pumped to the T-25 Area treatment facility. This separate treatment unit is needed because the air stripper and carbon filtration in the T-25 treatment facility do not readily remove 1,4-dioxane. The wellhead treatment unit uses hydrogen peroxide and iron (Fenton's reagent) in an advanced oxidation treatment process.

**Operations and Maintenance.** The T-25 Area groundwater treatment system is operated in accordance with the Groundwater Treatment System O&M Manual (ECC, 2010a). An operator is on-site 3 days per week to perform routine treatment facility operation and maintenance activities.

The following major O&M events have occurred during the 2006 to 2011 period:

2007. Upgrades were made to the T-25 Area Treatment Plant in Building T-94 to accommodate the additional influent contributed from new extraction wells installed at the Buildings 22 and 36 Area and the Buildings 63, 2, and 45 Area. The amount of new influent, approximately 10 to 15 gallons per minute (gpm), raises the total treatment facility influent to approximately 80 gpm, well below the 160 gpm capacity of the facility.

2008. An ex-situ wellhead treatment unit was installed to treat 1,4-dioxane in groundwater from the new extraction wells in the Buildings 63, 2, and 45 Area.

2009. A leak was discovered in the discharge inlet piping from MW-95B-4, and the well was shut down on February 21. The former extraction well MW-15B (located approximately 180 feet southeast of MW-95B-4) was reactivated by pulling the pump from MW-95B-4, placing it in MW-15B, and installing piping and electrical connections to MW-15B. Extraction of groundwater from MW-15B was initiated on March 11 at approximately the same flow rate as had been supplied by MW-95B-4.

2009. New carbon vessels were installed after discovery that the existing vessels had lost nearly all of their carbon through cracks in the outlet piping. The new canisters and carbon were installed during May-June of 2009.

2009. The motor on the pump in MW-90B-4 failed and required replacement.

2007 to 2011. The extraction wells were redeveloped as needed, and bag filters were changed as needed. Carbon maintenance included periodic (approximately every three months) backwashing of the liquid-phase carbon canisters. Rotometers and paddle wheel flow meters were cleaned regularly to remove deposits due to the extracted groundwater turbidity and oxidation of dissolved iron.

2010. Existing monitoring well MW-40B-2 (at the Boiler Plant Area) was over-drilled and an extraction well was installed in the borehole (MW-40BR) to address dieldrin contamination that has persisted at this location. Additionally, in 2010, MW-39B-HP4 (in the northwest corner of T-25 Area) was converted to an extraction well to provide capture of the PCE and TCE contamination exceeding MCLs north of the T-25 Area. Both MW-39B-HP4 and MW-40BR began pumping groundwater to the treatment plant in late August of 2010.

**Treatment System Performance.** During the year 2010, a total volume of approximately 38.8 million gallons of groundwater were pumped through the T-25 Area treatment system, including flow from the Buildings 22 and 36 and Buildings 63, 2, and 45 Areas. The average flow rate was approximately 74.8 gpm. During the operational period extending from start up through December 2010, a total of approximately 367 million gallons of groundwater have been treated. During 2010, the treatment system was operating for approximately 98 percent of the time.

Monthly average treatment system influent TCE concentrations ranged from 2.5 to 5.6 µg/L during 2010, while PCE influent concentrations ranged from 4.2 to 11.1 µg/L. Effluent concentrations were less than quantitation limits and less than discharge limitations of 2.5 µg/L for TCE and 0.69 µg/L for PCE. PCE and TCE were not detected in air samples collected from the treatment plant air discharge during the period. No secondary COCs exceeded their respective discharge limits in the effluent water samples

The T-25 Area treatment plant removes PCE and TCE in groundwater down to below discharge limits or to a non-detectable level. The treatment system is currently redundant with liquid-phase GAC as well as an air stripper and two vapor-phase GAC canisters. The air discharged from the air stripper after carbon filtration also typically has TCE and PCE removed down to non-detectable levels. The Buildings 63, 2, and 45 Area wellhead treatment unit typically removes 1,4-dioxane to below laboratory quantitation limits and the pre-2011 treatment goal for the treatment unit which was the Massachusetts drinking water guideline of 0.003 mg/L. An exception occurred in October 2009 when a buildup in the chemical feed pump resulted in a reduced volume of hydrogen peroxide reaching the reaction tank, and therefore,

limited 1,4-dioxane destruction. After servicing of the pump, treatment performance was restored. Massachusetts lowered its drinking water guideline for 1,4-dioxane to 0.0003 mg/L in 2011 which is less than the historical laboratory quantitation limit. Additional details about treatment system performance are contained in the groundwater treatment system annual reports (ECC, 2008a; ECC, 2008b; ECC, 2009b; ECC, 2010b; ECC, 2011b).

The annual and cumulative mass of TCE and PCE removed by the treatment system is reported each year in the annual groundwater treatment system report. Based on results of treatment system sampling, the total mass balance of TCE and PCE for the treatment system for 2006 through 2010 is shown below.

| Year | Mass Removed for Year (lbs) | Cumulative Since Start-up (lbs)* |
|---|---|---|
| 2006 | 2.2 | 81.94 |
| 2007 | 1.19 | 83.13 |
| 2008 | 2.76 | 85.89 |
| 2009 | 4.02 | 89.91 |
| 2010 | 4.74 | 94.65 |

* Cumulative values from annual reports except 2008 which was provided by ECC.

Figure 4-2 illustrates the cumulative mass of PCE and TCE removed as a function of time.

### 4.3.2 Long-Term Groundwater Monitoring

The progress of groundwater cleanup is evaluated through the long-term monitoring program, which has historically involved quarterly sampling of monitoring wells associated with the T-25 Area (ECC, 2009a). The results of each quarterly groundwater monitoring event were discussed in quarterly groundwater monitoring reports, and summarized in the annual treatment system reports.

In accordance with the amended Long-Term Monitoring Plan (ECC, 2010d), approved by USEPA and MassDEP, the installation-wide quarterly monitoring program was modified to a semiannual monitoring program in 2010. The first semiannual sampling event occurred in March 2010.

### 4.3.3 Monitored Natural Attenuation Evaluation

The long-term monitoring program included collection through 2010 of data to assess whether natural attenuation of contaminants through biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants is occurring over time. At that time it was concluded that there was little potential for natural attenuation of PCE and TCE by biodegradation pathways, and analysis of natural attenuation parameters was discontinued.

### 4.3.4 Implementation of Institutional Controls

As discussed in Subsection 3.2, institutional controls have been implemented to restrict access to groundwater during the T-25 Area groundwater remedial action, both on-facility and off-facility. The Army's Master Plan for NSSC (The Urban Collaborative, LLC, 2012) restricts the on-facility use of groundwater. A Town of Natick Board of Health ordinance (February 1999) prohibits both the installation of new private drinking water wells and the use of existing private drinking water wells in a prescribed area around the facility, and requires a permit for any other use, such as industrial or irrigation. Certification that the institutional controls are in place and remain effective is provided in letters from the Army and Town of Natick (Appendix A).

### 4.3.5 Five-Year Reviews

The first five-year review was completed in January 2007 and approved by USEPA on March 1, 2007. The review concluded that the remedy for the T-25 Area groundwater would be protective of human health and the environment upon attainment of cleanup goals. In the interim, exposure pathways that could result in unacceptable risks were being controlled through institutional controls, which restricted use of groundwater on-site and off-site.

### 4.3.6 Operation and Maintenance of the Springvale Treatment Plant

A component of the selected remedy includes the Army's support of a portion of the operation and maintenance of the air stripping system at the Town of Natick's Springvale Treatment Plant, to further protect the drinking water of the Town of Natick. A cooperative agreement (signed in August 2001)

between the Army and the Town of Natick was developed through negotiations between the town and the Army, with the involvement of the regulators. The agreement included several provisions including, but not limited to: 1) the Army would provide the town with a one-time payment of $3.1 million to support a portion of the operation and maintenance of the air stripping system at the town's Springvale Treatment Plant, 2) agreements by the town to continue operation of the Springvale Treatment Plant, and the Army to continue operation of source area containment of contaminated groundwater at the T-25 Area site, and 3) agreement by the Town of Natick to impose institutional controls in the area for the full time of the cleanup.

# 5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The first review identified four issues considered to have potential to affect future protectiveness and made recommendations for follow-up actions as listed in the following table.

| **Issues and Recommendations From First Five-Year Review** | |
|---|---|
| **Issue** | **Recommendation / Follow-up Action** |
| Extraction well pumping rate decline | Perform regular pumping rate maintenance and redevelopment of extraction wells to insure optimal pumping rates and maintain containment. |
| Residual off-site TCE concentrations | Continue monitoring off-site wells in accordance with the long-term monitoring plan, and install additional off-site extraction well to optimize cleanup. |
| Limited evidence for MNA | Continue monitoring for MNA parameters in accordance with the long-term monitoring plan. |
| Optimization using enhanced bioremediation | Implement proposed optimization study. Perform required long-term monitoring and data evaluation to determine effectiveness of enhanced bioremediation. |

## 5.1 ISSUE 1 - EXTRACTION WELL PUMPING RATE DECLINE

The first five-year review recommended performing regular pumping rate maintenance and redevelopment of extraction wells to insure optimal pumping rates and maintain containment.

### 5.1.1 Actions Taken

The contractor responsible for operation of the T-25 Area groundwater extraction and treatment system monitors extraction well performance and performs well maintenance as needed to maintain pumping rates and groundwater capture/containment. In August 2010, MW-39B-4 was added to the extraction well network to improve capture/containment, and the piping for MW-95B-4 was repaired, allowing this well to be reintroduced into the network. These wells have been operational since August 2010.

### 5.1.2 Results of Actions

As part of the management of the groundwater extraction systems, the contractor responsible for its operation completes an annual groundwater capture zone analysis for the T-25 Area utilizing a slightly modified version of the groundwater flow model developed for NSSC by Tsunamic Technologies LLC (2005). The groundwater model (using the USGS MODFLOW model code) has evolved over the years as additional data has become available from on-going investigations and collection of quarterly groundwater quality samples and measurements of water levels. As such, the model has reached a high state of calibration and detail. The model is used to assess capture of that portion of each plume in which the concentration of PCE and/or TCE is above the established cleanup goals of 5 µg/L (i.e., the target capture zone (TCZ)). As presented in the most recent report, the T-25 Area comingled plume TCZ and the isolated TCE TCZ at MW-208B are completely captured by the existing array of pumping wells at 2010 pumping rates (ECC, 2011b). Average annual extraction rates for 2005 through 2010 are shown in the following table. The table shows that annual extraction rates have been maintained.

**Average Annual Extraction Rates for T-25 Area Wells**

| Well | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| MW-90B-4 | 21.4 | 14.7 | 26 | 27.1 | 25.1 | 24.9 |
| MW-94B-4 | 10.3 | 17.7 | 12 | 10.7 | 10.1 | 10.3 |
| MW-95B-4 / -15B | 23.8 | 19 | 27.4 | 26.4 | 25.1 | 24.5 |
| MW-96B-4 | 8.3 | 8.5 | - | - | - | - |
| MW-39B-4 | - | - | - | - | - | 15.5 |
| Total, gpm | 63.8 | 59.9 | 65.4 | 64.2 | 60.3 | 75.2 |

**Notes:**
MW-96B-4 was shut down on September 23, 2006, to accommodate the bioremediation pilot test and has remained off through all of 2007, 2008, 2009, 2010, and 2011. It was brought back online in March 2012 and will be sampled on the same schedule as otherT-25 extraction wells.
MW-95B was shut down Feb 21, 2009, for pipeline repairs, and MW-15B was put online March 11, 2009.
MW-95B was put back on line and MW-15B taken off line in August 2010.
MW-39B was added to the extraction well network in August 2010.

## 5.2 ISSUE 2 - RESIDUAL OFF-SITE TCE CONCENTRATIONS

The first five-year review recommended monitoring off-site wells in accordance with the long-term monitoring plan, and installation of an additional off-site extraction well to optimize cleanup.

### 5.2.1 Actions Taken

The monitoring of off-site wells has continued in accordance with the long-term monitoring plan. An additional, off-site, extraction well has not been installed; however, existing monitoring well MW-39B-4, located at the northwest corner of the T-25 Area, was converted to an extraction well in August 2010 to enhance groundwater capture/containment.

### 5.2.2 Results of Actions

As discussed in Subsection 5.1.2, a component of the T-25 Area groundwater extraction and treatment system annual report is a groundwater capture zone analysis utilizing the existing groundwater flow model to assess capture of that portion of each plume in which the concentration of PCE and/or TCE is above the established cleanup goals of 5 µg/L (i.e., the target capture zone). As presented in the most recent report, the T-25 comingled plume TCZ and the isolated TCE TCZ at MW-208B are completely captured by the existing array of pumping wells at 2010 pumping rates (ECC, 2011b). Based on the report's conclusions, installation of an off-site extraction well is unnecessary. NSSC plans continued inclusion of the groundwater capture zone analysis in groundwater extraction and treatment system annual reports.

## 5.3 ISSUE 3 - LIMITED EVIDENCE FOR MNA

The first five-year review recommended continuing to monitor MNA parameters in accordance with the long-term monitoring plan.

### 5.3.1 Actions Taken

Monitoring of MNA parameters was discontinued in 2010, based on the conclusion that extensive long-term monitoring had shown little potential for natural degradation of PCE and TCE by biodegradation pathways and that additional monitoring was not justified (ECC, 2010d; 2011a). Natural attenuation of PCE and TCE will continue, however, through advection, dilution, and dispersion mechanisms.

### 5.3.2 Results of Actions

The discontinuance of monitoring MNA parameters does not adversely affect the performance groundwater extraction and treatment system or the protectiveness of the selected remedy at the T-25 Area.

## 5.4 ISSUE 4 - OPTIMIZATION USING ENHANCED BIOREMEDIATION

The first five-year review recommended implementing a previously proposed bioremediation optimization study and performing long-term monitoring and data evaluation to determine effectiveness of enhanced bioremediation.

### 5.4.1 Actions Taken

In August 2005, the Army proposed an optimization study to evaluate the potential of in-situ biological enhancement to decrease PCE and TCE concentrations in groundwater, and expedite the overall cleanup schedule for the T-25 Area groundwater (ICF Consulting, Inc., 2006). The study was implemented in the spring of 2006 and was based on the subsurface injection of an organic substrate (Hydrogen Release Compound [HRC®] marketed by Regenesis, Inc., of San Clemente, CA) to create conditions favorable for the anaerobic biodegradation of PCE and TCE. The initial injection took place in September 2006. The performance of the optimization study was monitored through one pre-HRC® injection and 8 post-HRC® injection sampling events spanning the period from April 2006 through July 2010 (ICF International, 2011b).

### 5.4.2 Results of Actions

Although the reducing conditions needed for anaerobic degradation of PCE and TCE were achieved, there was no conclusive evidence of enhanced biodegradation of PCE and TCE. It was initially thought that very low populations of the microorganism *Dehalococoides*, which play a significant role in the reductive dechlorination of PCE and TCE was a factor, so follow-on injections with HRC 3D Microemulsion and the microbial consortium Bio-Dechlor INOCULUM® were completed in November 2009 and December 2009, respectively. After post-bioaugmentation groundwater sampling events in March and June 2010,

evidence of that reductive dechlorination was occurring was still uncertain with indicator results similar to previous monitoring periods and monitoring was stopped (ICF International, 2010b).

# 6.0 FIVE-YEAR REVIEW PROCESS

## 6.1 COMMUNITY INVOLVEMENT

Community involvement activities for this five-year review consisted of publishing a notice in two local newspapers announcing the performance of the five-year review and providing information where and how the public could obtain additional information. The notice appeared in the MetroWest Daily news on January 3, 2012, and in the Boston Globe on January 3, 2012. A copy of the notice is provided in Appendix B.

In addition, preparation of the five-year review was announced at the February 2, 2012, meeting of the RAB, and the draft report was discussed.

The U.S. Army has maintained a public involvement and information program at NSSC and maintains an Administrative Record, as required by CERCLA, at NSSC and at the MassDEP. The Administrative Record contains information and documents relied upon by the Army in the decision making process for environmental cleanup at the sites reviewed in this document as well as other NSSC sites. For the convenience of the public, a copy of the Administrative Record is also maintained in an Information Repository located at the Morse Institute Library, 14 East Central Street, Natick, Massachusetts.

The Army point of contact is Mr. James Connolly, who can be reached at (508) 233-5550 or James.B.Connolly@us.army.mil.

## 6.2 DOCUMENT REVIEW

A list of documents cited in this document is provided in the list of references following the main body of this report. Review team members consisted of Stanley Reed, Engineer, AMEC E&I; Koren Kingman, Risk Assessor, AMEC E&I, Fred Santos, Project Manager, ECC; and Willard Murray, Engineer, ECC.

## 6.3 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENT REVIEW

The ARARs presented in Table 13 of the ROD are reprinted and appended in Appendix C of this report. These standards and regulations were current at the signing of the ROD and, as part of this five-year site review, have been reviewed for changes that could affect protectiveness. No changes were identified in the location- or action-specific ARARs listed in Appendix C that affect the protectiveness of the implemented remedial action.

In addition, a search was performed for any newly promulgated standards which could affect protectiveness at the site. No new ARARs were identified that would affect the protectiveness of the remedy.

Changes to chemical-specific ARARs and "to be considered guidance" (TBC) that pertain to risk assessment are discussed in Subsection 7.2.

## 6.4 DATA REVIEW

This five-year review included review of groundwater analytical data from 42 T-25 Area monitoring and extraction wells for the period from October 1993 through May 2011, focusing on the period from 2006 through May 2011, the most recent sampling event for which data were available. This dataset comprises analytical results groundwater monitoring events completed as part of the long-term monitoring program at NSSC. Targeted wells and analytes have varied through the life of the monitoring program, and not all wells were sampled in each event or for the same analytes each time. The following discussion focuses on PCE and TCE, the primary COCs and risk drivers at the T-25 Area, and on chromium, lead, manganese, nickel, thallium, vanadium, DDT, and bis(2-ethylhexyl) phthalate, the secondary COCs listed in the ROD. Although not listed as COCs in the ROD, cis-1,2-DCE and vinyl chloride, degradation products of PCE and TCE, are also discussed.

**Trichloroethene**. TCE has been reported above detection limits at 35 of the 42 historical sample locations. A concentration of 800 µg/L was reported in MW-35B-M13 as recently as January 2000; however, TCE in replacement well MW-35BR decreased to 1.5 µg/L in May 2011. In general, TCE concentrations at the T-25 Area have decreased substantially during the 18-year extent of the long-term

monitoring program, and, especially, in the 14 years since startup of the groundwater extraction system in 1997. During the period from 2006 through May 2011, TCE was reported above the cleanup level of 5 µg/L in 8 monitoring wells and 3 extraction wells (MW15B, MW-90B-4, and MW-96B-4). TCE data for this period are summarized in Appendix D. In 2010, TCE was reported above detection limits in 17 locations; however, only 7 locations exceeded the cleanup level of 5 µg/L. In May 2011, TCE was reported above detection limits in 10 locations; however, only 4 locations exceeded the cleanup level of 5 µg/L (MW-18B-HP2 at 76 µg/L, MW37B-HP2 at 46.1 µg/L, MW83B-2 at 19 µg/L, and MW208B-HP2 at 31.6 µg/L) reflecting a general downward trend in concentrations. Figure 6-1 shows TCE plume contours for sampling performed in the winter of 1996/1997 prior to start-up of the pump and treat system as depicted in the Event 13 monitoring report (Arthur D. Little, Inc., 1997a). Figures 6-2 through 6-6 show TCE plume contours from Sampling Events 46 (September 2006), 51 (December 2007), 55 (December 2008), 59 (December 2009), and 61 November 2010), as depicted in the respective monitoring reports. Comparison of the figures shows that the maximum TCE concentrations have decreased from 820 µg/L at MW-35BR in the winter of 1996/1997 to 104 µg/L at MW-18B-HP2 in 2010. In addition, the area exceeding the cleanup level of 5 µg/L is significantly reduced in 2010, especially in the off-installation area outside of the T-25 boundary. The figures indicate that the TCE plume is decreasing in size and concentration. Appendix E contains time series plots for TCE based on long-term monitoring data from 23 T-25 Area monitoring wells for the period extending from 1993 through May 2011.

Review of Figure 6-6 shows that portions of the T-25 TCE plume exceeding the vapor intrusion screening concentration of 5 µg/L occur beneath occupied buildings at the T-25 Area and beneath the residential area northwest of the T-25 Area. This is discussed further in Subsection 7.2.

**Tetrachloroethene.** PCE has been reported above detection limits at 39 of the 42 historical sample locations. The highest historical concentration was 2,000 µg/L in MW-18B-HP2 in May 1995; however, PCE in this monitoring well decreased to less than the cleanup level 5 µg/L for most of the period from March 2006 through January 2010. Concentrations increased somewhat to 20.6 µg/L in March 2011. In general, PCE concentrations at the T-25 Area have decreased substantially during the extent of the long-term monitoring program, and especially since startup of the groundwater extraction system in 1997. During the period from 2006 through May 2011, PCE was reported above the cleanup level of 5 µg/L in 5 monitoring wells and 2 extraction wells (MW-90B-4 and MW-96B-4). The highest reported concentration was 57.2 µg/L in MW-96B-4 in 2008. PCE data for this period are summarized in

Appendix D. In 2010, PCE was reported above detection limits in 11 locations; however, only 3 locations exceeded the cleanup level of 5 µg/L. In May 2011, PCE was reported above detection limits in 9 locations; however, only 1 location (MW-18B-HP2 at 20.6 µg/L) exceeded the cleanup level of 5 µg/L, reflecting a general downward trend in concentrations. Figure 6-7 shows PCE plume contours for sampling performed in the winter of 1996/1997 prior to start-up of the pump and treat system as depicted in the Event 13 monitoring report (Arthur D. Little, Inc., 1997a). Figures 6-8 through 6-12 show PCE plume contours from Sampling Events 46 (September 2006), 51 (December 2007), 55 (December 2008), 59 (December 2009), and 61 November 2010), as depicted in the respective monitoring reports. Comparison of the figures shows that the maximum PCE concentrations have decreased from greater than 300 µg/L at MW-18B-HP2 (1,000 µg/L in data tables) in the winter of 1996/1997 to less than 10 µg/L in 2010. In addition, the area exceeding the cleanup level of 5 µg/L is significantly reduced in 2010. The figures indicate that the PCE plume is decreasing in size and concentration. Appendix E contains time series plots for PCE based on long-term monitoring data from 23 T-25 Area monitoring wells for the period extending from 1993 through May 2011.

Review of Figure 6-12 shows that portions of the T-25 PCE plume exceeding the vapor intrusion screening concentration of 5 µg/L occur beneath occupied buildings at the T-25 Area and beneath the residential area northwest of the T-25 Area. This is discussed further in Subsection 7.2.

**Cis-1,2-DCE and Vinyl Chloride.** Review of analytical data for T-25 Area monitoring wells, including downgradient wells in the residential area northwest of the T-25 Area, for the period extending from March 2006 through May 2011 shows a maximum cis-1,2-DCE concentration of 7.6 µg/L at MW-18B-HP2. This is well below the MCL of 70 µg/L for cis-1,2-DCE. Review of vinyl chloride data for the same wells and time period shows all concentrations reported as undetected at 1 µg/L or less. The MCL for vinyl chloride is 2 µg/L. Cis-1,2- DCE and vinyl chloride data for this period are summarized in Appendix D.

**Metals**. Selected off- and on-post T-25 Area wells have been sampled and analyzed periodically for the six metals listed as secondary COCs in the ROD (i.e., chromium, lead, manganese, nickel, thallium, and vanadium) during the long-term monitoring program. Review of analytical data spanning 1993 through 2010 shows that in most instances metals concentrations in groundwater are less than T-25 Area cleanup levels. Further, in instances where total concentrations exceed cleanup levels, dissolved concentrations

typically do not, suggesting that suspended solids contributed to elevated metal concentrations and that the metals are not mobile in the subsurface. As noted in Subsection 7.2, the USEPA Regional Screening Level (RSL) for manganese is 320 µg/L, and USEPA Region 1 currently recommends 300 µg/L as a manganese cleanup level, based on the EPA Office of Water Health Advisory for Manganese. With the exception of MW128A and MW18B-HP-2, T-25 Area samples have not exceeded the 1,700 µg/L manganese cleanup level listed in the ROD during the 2006 to May 2011 time period. During the same period, samples from 7 wells exceeded the RSL of 320 µg/L. Four of 16 wells analyzed for metals in 2010 exceeded 320 µg/L. In the case of vanadium where the MCP Method 1 GW-1 standard has decreased from 50 to 30 µg/L, there have been no exceedances of either value since 1996.

The First Five-Year Review (ICF, 2007) recommended elimination of chromium, lead, manganese, nickel, thallium, and vanadium as COCs at the T-25 Area. With the exception of four on-post wells and one off-post well, these metals were eliminated from the T-25 Area long-term monitoring plan in 2009 (ECC, 2009a). Analytical data for metals for the 2006 through May 2011 period are summarized in Appendix D.

**DDT.** The pesticide DDT was reported at concentrations greater than the cleanup level of 0.3 µg/L in two samples from MW-32B-HP2 in the early 1990s, and selected on-post T-25 Area wells have been sampled and analyzed periodically for pesticides during the long-term monitoring program. These subsequent samples showed concentrations less than the cleanup level, and the First Five-Year Review (ICF, 2007) recommended elimination of DDT as a COC at the T-25 Area. DDT has not been a target analyte in samples from the T-25 Area since June 2006.

**Bis(2-ethylhexyl) phthalate.** The SVOC bis(2-ethylhexyl) phthalate was reported at concentrations greater than the cleanup level of 6 µg/L in several samples from T-25 Area wells in the early and mid-1990s. Subsequent samples showed concentrations less than the cleanup level, and the First Five-Year Review (ICF, 2007) recommended elimination of bis(2-ethylhexyl) phthalate as a COC at the T-25 Area. Bis(2-ethylhexyl) phthalate has not been a target analyte in samples from the T-25 Area since June 2006.

## 6.5 SITE INSPECTION

A part of this five-year review, ECC and AMEC E&I completed a site inspection at the T-25 Area on December 7, 2011. Participants included James Connolly, Restoration Program Manager, NSSC; Fred Santos, Project Manager, ECC; Willard Murray, Engineer, ECC; and Stanley Reed, Engineer, AMEC E&I. At the time of the site inspection, the treatment facility appeared to be operating as intended and without problems. The building was clean, heated, well-lighted, and in good repair, although a small amount of rain had driven in under an overhead door. Operation and maintenance documents including an O&M manual, equipment manuals, Health and Safety Plan, operational logs, and sampling and monitoring reports were present and accessible.

The treatment building is normally kept locked. The building is not fenced, but it is located within the NSSC security fence. Access to the NSSC campus is strictly controlled. There was no on-site use of, or exposure to, groundwater or change in land use that would affect the protectiveness of the remedy.

The site inspection checklist contained in Appendix D of USEPA's five-year review guidance (USEPA, 2001) was referred to during the inspection, but was not filled out.

## 6.6 INTERVIEWS

As part of the five-year review process, brief interview forms were forwarded to the following individuals on December 2, 2011, to get their views about site conditions and related concerns.

- Christine A.P. Williams – Remedial Project Manager, USEPA Region 1
- Bob Campbell – Bureau of Waste Site Cleanup, MassDEP
- James Connolly – Restoration Program Manager, NSSC
- Robert Bois – Environmental Compliance Officer, Town of Natick
- James White – Director of Public Health, Town of Natick
- Marco Kaltofen - RAB
- Dave Reault - T-25 Groundwater Treatment Plant Operator, ECC

Follow-up messages, as appropriate, were forwarded on December 13. In addition, Mr. Bois and Mr. White were informed on November 16 that they would receive interview forms. Responses were received from C. Williams, J. Connolly, M. Kaltofen, and D. Reault. Copies of the questions and responses are contained in Appendix F.

Concerns mentioned in the interview responses are noted below.

1) M. Kaltofen identified the potential for vapor intrusion (PCE, TCE, and breakdown products including vinyl chloride) in homes downgradient of the T-25 Area as a community concern. In addition, he said that appearance of new zones of detectable TCE was a concern.
2) D. Reault recommended shut down of the air stripper and vapor-phase GAC as a means to eliminate redundancy in the groundwater treatment system and reduce operation and maintenance costs to the Army.

A discussion of about the vapor intrusion pathway is included in Subsection 7.2. In addition, the Army has not detected new zones of TCE contamination at the T-25 Area. The potential to shut down the air stripper and vapor phase GAC canisters is discussed in Subsection 7.1.4.

# 7.0 TECHNICAL ASSESSMENT

## 7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

Yes, the remedy is functioning as intended.

### 7.1.1 Remedial Action Performance

The remedial action selected for T-25 Area groundwater includes installation and operation of a groundwater extraction and treatment system to minimize the migration of contaminated groundwater (i.e., contain contaminated groundwater) and reduce contaminant mass in the aquifer; long-term groundwater monitoring; evaluation of monitored natural attenuation; and participating in the O&M of the Springvale Treatment Plant. The review of documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD.

**Groundwater Extraction and Treatment.** A groundwater extraction and treatment system has been installed. Monitoring data and groundwater modeling indicate that contaminant migration is being controlled and contaminant mass is being reduced. The treatment system effectively treats PCE and TCE in influent groundwater. A wellhead treatment system treats 1,4-dioxane from Buildings 63, 2, and 45 extraction wells. The remedial action continues to operate and function as designed and is expected to achieve cleanup levels.

**Long-Term Groundwater Monitoring.** Long-term groundwater monitoring is being performed in accordance with an approved monitoring plan.

**Evaluation of Monitored Natural Attenuation.** The long-term monitoring program included monitoring of monitored natural attenuation parameters through 2010, at which time it was concluded that there was little potential for natural attenuation of PCE and TCE by biodegradation pathways.

**O&M at the Springvale Treatment Plant.** NSSC has contributed to the operation and maintenance of the Town of Natick Springvale Treatment Plant.

**Implementation of Institutional Controls.** Institutional controls have been implemented as discussed in Subsections 3.2 and 4.3. Other measures required by the ROD have been implemented as discussed in Subsection 4.3. No indication of the use of, or exposure to, groundwater was observed during preparation of this five-year review.

### 7.1.2 System Operations/Operations and Maintenance

The treatment system is operated and maintained in a manner to maintain performance and minimize costs.

### 7.1.3 Costs of System Operations/O&M

Estimated and actual costs for remedial action operation (RA-O) of the T-25 Area Groundwater Treatment Facility are shown in the following table.

**Comparison of Estimated and Actual Operating Costs**

| Calendar Year | Estimated Cost[1] | Current/Actual Cost[2] |
|---|---|---|
| 2007 | $187,000 | $220,000 |
| 2008 | $196,000 | $234,000 |
| 2009 | $202,000 | $169,000 |
| 2010 | $207,000 | $88,000 |
| 2011 | $215,000 | $107,000 |

**Notes:**
[1] Estimated costs are based on 1998 costs presented in Table 11b of the ROD excluding groundwater monitoring, water level measurements, five-year review, and electrical costs, all without contingency and escalated using the Engineering News Record Construction Cost Index (ENR CCI).
[2] Current costs provided by ECC.
[3] All costs rounded to nearest $1,000.

As shown in the table, operating costs have decreased over the last several years. This is attributed to efforts by the contractor (ECC) responsible for system operation to optimize treatment and reduce costs where possible. Treatment System Optimization measures include the following:

- Implementation of wireless remote access technology resulted in a reduction of operator labor from full time to part time operations.
- Air sampling frequency was reduced from monthly to quarterly
- Changed from hydrochloric acid to sulfuric acid in the 1,4-dioxane system. This reduced damage to equipment due to corrosion from hydrochloric acid fumes (greatly reducing replacement/repair of equipment in the 1,4-dioxane unit).

Long-term monitoring at T-25 is performed as part of an installation-wide monitoring program and a breakout of long-term monitoring costs associated with T-25 Area monitoring wells was not available for this five-year review and is not included in the preceding tabulation; however, the remediation contractor has implemented measures, with USEPA concurrence, to reduce installation-wide long-term groundwater monitoring costs. These measures include the following:

- Reducing the frequency of field sampling events from quarterly to semiannual (spring and fall)
- Monitoring report frequency was reduced from quarterly to semiannual
- Replacing the spring event monitoring report with a Data Transmittal Letter Report
- Terminating sampling and analysis for MNA evaluation

### 7.1.4 Opportunities for Optimization

As discussed in Subsection 4.3.1, the T-25 Area treatment plant removes PCE and TCE in groundwater down to below discharge limits or to a non-detectable level. The treatment system is currently redundant with an air stripper and vapor-phase GAC canisters in addition to liquid-phase GAC. An analysis of the treatment plant processes by the operator indicates that groundwater treatment by liquid phase carbon alone is sufficient to remove the TCE/ PCE concentrations to non-detectable concentrations. Shut down of the air stripper with its energy intensive air blower and vapor GAC with its energy intensive heater would result reduce energy use and carbon footprint. Calculations have shown that electrical power consumption equal to 196,733 kilowatt-hours per year can be saved by making this treatment process optimization (ECC, 2011b).

### 7.1.5 Early Indicators of Potential Remedy Problems

No indicators of potential remedy failure were noted.

## 7.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES USED AT THE TIME OF REMEDY SELECTION STILL VALID?

No. There have been changes to exposure assumptions and toxicity values; however, they do not result in change to the cleanup levels or call into question the protectiveness of the groundwater remedy.

**Changes in Standards and To Be Considered Guidance.** The ARARs and TBC used as a basis for the cleanup levels for COCs listed in Subsection 4.1 were reviewed to identify changes. Several changes were identified, and the results of the review are summarized in Table 7-1. In particular, the Region 9 Preliminary Remediation Goals (PRGs) used as a basis for the manganese cleanup level have been replaced with RSLs. The RSL for manganese is 320 µg/L, and USEPA Region 1 currently recommends a concentration of 300 µg/L as a manganese cleanup level. In addition, the Massachusetts Contingency Plan (MCP) Method 1 GW-1 groundwater standard used as a basis for the vanadium cleanup level has been lowered from 50 to 30 µg/L.

Review of long-term monitoring data (see Subsection 6.4) indicates that, with the exception of MW128A and MW18B-HP-2, recent samples from the T-25 Area do not exceed the 1,700 µg/L manganese cleanup level listed in the ROD. During the same period, samples from 7 wells exceeded the RSL of 320 µg/L. In the case of vanadium where the MCP Method 1 GW-1 standard has decreased from 50 to 30 µg/L, there have been no exceedances of either value since 1996. The First Five-Year Review (ICF, 2007) recommended elimination of chromium, lead, manganese, nickel, thallium, and vanadium as COCs at the T-25 Area. These metals were eliminated from the long-term monitoring plan in 2009 (ECC, 2009a).

**Changes in Exposure Pathways.** The T-25 Area is a 15.6-acre rectangular area in the northwestern portion of the NSSC facility. Most of the T-25 Area ground surface is covered by buildings or asphalt. Many of the buildings are temporary. An unpaved road on an embankment approximately 10 feet above the rest of the T-25 Area rings the area on three sides. The embankment rises an additional 10 feet above the dirt road and is topped by a chain-linked fence. The only open, uncovered areas include a baseball field for employee use located in the northwest corner of the area and the unpaved perimeter road and embankment. The T-25 Area is bounded to the west, north, and east by residential properties; it is

bounded to the south by the rest of the NSSC facility. The facility is currently operational with commercial/industrial use and there are no plans or expectations that this will change in the future. Because future land use is expected to remain the same as current land use, it is unlikely that residences will be built on the T-25 Area and that use of groundwater will occur. However, the basis of the groundwater risk assessment is the potential future use of groundwater by future industrial workers and future residents who may install a well and use groundwater from beneath the T-25 Area. For potential future residential exposures to groundwater, the HHRA evaluated ingestion and dermal contact during household water use. For future worker exposure routes to groundwater, the HHRA evaluated dermal contact.

Because on-site personnel and nearby residents may also potentially be exposed to vapors in indoor air as a result of a plume of VOC contamination in groundwater, evaluation of the potential completeness of the vapor intrusion exposure pathway is also warranted. USEPA guidance for evaluating the vapor intrusion exposure pathway (OSWER *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* [2002]) indicates that the vapor intrusion pathway would be considered potentially complete if VOCs are detected in groundwater that is within 100 feet of an occupied building at concentrations in excess of the vapor intrusion screening values published in the guidance document.

To evaluate whether this exposure pathway could potentially be significant, current (most recent) concentrations of VOCs in groundwater from monitoring wells in the T-25 area and downgradient of the T-25 Area were compared to vapor intrusion screening values published by USEPA (OSWER *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* [2002]).

Groundwater in the overburden aquifer beneath the site is comprised of two groundwater layers. Groundwater encountered less than 30 feet bgs, or the upper layer of the unconfined aquifer, is referred to as Layer “A” in the HHRA. Groundwater encountered between 30 and 80 feet bgs, or the lower layer of groundwater, is referred to as Layer “B”.

VOCs were detected in Layer A in the most recent groundwater sampling event for which data were available for review (Spring 2011, Event 62); however, no VOCs have been detected at concentrations in excess of the vapor intrusion screening values since 1996. Review of analytical data for cis-1,2-DCE and

vinyl chloride, which are not identified as COCs in T-25 Area groundwater, for the period extending from April 2005 through May 2011 does not show concentrations in excess of the vapor intrusion screening values.

VOCs were detected in four Layer B wells in Event 62 sampling round at concentrations in excess of the vapor intrusion screening values. PCE and TCE were detected above their vapor intrusion screening values of 5 µg/L in groundwater collected from on-site monitoring well MW-18B-HP2 at respective concentrations of 76 and 20.6 µg/L. TCE was detected in groundwater above its vapor intrusion screening value from two additional on-site monitoring wells, MW-37B-HP2 and MW-83B-2, at respective concentrations of 46.1 and 19 µg/L. TCE was detected in groundwater from one off-site monitoring well, MW208B-HP2, at a concentration of 31.6 µg/L.

Although groundwater concentrations of PCE and TCE in B layer groundwater continue to exceed vapor intrusion screening levels, concentrations in the overlying A layer of groundwater are consistently below screening values. This, in combination with the downward vertical gradient identified for the NSSC property, suggests that the vapor intrusion exposure pathway is incomplete and that there is not a current vapor intrusion risk to receptors exposed to indoor air in on-site structures or off-site residences.

Groundwater at the T-25 Area is not used as a potable water source at this time and is not expected to be used for such purposes in the future. The current drinking water source for NSSC is the Town of Natick drinking water supply system. No changes to the use of groundwater on Base, or supply of public water to the Base, are anticipated. Nonetheless, the aquifer beneath the site has been classified by the State of Massachusetts as Groundwater 1 (GW-1) under the MCP and must be maintained as a potential source of drinking water. Consequently, the ROD includes a RAO to restore the aquifer to meet federal and more stringent state drinking water standards. RAOs established in the ROD remain valid and no RAO changes are needed.

**Changes in Risk Assessment Methodology, Exposure Parameters, Toxicity, and Other Contaminant Characteristics.** The baseline risk assessment for the T-25 Area identified 20 chemicals of potential concern (COPCs) for groundwater, two of which (PCE and TCE) were identified as primary COCs, and eight of which (chromium, lead, manganese, nickel, thallium, vanadium, DDT, and bis(2-ethylhexyl) phthalate) were identified as secondary COCs based on uncertainty that they are present due to site

releases. No COPCs were identified for vapors of groundwater origin in the Phase II HHRA. Because there are on-site structures and nearby off-site residences, the vapor intrusion pathway was evaluated during this review as discussed previously. The contaminated lower layer of the overburden aquifer (B layer) is isolated by the upper layer of the overburden aquifer (A layer) with contaminant levels below the vapor intrusion screening values. The vapor intrusion exposure pathway is considered incomplete, and exposure to vapors migrating from groundwater is not considered to currently pose an unacceptable health risk.

The COPCs that were not identified as COCs were established as such because they did not contribute significantly to risks.

The toxicity values for the COPCs and COCs were reviewed to determine if any changes (updates) to toxicity values could change the chemicals identified as COCs. For COPCs identified in T-25 Area groundwater, toxicity values selected in accordance with the USEPA policy on human health toxicity values in Superfund risk assessments (USEPA, 2003) have been updated through March 2012 as shown in Table 7-2.

Since completion of the risk assessment included in the 1998 Final Phase II Remedial Investigation Report, updated child exposure factors have been published in the Child Specific Exposure Factors Handbook (USEPA, 2008) and updated adult exposure factors for the resident and on-site worker have been published in Risk Assessment Guidance for Superfund Sites, Part E (RAGS, Part E) (USEPA, 2004). Table 7-3 presents the changes between the exposure parameters used in the Phase II HHRA and the updated values. Updated dermal permeability constant values are also available in RAGS, Part E.

The combination of updated exposure parameters, permeability constants, and toxicity values will increase risk associated with ingestion and dermal contact with groundwater. In general, risk associated with bis(2-ethylhexyl) phthalate, beryllium, nickel, TCE, and cis-1,2-DCE increased the most, while risk associated with DDT, dieldrin, endrin ketone, barium, and vanadium decreased. Non-cancer hazards associated with copper, iron, and thallium were added to non-cancer risks, as toxicity information is now available.

In the Phase II HHRA selection of COCs, VOCs were selected based on estimated risk and non-cancer hazard, as they were known to be site-related. All other chemicals, or those that were uncertain to be site-related, were selected as COCs because they were detected at concentrations above their drinking water standards and/or caused some increases in site-related risk. Using this same approach, the conclusions of the Phase II HHRA and selection of COCs remain unchanged. Although cis-1,2-DCE and TCE risks increased in this evaluation, no cis-1,2-DCE risks exceeded a threshold value for being selected as a COC, and TCE was already selected as a COC in the Phase II HHRA.

The only change to risk assessment methodology that would have a bearing on the T-25 Area risk assessment is the publication of *Risk Assessment Guidance for Superfund (RAGS), Part F, Inhalation Risk Assessment*. The RAGS Part F guidance stipulates that inhalation reference concentration and unit risk values should be used instead of inhalation reference dose and cancer slope factor values to quantify inhalation toxicity and risks. However, use of reference concentration and unit risk values instead of reference dose and cancer slope factor values would not have a bearing on the results or conclusions of the risk assessment.

**Implications on Cleanup Levels.** The cleanup levels established in the ROD for T-25 Area COCs are shown in Subsection 4.1. Based on the discussion in the preceding paragraphs, no changes to cleanup levels are recommended.

## 7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

No information has come to light that calls into question the protectiveness of the remedy.

## 7.4 TECHNICAL ASSESSMENT SUMMARY

The following table summarizes the technical assessment of the selected remedy for T-25 Area Groundwater.

| Assessment Item | Assessment Summary |
|---|---|
| **Question A:** Is the remedy functioning as intended by the decision documents? | Yes. The major components of the remedy have been implemented. Institutional controls have been put in place, and the groundwater extraction and treatment system appears to be working as envisioned in the ROD. |
| **Question B:** Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid? | No. There have been changes to exposure assumptions and toxicity values; however, they do not result in change to the cleanup levels or call into question the protectiveness of the groundwater remedy. |
| **Question C:** Has any other information come to light that could call into question the protectiveness of the remedy? | No. Information has not come to light that calls into question the protectiveness of the remedy. |

# 8.0 ISSUES

No issues that affect the protectiveness of the T-25 Area remedy were identified during this five-year review.

# 9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The following follow-up actions are recommended to address concerns identified in this report.

The Army should discuss shut down of the air stripper and vapor-phase GAC treatment steps in detail with USEPA and layout an approach for implementing changes, as appropriate and warranted.

## 10.0 PROTECTIVENESS STATEMENT

The T-25 Area Groundwater remedy is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

## 11.0 NEXT REVIEW

The T-25 Area Groundwater OU will require five-year reviews as long as OU contaminants remain on site above levels that allow for unlimited use and unrestricted exposure. The next five-year review will be due not later than March 1, 2017, which falls on the anniversary of USEPA concurrence with the first five-year report.

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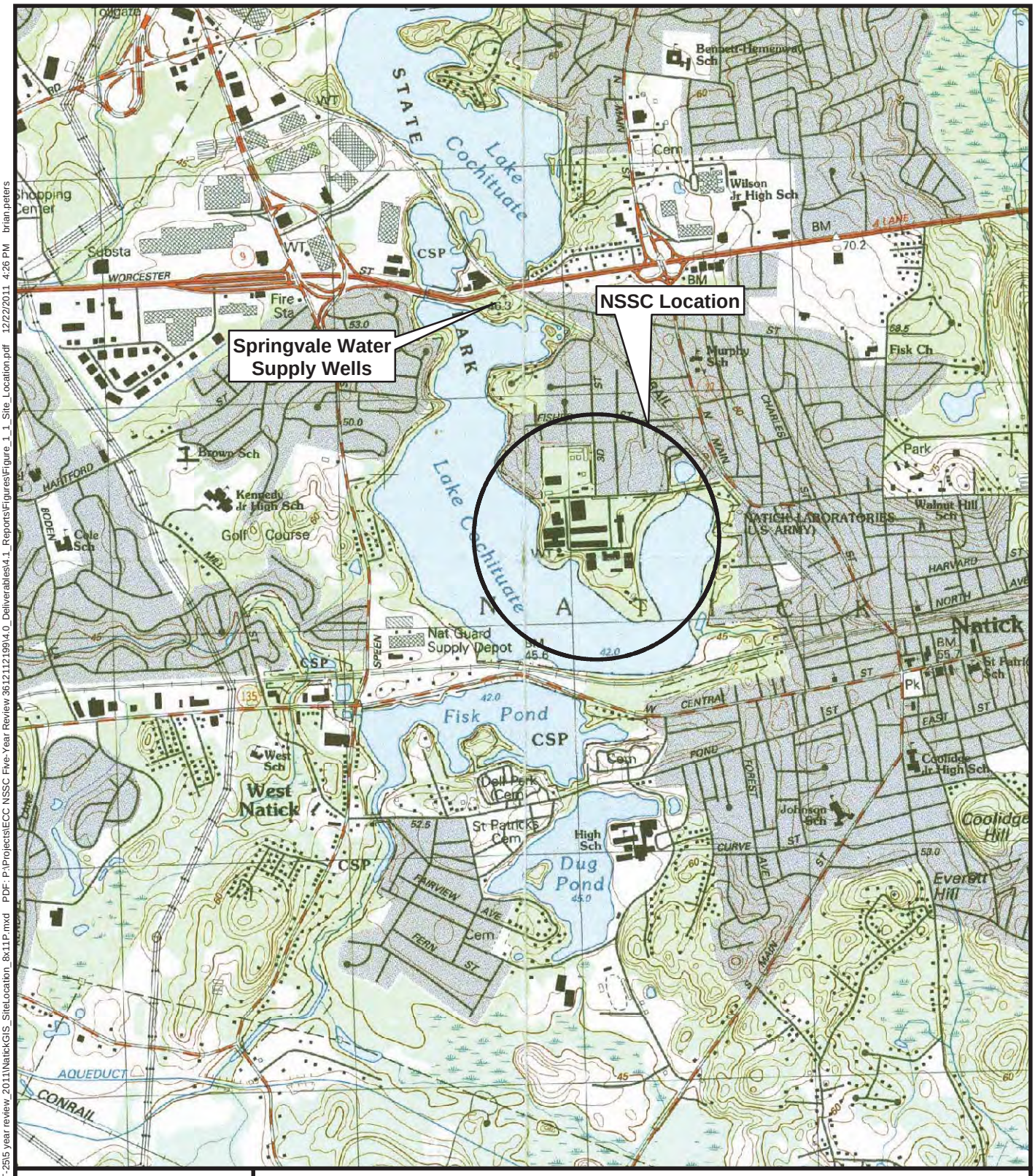
**FIGURES**




Massachusetts

Source: 1:24,000 scale digital topographic map obtained from Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs at http://www.mass.gov/mgis/massgis.htm

N

0 1,000 2,000 Feet

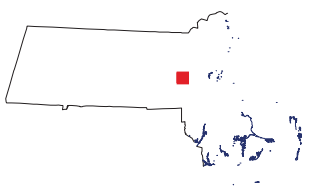
Prepared by BRP | Checked by SWR

# Figure 1-1

## NSSC Location Map

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

**Legend**

- Buildings
- Roads and Parking
- Installation Boundry

N

0 400 800

Feet

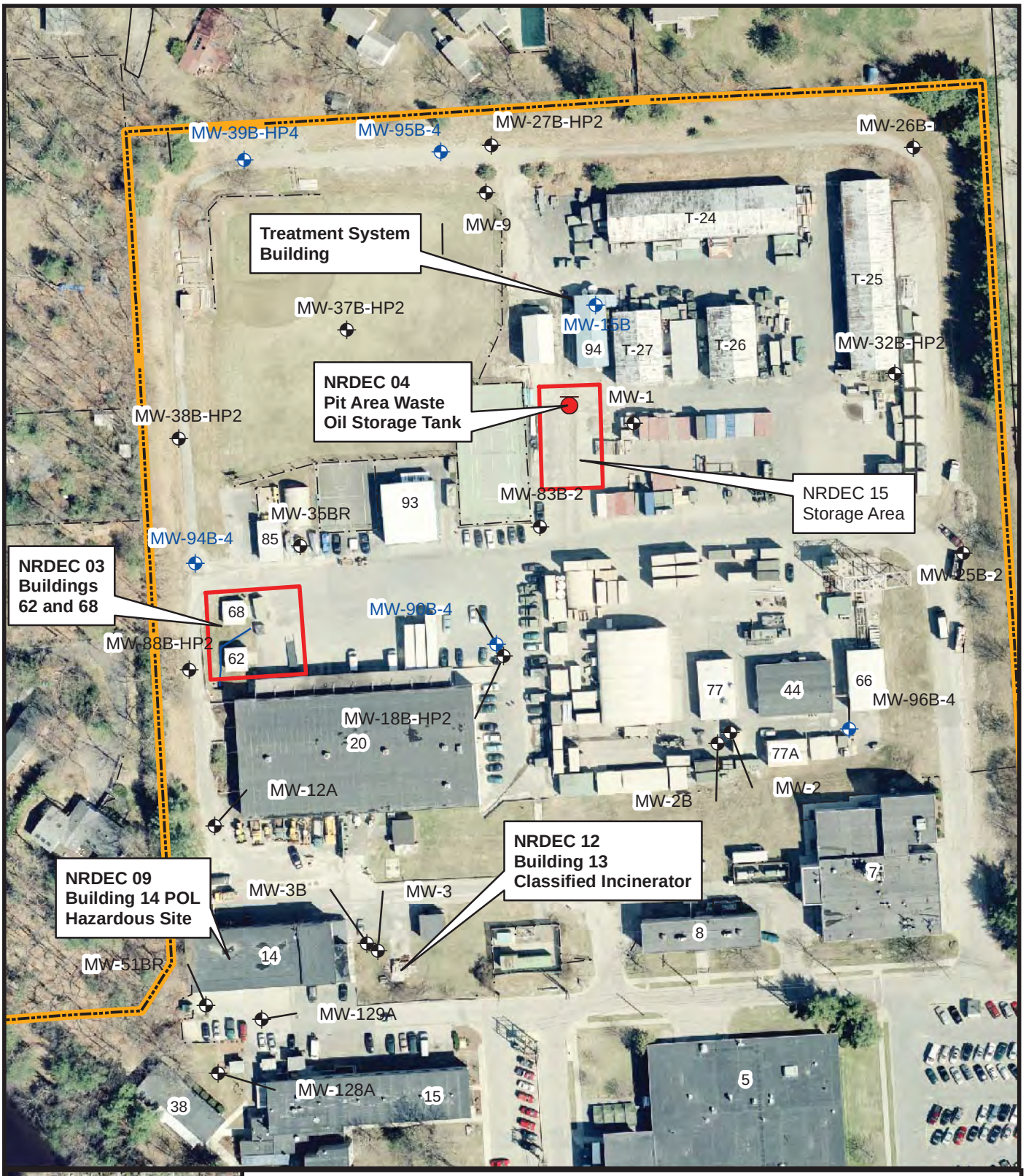
Prepared by BRP | Checked by SWR

# Figure 1-2

Location of T-25 Area

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

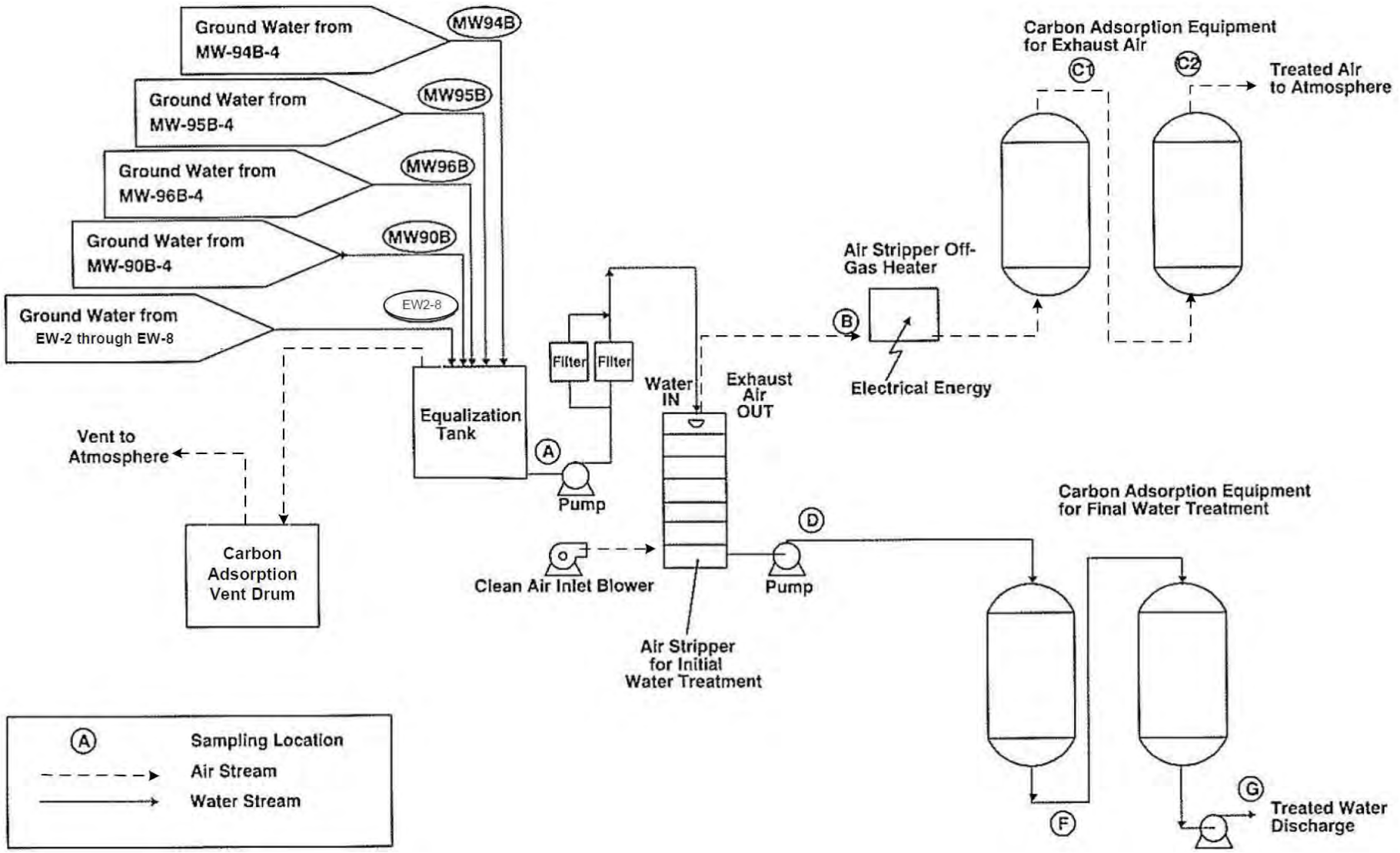



# Figure 3-1

## T-25 Area Site Features

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

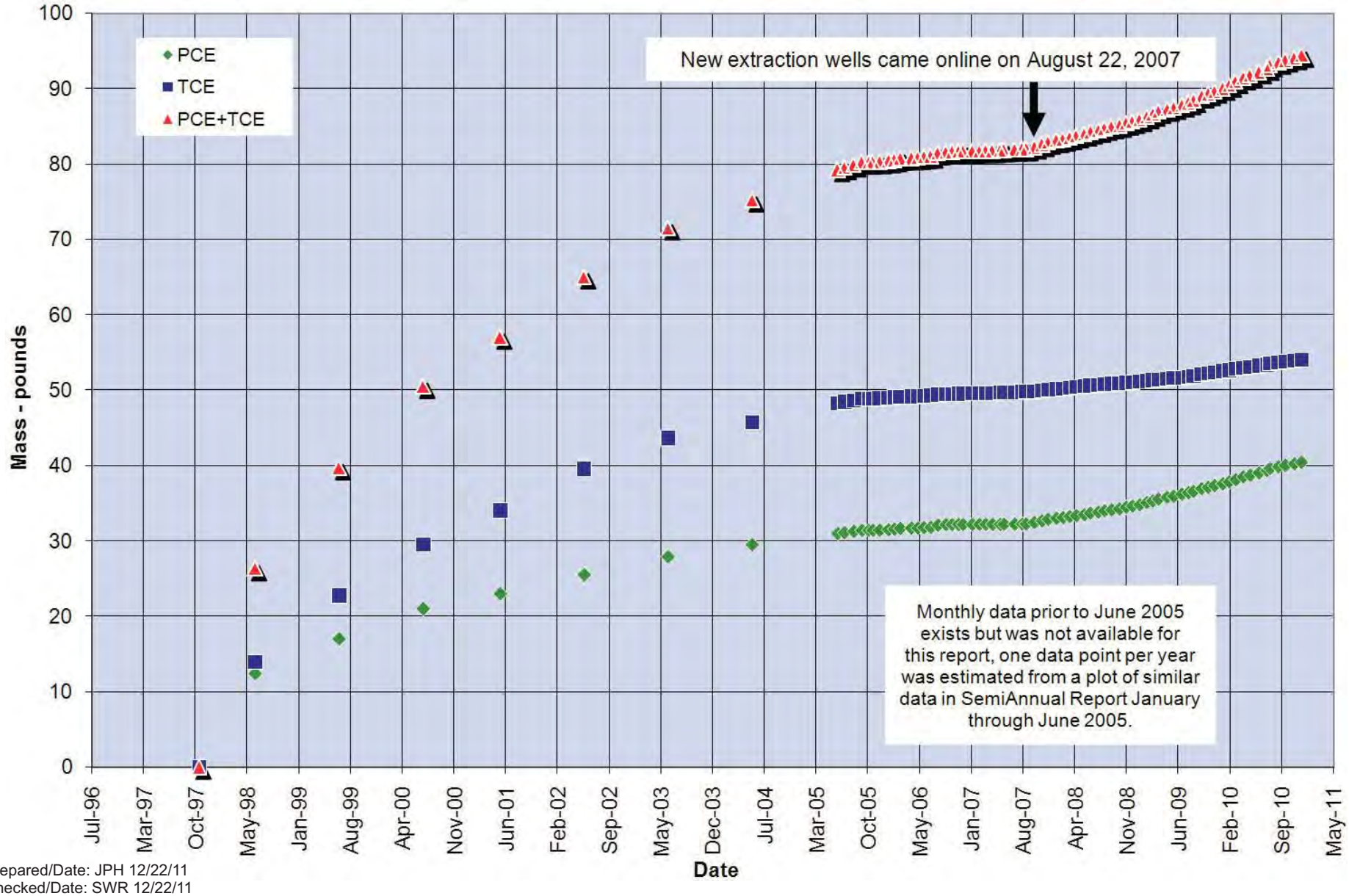



Prepared/Date: JPH 12/22/11
Checked/Date: SWR 12/22/11

Natick Soldier Systems Center
Natick, Massachusetts

Figure 4-1
Treatment System Sampling Locations
and Major Components
Project Number 3612112157/01

PORT2011031a.cdr

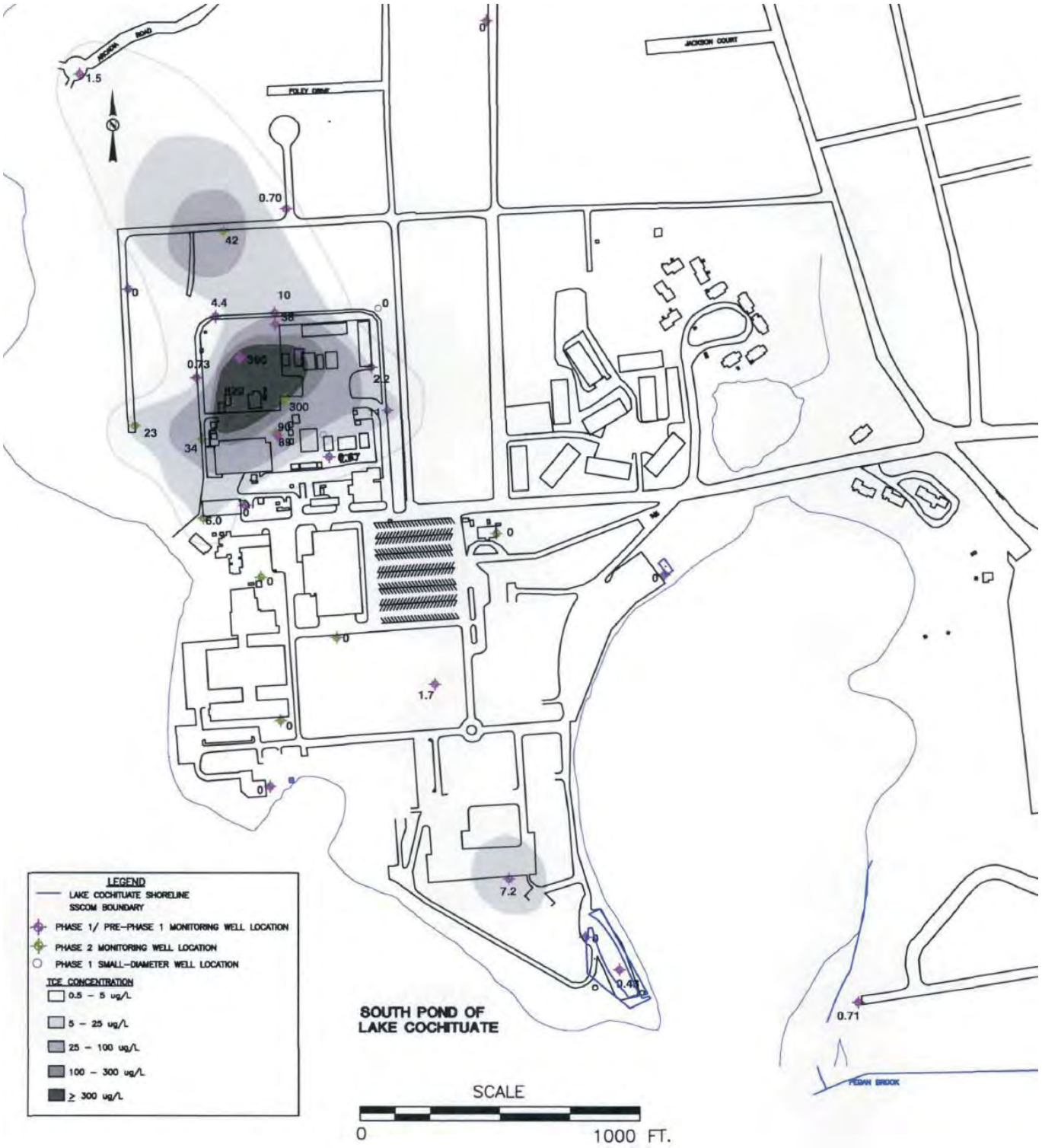



Prepared/Date: JPH 12/22/11
Checked/Date: SWR 12/22/11

Natick Soldier Systems Center
Natick, Massachusetts

Figure 4-2
Cumulative Mass of PCE and TCE Removed
Project Number 3612112157/01

PORT2011031b.cdr



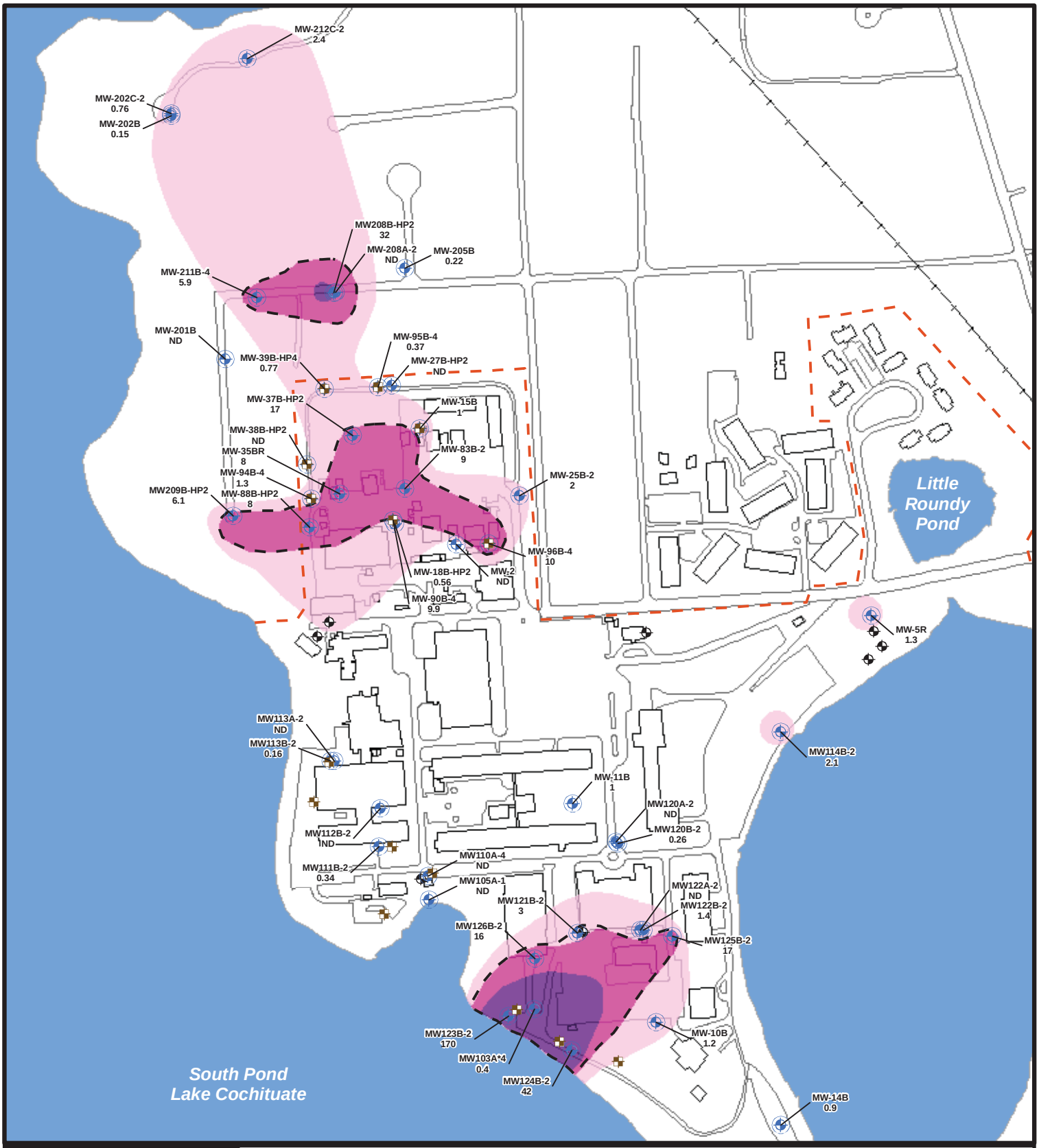

Source: ICF International

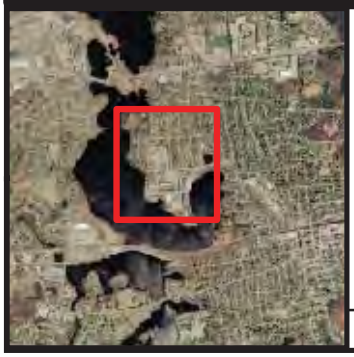
Prepared/Date: JPH 12/22/11
Checked/Date: SWR 12/22/11

Natick Soldier Systems Center
Natick, Massachusetts

Figure 6-1
TCE Distribution In
Groundwater - Winter 1996/1997
Project Number 3612112199/01

PORT2011031c.cdr



**Legend**

- Existing Extraction Well Location
- Monitoring Well Sampled for TCE
- Monitoring Well Not Sampled for TCE
- USEPA MCL (µg/L)
- Installation Boundary
- Railroad Tracks

**TCE Concentration Contour**

- 0.3 - 5 µg/L
- 5 - 25 µg/L
- 25 - 100 µg/L
- Buildings
- Roads and Parking

N

0 200 400 Feet

Prepared by JYK | Checked by WAM

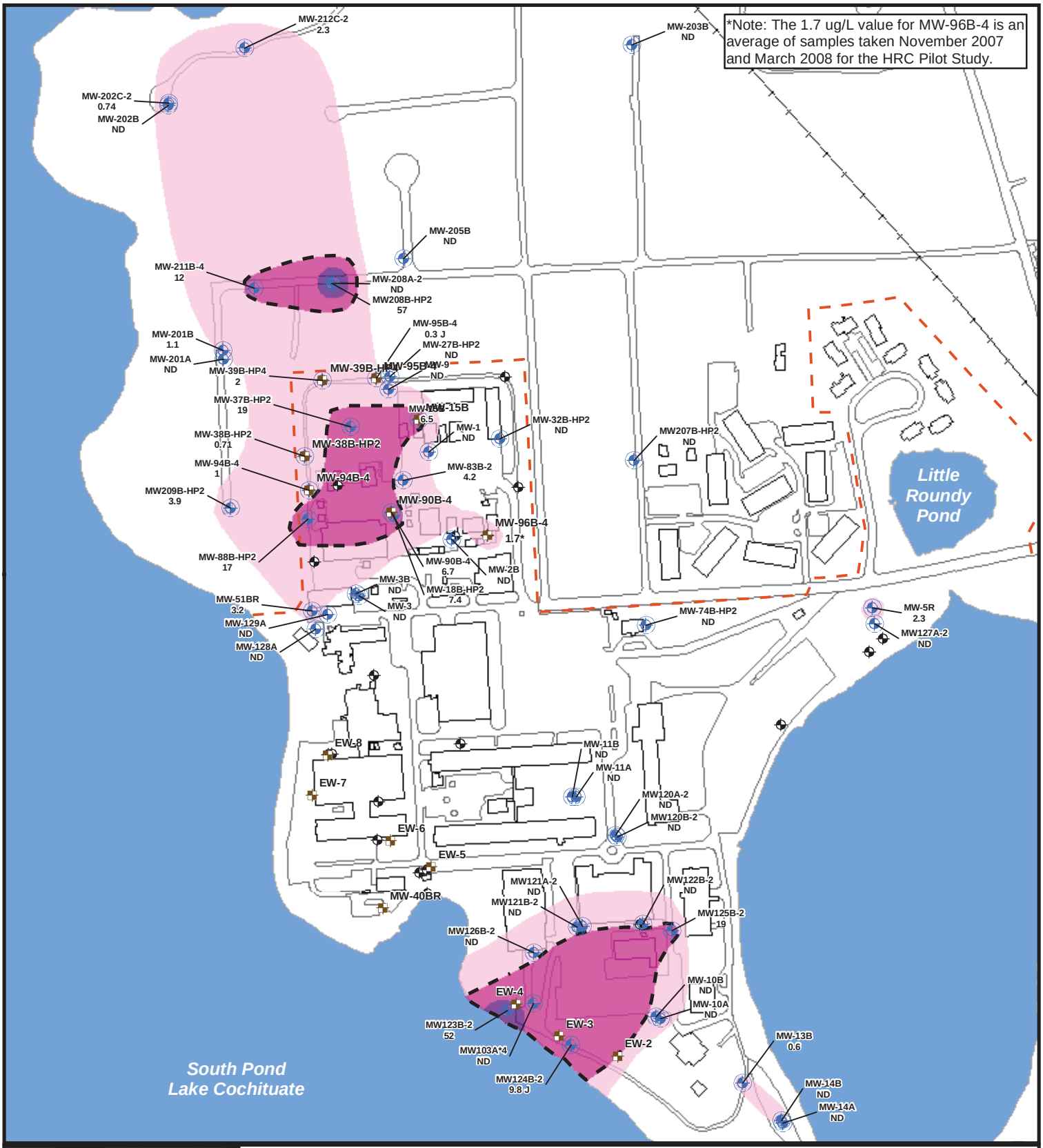
# Figure 6-2

## TCE Distribution in Groundwater
## September 2006

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

GIS Server D:\OtherGIS\Natick\MapDocuments\Quarterly_Report\Event_46\AMEC_Fig6-2_TCE.MXD




# Figure 6-3

TCE Distribution in Groundwater
December 2007

Natick Soldier Systems Center
Natick, Massachusetts

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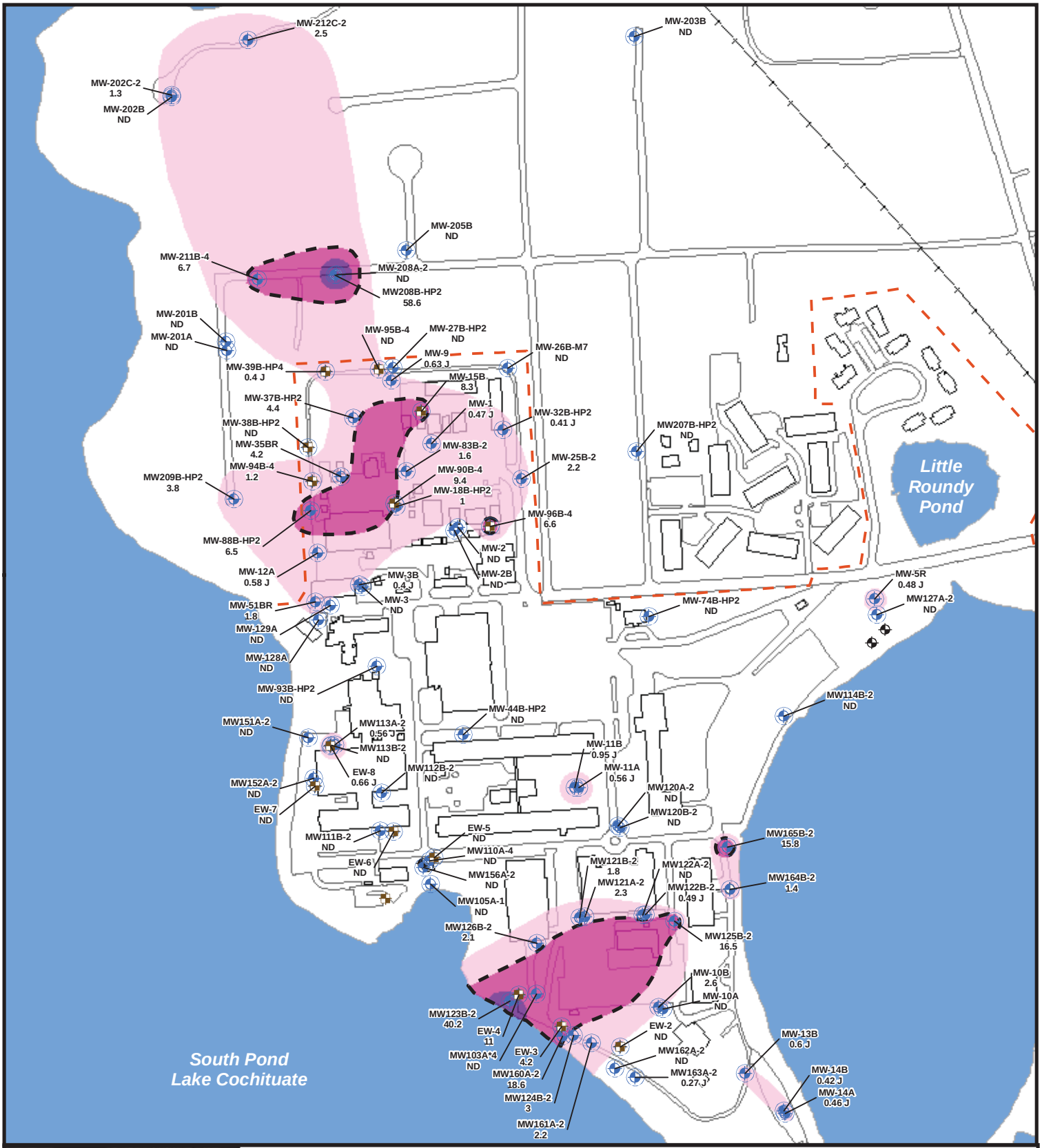
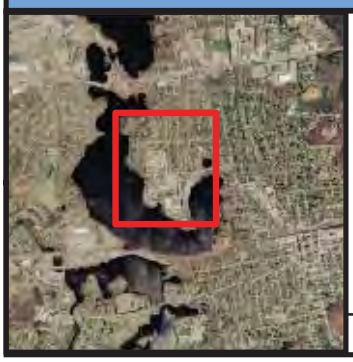


## Legend

- Existing Extraction Well Location
- Monitoring Well Sampled for TCE
- Monitoring Well Not Sampled for TCE
- USEPA MCL (ug/L)
- Installation Boundary
- Railroad Tracks

**TCE Concentration Contour**

- 0.3-5 ug/L
- 5-25 ug/L
- 25-100 ug/L
- Buildings
- Roads and Parking

N

0 200 400 Feet

Prepared by JYK | Checked by WAM

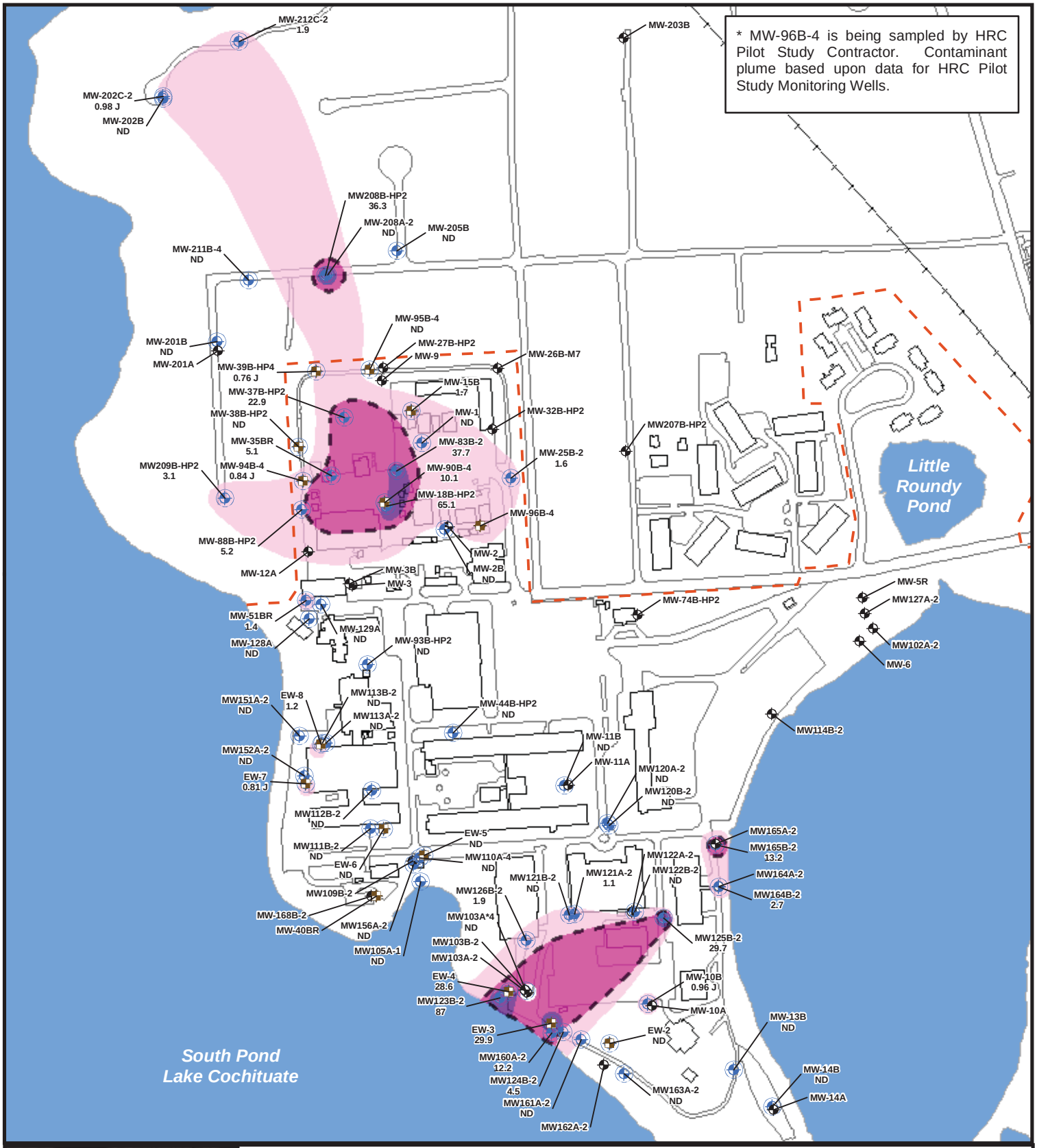
# Figure 6-4

TCE Distribution in Groundwater
December 2008

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

GIS Server D:\OtherGIS\NatickMapDocuments\Quarterly_Report\Event_55\AMEC_Fig6-4_TCE.MXD




## Legend

- Existing Extraction Well Location
- Monitoring Well Sampled for TCE
- Monitoring Well Not Sampled for TCE
- Installation Boundary
- USEPA MCL (ug/L)
- Railroad Tracks

**TCE Concentration Contour**

- 0.3-5 ug/L
- 5-25 ug/L
- > 25 ug/L
- Buildings
- Roads and Parking

N

0 200 400 Feet

Prepared by JYK | Checked by WAM

# Figure 6-5

TCE Distribution in Groundwater
December 2009

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

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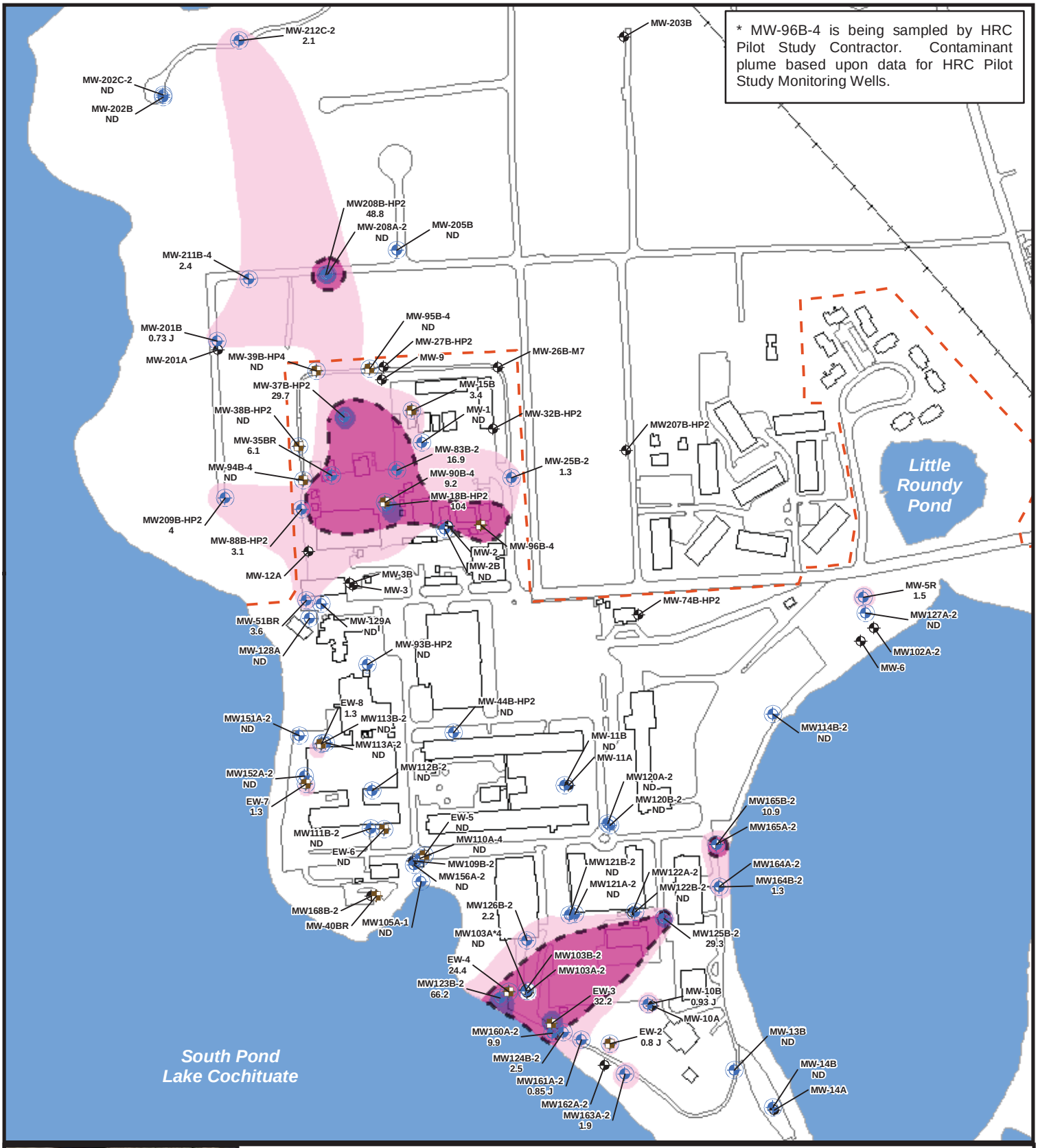
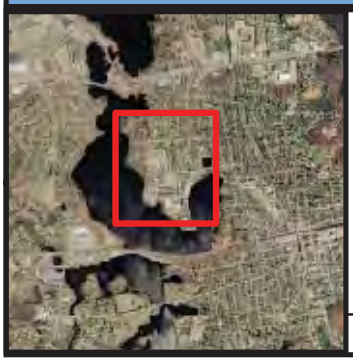


**Legend**

- Existing Extraction Well Location
- Monitoring Well Sampled for TCE
- Monitoring Well Not Sampled for TCE
- Installation Boundary
- USEPA MCL (ug/L)
- Railroad Tracks

**TCE Concentration Contour**

- 0.3-5 ug/L
- 5-25 ug/L
- > 25 ug/L
- Buildings
- Roads and Parking

N

0 200 400 Feet

Prepared by JYK | Checked by WAM

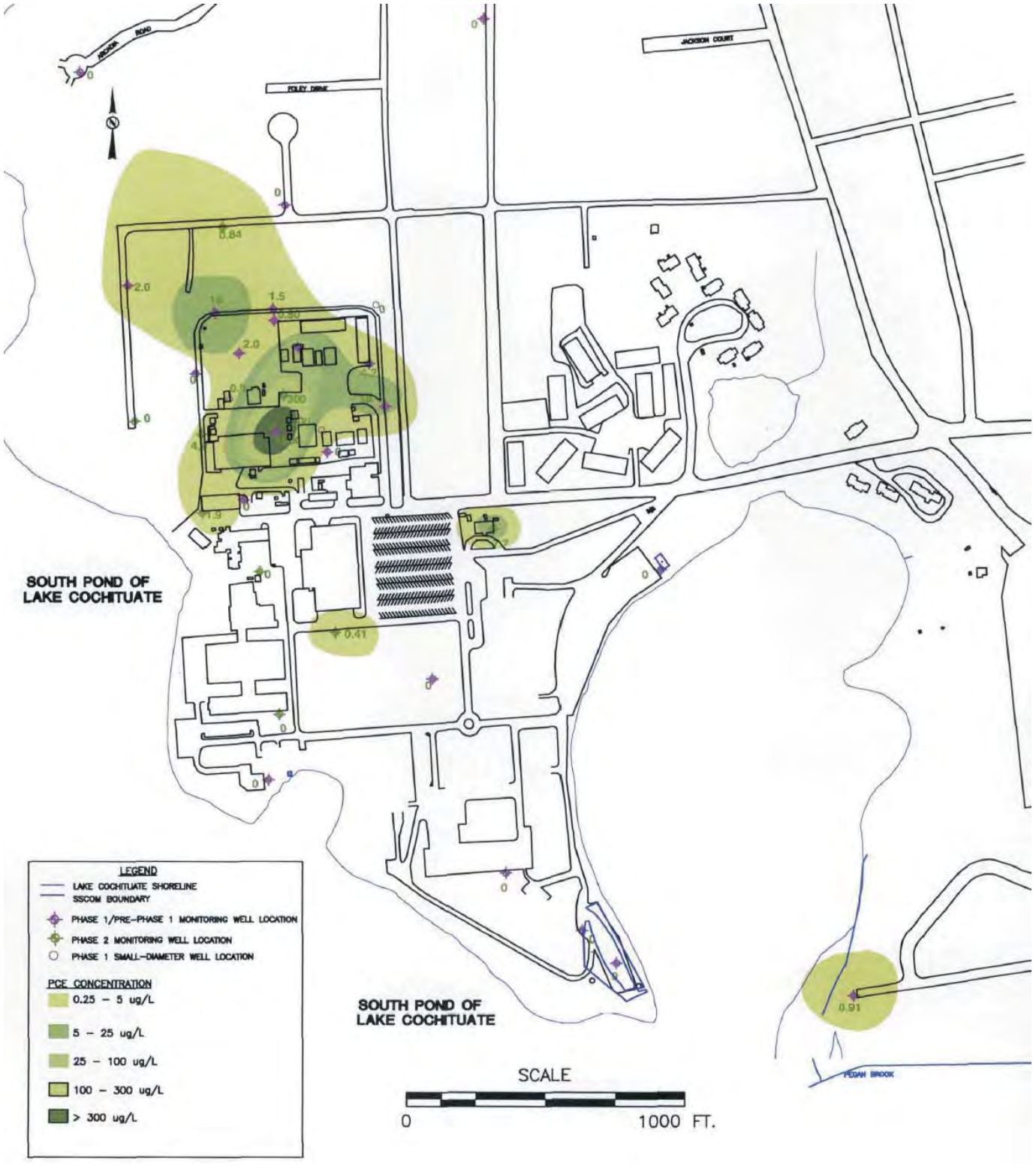
# Figure 6-6

## TCE Distribution in Groundwater November 2010

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

GIS Server D:\OtherGIS\NatickMapDocuments\Quarterly_Report\Event_61\AMEC_Fig6-6_TCE.MXD

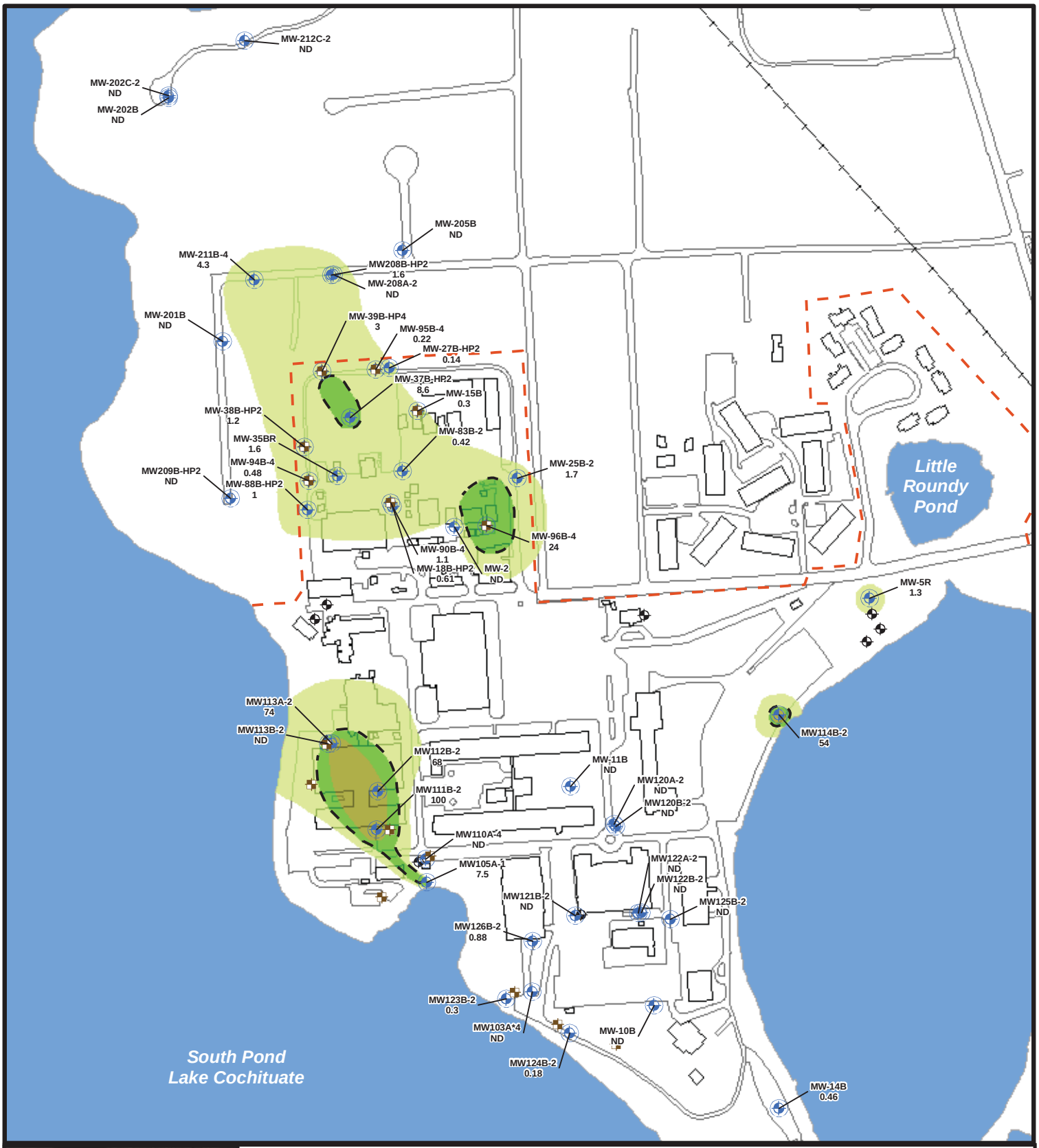



Source: ICF International

Prepared/Date: JPH 12/22/11
Checked/Date: SWR 12/22/11

| | | |
|---|---|---|
| Natick Soldier Systems Center<br>Natick, Massachusetts | ECC amec | Figure 6-7<br>PCE Distribution In<br>Groundwater - Winter 1996/1997<br>Project Number 3612112199/01 |

PORT2011031d.cdr




## Legend

- Existing Extraction Well Location
- Monitoring Well Sampled for PCE
- Monitoring Well Not Sampled for PCE
- USEPA MCL (ug/L)
- Installation Boundary
- Railroad Tracks

**PCE Concentration Contour**

- 0.3 - 5 µg/L
- 5 - 25 µg/L
- 25 - 100 µg/L
- Buildings
- Roads and Parking

N

0 200 400 Feet

Prepared by JYK | Checked by WAM

# Figure 6-8

PCE Distribution in Groundwater
September 2006

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

GIS Server D:\OtherGIS\NatickMapDocuments\Quarterly_Report\Event_46\AMEC_Fig6-8_PCE.MXD


# Figure 6-9

PCE Distribution in Groundwater
December 2007

Natick Soldier Systems Center
Natick, Massachusetts

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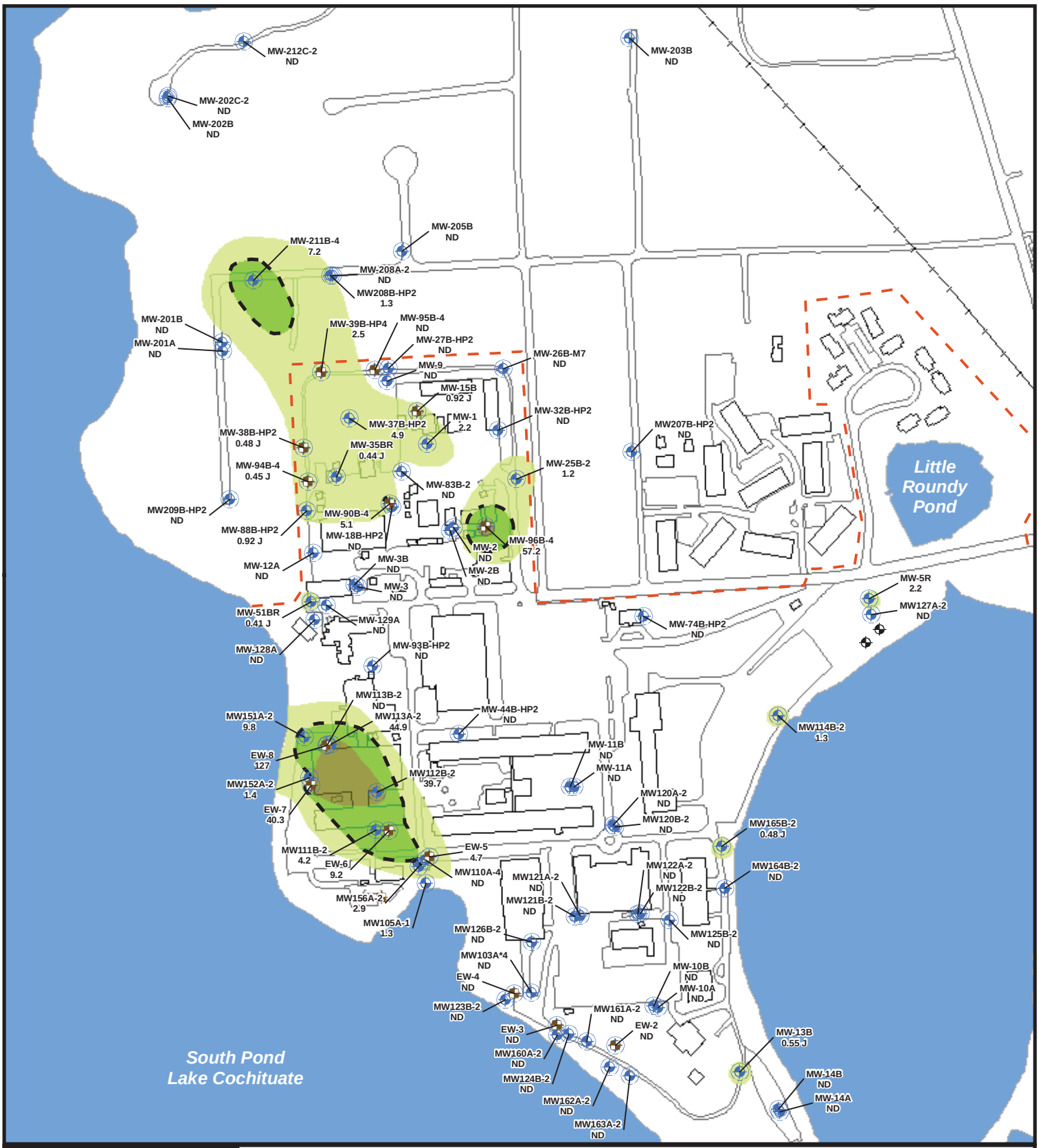
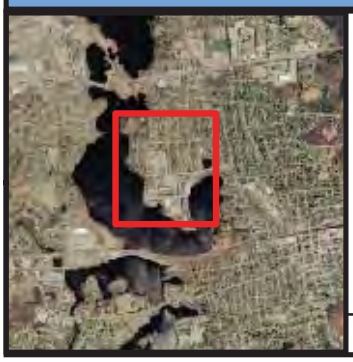


## Legend

- Existing Extraction Well Location
- Monitoring Well Sampled for PCE
- Monitoring Well Not Sampled for PCE
- USEPA MCL (ug/L)
- Installation Boundary
- Railroad Tracks

**PCE Concentration Contour**

- 0.3-5 ug/L
- 5-25 ug/L
- > 25 ug/L
- Buildings
- Roads and Parking

N

0 200 400 Feet

Prepared by JYK | Checked by WAM

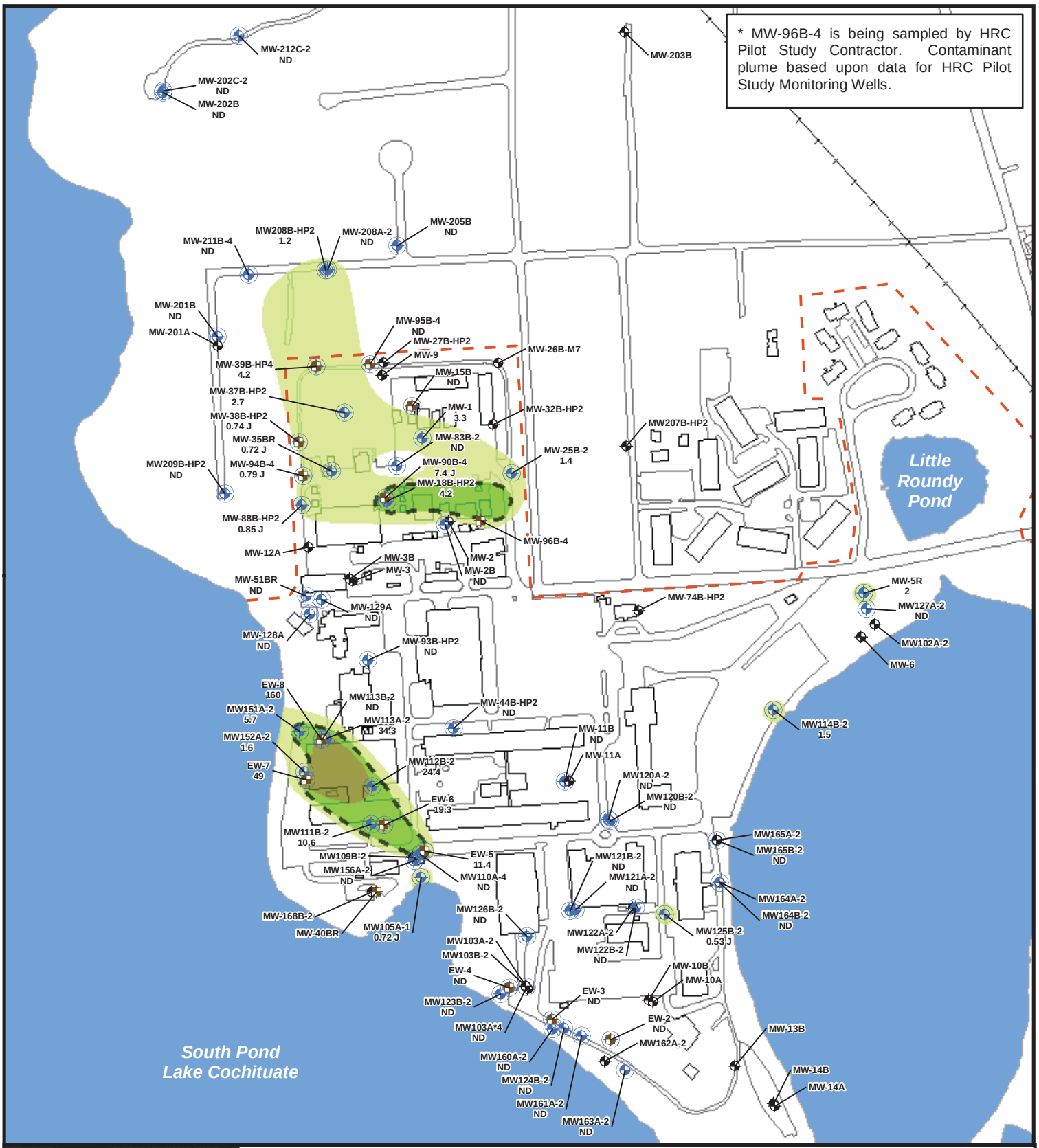
# Figure 6-10

PCE Distribution in Groundwater
December 2008

Natick Soldier Systems Center
Natick, Massachusetts

ECC amec

GIS Server D:\OtherGIS\Natick\MapDocuments\Quarterly_ReportEvent_55\AMEC_Fig6-10_PCE.MXD

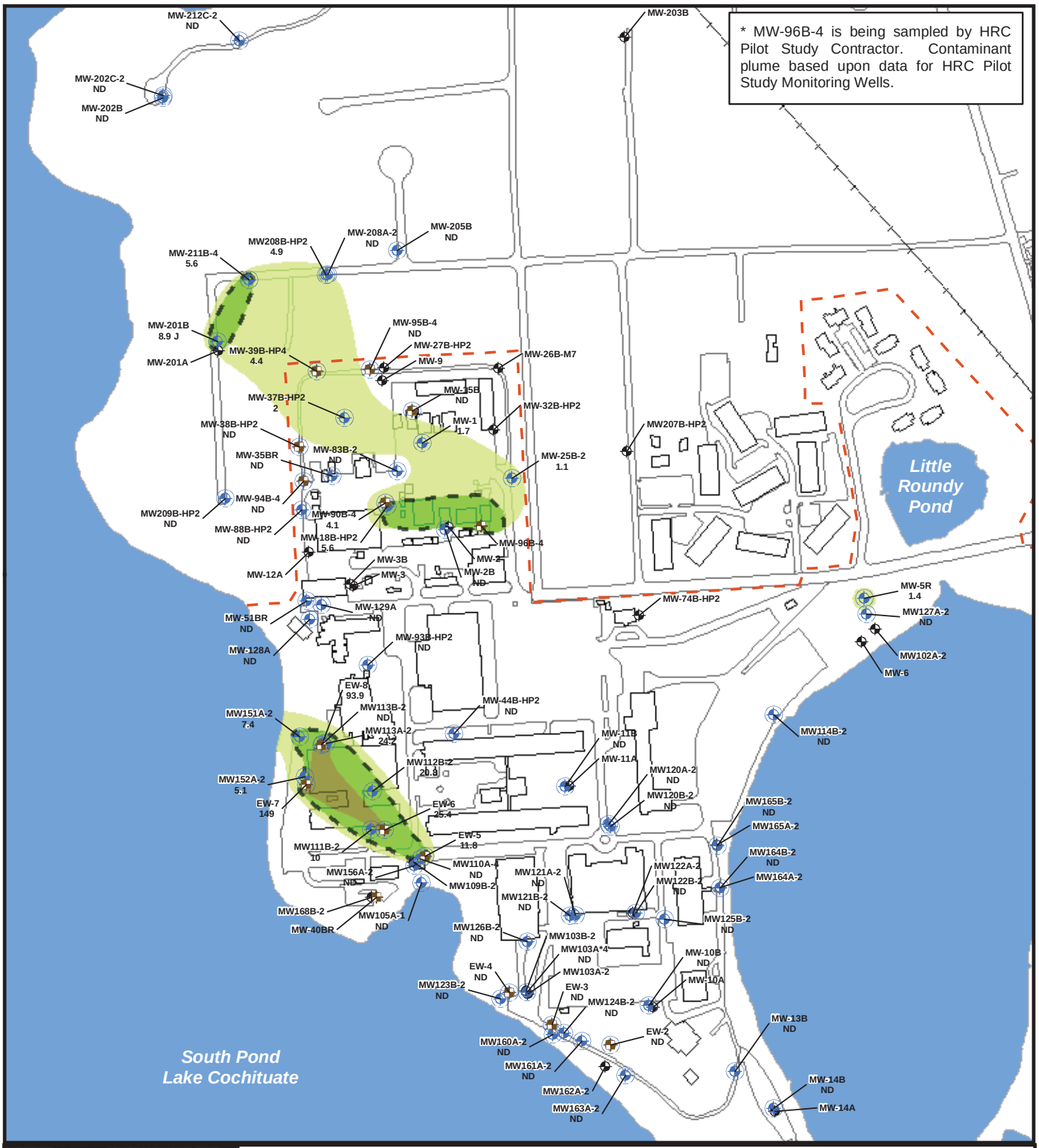



# Figure 6-11

PCE Distribution in Groundwater
December 2009

Natick Soldier Systems Center
Natick, Massachusetts

GIS Server D:\OtherGIS\NatickMapDocuments\Quarterly_Report\Event_59\AMEC_Fig6-11_PCE.MXD




# Figure 6-12

PCE Distribution in Groundwater
November 2010

Natick Soldier Systems Center
Natick, Massachusetts

GIS Server D:\OtherGIS\NatickMapDocuments\Quarterly_Report\Event_61\AMEC_Fig6-12_PCE.MXD

**TABLES**

**Table 7-1: Changes to ARARs and TBCs for Chemical of Concern Cleanup Levels**

| Chemical of Concern | ROD Cleanup Level (µg/L) | Basis Given in ROD | Changes in ARARs and TBC | Recommended Change |
|---|---|---|---|---|
| Primary Chemicals of Concern | | | | |
| Tetrachloroethene (PCE) | 5 | MCL | None identified | None |
| Trichloroethene (TCE) | 5 | MCL | None identified | None |
| Secondary Chemicals of Concern | | | | |
| Chromium | 100 | MCL | None identified | None. This and other secondary COCs have been dropped from the long-term monitoring program with USEPA concurrence. |
| Lead | 15 | USEPA Action Level | None identified | None, see chromium above. |
| Manganese | 1,700 | USEPA Region 9 PRG | The Region 9 PRGs have been replaced with Regional Screening Levels (RSLs). The RSL for manganese is 320 µg/L. In addition, USEPA Region 1 currently recommends the health advisory concentration of 300 µg/L as a manganese cleanup level. | USEPA considers 300 µg/L as TBC for manganese. |
| Nickel | 100 | MCL | The MCL for nickel was remanded on February 5, 1995. The MCP Method 1 GW-1 standard is 100 µg/L. | None, see chromium above. |
| Thallium | 2 | MCL | None identified | None, see chromium above. |
| Vanadium | 50 | MCP | The MCP Method 1 GW-1 groundwater standard has been lowered to 30 µg/L. | None, see chromium above. |
| DDT | 0.3 | MCP | None identified | None, see chromium above. |
| Bis(2-ethylhexyl) phthalate | 6 | MCP | No change to MCP Method 1 GW-1 groundwater standard. The MCL for bis(2-ethylhexyl) phthalate is 6 µg/L. | None, see chromium above. |

**Notes:**

[1] MCL - Federal Safe Drinking Water Act, Maximum Contaminant Level
MCP - Massachusetts Contingency Plan Method 1 GW-1 standard
USEPA Region 9 Preliminary Remediation Goal (PRG) for groundwater

[5] The current MCL for bis(2-ethylhexyl) phthalate is 6 µg/L.

Prepared/Date: KASK 08/26/11
Checked/Date: SWR 03/19/2012

**Table 7-2: Summary of Toxicity Value Changes**

| Chemical of Potential Concern (COPC) | Oral Reference Dose (RfD) [mg/kg/day] | | | | Inhalation Reference Dose (RfD) [mg/kg/day] (1) | | | | Oral Cancer Slope Factor (CSF) [mg/kg/day]$^{-1}$ | | | | Inhalation Cancer Slope Factor (CSF) [mg/kg/day]$^{-1}$ (2) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Record of Decision | | Updated | | Record of Decision | | Updated | | Record of Decision | | Updated | | Record of Decision | | Updated | |
| | Value | Source | Value | Source | Value | Source | Value | Source | Value | Source | Value | Source | Value | Source | Value | Source |
| 4-4'-DDE | ND | | | | ND | | | | 3.4E-01 | IRIS | | | ND | | 3.4E-01 | CALEPA |
| 4-4'-DDT | 5.0E-04 | IRIS | | | ND | | | | 3.4E-01 | IRIS | | | 3.4E-01 | IRIS | | |
| Dieldrin | 5.0E-05 | IRIS | | | ND | | | | 1.6E+01 | IRIS | | | 1.61E+01 | IRIS | | |
| Endrin Ketone | 3.0E-04 | surrogate | | | ND | | | | ND | | | | ND | | | |
| bis(2-ethylhexyl) phthalate | 2.0E-02 | IRIS | | | ND | | | | 1.4E-02 | IRIS | | | ND | | 8.4E-03 | CALEPA |
| Arsenic | 3.0E-04 | IRIS | | | ND | | 4.3E-06 | CALEPA | 1.5E+00 | IRIS | | | 1.51E+01 | IRIS | | |
| Barium | 7.0E-02 | IRIS | 2.0E-01 | IRIS | ND | | 1.4E-04 | HEAST | ND | | | | ND | | | |
| Beryllium | 5.0E-03 | IRIS | 2.0E-03 | IRIS | ND | | 5.7E-06 | IRIS | 4.3E+00 | IRIS | ND | | 8.4E+00 | IRIS | | |
| Chromium (values for Cr VI) | 5.0E-03 | IRIS | 3.0E-03 | IRIS | ND | | 2.9E-05 | IRIS | ND | | | | 4.2E+01 | IRIS | | |
| Copper | ND | | 4.0E-02 | HEAST | ND | | | | ND | | | | ND | | | |
| Iron | ND | | 7.0E-01 | PPRTV | ND | | | | ND | | | | ND | | | |
| Lead | ND | | | | ND | | | | ND | | | | ND | | | |
| Manganese | 2.3E-02 | IRIS | 2.4E-02 | IRIS | 1.4E-08 | IRIS | 1.4E-05 | IRIS | ND | | | | ND | | | |
| Molybdenum | 5.0E-03 | IRIS | | | ND | | | | ND | | | | ND | | | |
| Nickel | 2.0E-02 | IRIS | | | ND | | 2.6E-05 | PPRTV | ND | | | | ND | | 9.1E-01 | CALEPA |
| Thallium | ND | | 1.0E-05 | PPRTV | ND | | | | ND | | | | | | | |
| Vanadium | 7.0E-03 | HEAST | 9.0E-03 | IRIS | ND | | 2.0E-06 | PPRTV | ND | | | | ND | | 2.9E+01 | PPRTV |
| Tetrachloroethene | 1.0E-02 | IRIS | 6.0E-03 | IRIS | ND | | 1.1E-02 | IRIS | 5.2E-02 | EPA | 2.10E-03 | IRIS | 2.0E-03 | EPA | 9.1E-04 | IRIS |
| Trichloroethene | 6.0E-03 | EPA | 5.0E-04 | IRIS | ND | | 5.7E-04 | IRIS | 1.1E-02 | EPA | 4.60E-02 | IRIS | 6.0E-03 | EPA | 1.4E-02 | IRIS |
| cis-1,2-Dichloroethene | 1.0E-02 | HEAST | 2.0E-03 | IRIS | ND | | | | ND | | | | ND | | | |

IRIS - Integrated Risk Information System March 2012
ATSDR - Agency for Toxic Substances and Disease Registry Minimum Risk Level (MRL) (December 2010)
CALEPA - California Environmental Protection Agency; slope factors (July 2009) and Reference Exposure Levels (RELs) (December 2008)
PPRTV - Provisional Peer Reviewed Reference Toxicity Value
HEAST97 - Health Effects Assessment Summary Tables FY 1997
EPA - These values were withdrawn from IRIS, however were approved for use by Region 1.
ND - Value or information not determined
Surrogate: Endrin was used as a surrogate for endrin ketone; vanadium pentoxide was used as a surrogate for vanadium.
(1) RfDs were converted from reference concentrations (RfCs) by multiplying the RfC by 20 cubic meters ($m^3$)/day and then dividing by 70 kilograms.
(2) Inhalation CSFs [mg/kg/day]$^{-1}$ were converted from the inhalation unit risks [ug/$m^3$]$^{-1}$ (IUR) by multiplying the IUR by 3,500 (70 kg X 1000 ug/mg / 20 $m^{3/}$day).

Prepared/Date: KASK 08/26/11
Checked/Date: BJR 03/22/12

**Table 7-3: Summary of Exposure Factor Changes**

| | | Child Ages 0-6 | | | Child Ages 7-18 | | | Adult | | | Future On-site Worker | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exposure Assumption** | **Scenario** | Original | Updated | Source | Original | Updated | Source | Original | Updated | Source | Original | Updated | Source |
| Ingestion Rate (liters per day) | Average | 0.5 | 0.4 | CSEFH | 1.4 | 0.6 | CSEFH | | | | | | |
| | Upperbound | | | | | | | | | | | | |
| Skin Surface Area (square centimeters) | Average | 7,110 | 6,365 | CSEFH | 13,000 | 14,500 | CSEFH | 20,000 | 18,000 | RAGS E | 2,000 | 2,490 (1) | EFH |
| | Upperbound | 7,280 | 7,694 | CSEFH | 13,500 | 18,633 | CSEFH | 23,000 | 18,000 | RAGS E | 3,200 | 3,300 (2) | RAGS E |
| Exposure Frequency (days/year) | Average | | | | | | | | | | 250 | 219 | RAGS E |
| Exposure Duration (years) | Average | | | | | | | | | | 12.5 | 9 | RAGS E |
| Averaging Time, Non-cancer (days) | Average | | | | | | | | | | 4,563 | 3,285 | RAGS E |
| Body Weight (kilograms) | Average | | | | 43 | 50 | CSEFH | | | | | | |

CSEFH: Child-Specific Exposure Factor Handbook. USEPA 2008.
EFH: Exposure Factor Handbook. USEPA 1997.
RAGS E: Risk Assessment Guidance for Superfund, Part E, Final. USEPA 2004.
(1) Assuming hands and forearms are exposed.
(2) Assuming hands, forearms and face are exposed.

Prepared/Date: KASK 08/26/11
Checked/Date: BJR 09/13/11

# APPENDIX A

# INSTITUTIONAL CONTROL CERTIFICATIONS

**DEPARTMENT OF THE ARMY**
US ARMY SOLDIER SYSTEMS CENTER
KANSAS STREET
NATICK, MASSACHUSETTS 01760-5049

REPLY TO
ATTENTION OF

Environmental, Safety and Health Office

23 May, 2011

Christine Williams
U.S. Environmental Protection Agency
5 Post Office Square - Suite 100
Mail Code - OSRR 07-3
Boston MA 02109-3912

SUBJECT: Record of Decision, T-25 Area Ground Water (Operable Unit 1)
Annual Institutional Controls Certification

Dear Christine:

The Environmental health and Safety Office has conducted the required assessment and has determined that the U.S. Army Soldier System Center (SSC) is in compliance with ground water use restrictions outlined in the SSC Real Property Master Plan. No new projects involving use of ground water at the SSC facility were proposed during calendar year 2010.

Attached please find the required letter from the Town of Natick documenting that they are in compliance with the ROD and the Board of Health regulation.

Please call me at (508) 233-5404 if you have any questions.

Sincerely,

John J. McHugh
Chief - Environmental and Health Office

# COMMUNITY DEVELOPMENT

BUILDING

PLANNING

ZONING

CONSERVATION


May 11, 2011

Mr. John McHugh
Chief, Environmental and Health Office
U.S. Army Garrison Natick
Kansas Street
Natick, MA 01760-5049

Dear Mr. McHugh:

Enclosed please find the certification required in accordance with the Record of Decision, T-25 Area Ground Water (Operable Unit 1), U.S. Army Soldier Systems Center (SSC), Natick, Massachusetts dated April 1, 2001 (the ROD). The certification is required annually to document the maintenance of institutional controls. Institutional controls were implemented as a component of the T-25 Area ground water remedy to restrict access to and human contact with the ground water both on-facility and off-facility throughout the remedial action.

Off-facility, ground water use restrictions are affected through a municipal ordinance that covers the area where contaminated ground water has been found. More specifically, a town of Natick Board of Health regulation prohibits both the installation of new private drinking water wells and the use of existing private drinking water wells in the area to prevent any access or exposure to contaminated ground water. On February 24, 1999 the town of Natick Board of Health published an amendment to its regulations that states:

> *Private wells for drinking water shall not be allowed where a public water supply is available in sufficient quantity and pressure so as to meet U.S. and Massachusetts safe drinking water standards.*

This restriction was imposed within the area bounded by North Main Street (Route 27), Lake Cochituate, West Central Street (Route 135), and the Massachusetts Turnpike (Route 90).


*13 East Central Street, Natick, MA 01760*

*phone: 508-647-6450 / fax: 508-647-6444*
*website: www.natickma.org*

In accordance with the requirements of the ROD, I hereby certify for calendar year 2010 that:

- The Board of Health regulation is in place, and is being properly enforced;
- I have reviewed private well permits issued by the town during the past year and have determined that these permits are in compliance with the Board of Health regulation; and,
- I have reviewed private well permits issued by the town during the past year. No new potable wells have been installed within the area covered by the Board of Health regulation.

Town of Natick records indicate no wells were installed in the past year within the area covered by the Board of Health regulation.

Please call me if you have any questions.

Sincerely,

TOWN OF NATICK

Robert Bois
Environmental Compliance Officer

**APPENDIX B**

**PUBLIC NOTICE**

**PUBLIC NOTICE**
**FIVE-YEAR REVIEW OF THE T-25 AREA GROUNDWATER REMEDY AT NSSC**

The U.S. Army is currently performing a five-year review of the Operable Unit 1(OU-1), T-25 Area, groundwater remedy at the Natick Soldier Systems Center (NSSC), Natick, Massachusetts, in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 (c). In 1995, the U.S. Army constructed a groundwater extraction and treatment (i.e., pump and treat) system at T-25 Area to control the off-site migration, and reduce the mass, of the groundwater contaminants tetrachlorethene (PCE) and trichloroethene (TCE). The purpose of the five-year review is to evaluate the performance of the groundwater cleanup remedy to ensure it remains protective of human health and the environment. If the review identifies issues that affect protectiveness, the five-year review report will recommend improvements. It is not the purpose of the review to reconsider the remedy.

The review will also provide a summary of the current status of ten other sites. These sites consist of: OU-3, the Former Proposed Gymnasium site; OU-4, Buildings 22 and 36; OU-5, Buildings 63, 2, and 45; the Boiler Plant site; OU-6, the Building 13 (POL Hazardous Site) site and the Building 14 (Classified Incinerator) site; OU-7, the Buildings 62 and 68 site; the Chlordane Storage Area; the Pit Area Waste Oil Storage Tank, and the MW114B Area.

The public may ask questions about, comment on, and contribute to review process by contacting:

Mr. James Connolly
U.S. Army Soldier Systems Center
Kansas Street
Natick, MA 01760-5011
(508) 233-5550
James.B.Connolly@us.army.mil

The Army plans to issue the five-year review in February 2012. Following release of the report, the Army will also issue a public notice announcing the availability of the report and a statement of its findings.

MORE INFORMATION
Additional information about sites included in the five-year review is contained in the Administrative Record that is maintained at NSSC and the Massachusetts Department of Environmental Protection. For the convenience of the public, a copy of the Administrative Record is also maintained at the Morse Institute Library located at 14 East Central Street, Natick, Massachusetts.

Hours: Monday - Thursday 10 am - 9 pm
Friday - Saturday 10 am - 5 pm
Sunday 2pm - 5 pm
Telephone (508) 647-6521 or visit www.morseinstitute.org to confirm times before visiting.

# APPENDIX C

## OU-1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

**Table 13: ARARS, Criteria, Advisories, and Guidance**

**SELECTED REMEDY**
**T-25 AREA AT US ARMY SOLDIER SYSTEMS CENTER**

| ARARs | REQUIREMENT | STATUS | REQUIREMENT SYNOPSIS | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT |
|---|---|---|---|---|
| **CHEMICAL-SPECIFIC REQUIREMENTS** | | | | |
| **GROUND WATER**<br><br>**Federal** | Safe Drinking Water Act (SDWA) – Maximum Contaminant Levels (MCLs); 40 CFR 141.11-141.16,141.61, 141.62 | Relevant and Appropriate | MCLs are enforceable standards that have been promulgated for a number of organic and inorganic contaminants in public drinking water systems. | The remedy will consist of ground water extraction followed by air stripping/carbon adsorption for the on-facility contamination, with MNA for on-facility contamination not contained by the ground water extraction system while it is in operation, and for any on-facility and off-facility contamination remaining after system shut-off.. It will also include long-term monitoring and institutional controls. The remedy will meet federal MCLs for the primary COCs PCE and TCE, and the secondary COCs chromium, lead, nickel, and thallium throughout the ground water plume at completion. |
| | SDWA – Non-Zero Maximum Containment Level Goals (MCLGs), 40 CFR 141.50-141.52 | Relevant and Appropriate | MCLGs are nonenforceable health goals for public water systems that are set at levels that would result in no known or expected adverse health effects with an adequate margin of safety. | For those contaminants for which MCLs have not been established, at completion the remedy will meet non-zero MCLGs throughout the ground water plume. |

**Table 13: ARARS, Criteria, Advisories, and Guidance (continued)**

| ARARs | REQUIREMENT | STATUS | REQUIREMENT SYNOPSIS | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT |
|---|---|---|---|---|
| | USEPA Carcinogen Assessment Group, Cancer Slope Factors (CSFs) | To Be Considered | CSFs are used to compute the incremental cancer risk from exposure to site contaminants and represent the most up-to-date information on cancer risk from USEPA's Carcinogen Assessment Group. | CSFs were considered to assess health risks at the site. |
| | U.S. EPA Risk Reference Doses (RfDs) | To Be Considered | RfDs were considered the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for lifetime. | RfDs were considered to assess health risks from contaminants at the site. |
| | EPA Region 9 Preliminary Remediation Goals | To Be Considered | EPA Region 9 Preliminary Remediation Goals (PRGs) are risk-based guidelines for evaluating and cleaning up contaminated sites. PRGs can be used to screen pollutants in environmental media, trigger further investigation, and provide an initial cleanup goal if applicable, but are not enforceable regulatory standards. The PRGs are developed using accepted risk assessment algorithms and default exposure factors for residential exposure scenarios, assuming exposure in each medium occurs through multiple routes, in combination with current EPA toxicity values. PRGs are based on a risk level of 1 x 10-6 and/or a hazard quotient of 1. | The remedy will consist of ground water extraction followed by air stripping/carbon adsorption for the on-facility contamination, with MNA for on-facility contamination not contained by the ground water extraction system while it is in operation, and for any on-facility and off-facility contamination remaining after system shut-off. It will also include long-term monitoring and institutional controls. The remedy will meet the EPA Region 9 PRG for the secondary COC manganese (which PRG is a drinking water risk-based guideline) throughout the ground water plume at completion. |

**Table 13: ARARS, Criteria, Advisories, and Guidance (continued)**

| ARARs | REQUIREMENT | STATUS | REQUIREMENT SYNOPSIS | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT |
|---|---|---|---|---|
| **State** | Massachusetts Drinking Water Standards, 310 CMR 22.00 | Relevant and Appropriate | These standards establish MCLs for a number of organic and inorganic contaminants, in public water systems. | The remedy will consist of ground water extraction followed by air stripping/carbon adsorption for the on-facility contamination, with MNA for on-facility contamination not contained by the ground water extraction system while it is in operation, and for any on-facility and off-facility contamination remaining after system shut-off. It will also include long-term monitoring and institutional controls: The remedy will meet state MCLs for the primary COCs PCE and TCE, and the secondary COCs chromium, lead, nickel, and thallium throughout the ground water plume at completion. |
| | Massachusetts Contingency Plan (MCP) Method S-1/GW-1 Standards, 310 CMR 40.0000 | Applicable | These standards consider the potential risk or harm resulting from direct exposure to hazardous materials in the soil and the potential impacts on the ground water at a site. | The remedy will consist of ground water extraction followed by air stripping/carbon adsorption for the on-facility contamination, with MNA for on-facility contamination not contained by the ground water extraction system while it is in operation, and for any on-facility and off-facility contamination remaining after system shut-off. It will also include long-term monitoring and institutional controls. The remedy will meet the MCP Method 1 S-1/GW-1 standards for the secondary COCs bis(2-ethylhexyl)phthalate, DDT, and vanadium throughout the ground water plume at completion. |

**Table 13: ARARS, Criteria, Advisories, and Guidance (continued)**

| ARARs | REQUIREMENT | STATUS | REQUIREMENT SYNOPSIS | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT |
|---|---|---|---|---|
| **LOCATION-SPECIFIC REQUIREMENTS** | | | | |
| **OTHER NATURAL RESOURCES**<br><br>**Federal** | Fish and Wildlife Coordination Act; 16 USC 661-666, 40 CFR Part 6.302(g) | Applicable | These regulations require protection of fish and wildlife resources related to federal actions that control or modify water bodies. | Remedial activities will be in compliance with these regulations. |
| **ACTION-SPECIFIC REQUIREMENTS** | | | | |
| **Federal** | CWA – National Pollutant Discharge Elimination System, 40 CFR Part 122-125, 131 | Applicable | These regulations contain discharge limitations, monitoring requirements and best management practices for discharges into navigable waters, i.e., surface waters. | The aqueous discharge from the treatment system will be treated using aeration, filtration, air stripping, and carbon adsorption and will be regularly monitored to comply with these regulations. Discharges of treated ground water to surface waters will comply with these regulations. |
| | Resource Conservation and Recovery Act (RCRA) – Identification and Listing of Hazardous Wastes; Toxicity Characteristic, 40 CFR Part 261.24 | Applicable | These requirements identify the maximum concentrations of contaminants for which the waste would be a RCRA-characteristic hazardous waste for toxicity. | Wastes generated from ground water treatment will be analyzed to determine if they are RCRA-characteristic hazardous waste. If analysis results exceed the standards in 261.64, the waste will be disposed of in a RCRA Subtitle C facility. |

**Table 13: ARARS, Criteria, Advisories, and Guidance (continued)**

| ARARs | REQUIREMENT | STATUS | REQUIREMENT SYNOPSIS | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT |
|---|---|---|---|---|
| | RCRA – Standards Applicable to Generators of Hazardous Waste, 40 CFR Part 262 | Applicable | These standards establish standards for generators of hazardous waste. Massachusetts has been delegated the authority to administer these standards through its state hazardous waste regulations. The applicable portions of 40 CFR Part 262 are incorporated by reference. | Management of hazardous waste generated from ground water treatment will be managed in accordance with these regulations. |
| | RCRA – Air Emission Standards for Process Vents, 40 CFR Part 264, Subpart AA | Relevant and Appropriate | These regulations establish requirements for controlling emissions from process vents associated with treatment processes that manage hazardous wastes with organic concentrations of 10 ppmw or more. | The air streams from the air stripper and the equalization tank will be treated using carbon adsorption and monitored before and after the carbon tanks to meet these standards. To date these streams have not exceeded 10 ppmw,. |
| | RCRA – Air Emission Standards for Equipment Leaks, 40 CFR Part 264, Subpart BB | Relevant and Appropriate | These regulations contain standards for equipment that contains or contacts hazardous waste with organic concentrations of at least 10% by weight. | The air streams from the air stripper and the equalization tank will be treated using carbon adsorption and monitored before and after the carbon tanks to meet these standards. To date these streams have not exceeded 10 ppmw. |

**Table 13: ARARS, Criteria, Advisories, and Guidance (continued)**

| ARARs | REQUIREMENT | STATUS | REQUIREMENT SYNOPSIS | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT |
|---|---|---|---|---|
| | USEPA Policy on Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.0-28 | To Be Considered | This policy provides guidance on the control of air emissions from air strippers used at Superfund sites. | The air streams from the air stripper and the equalization tank will be treated using carbon adsorption and monitored before and after the carbon tanks to satisfy this policy. |
| | USEPA Region I 1 Memorandum, 12 July 1989 from Louis Gitto to Merril S. Hohman | To Be Considered | This memorandum states that Superfund air strippers in ozone nonattainment areas generally merit controls on all VOC emissions. | The air streams from the air stripper and the equalization tank will be treated using carbon adsorption and monitored before and after the carbon tanks to satisfy this policy. |
| **State** | Massachusetts Surface Water Discharge Permit Program, 314 CMR 3.00 | Applicable | These standards regulate the discharge of pollutants to Massachusetts surface waters. | The aqueous discharge from the treatment system will be treated by carbon adsorption after the air stripper and monitored before and after the carbon to meet these standards. |
| | Massachusetts Air Pollution Control Regulations, 310 CMR 7.00 | Applicable | These regulations set emissions limits necessary to attain ambient air quality standards. | Remedial actions will be conducted to meet the standards for visible emissions (310 CMR 7.06); dust, odor, construction and demolition (310 CMR 7.09); and volatile organic compounds (310 CMR 7.18). If standards are exceeded, emissions will be managed through engineering controls. |

**Table 13: ARARS, Criteria, Advisories, and Guidance (continued)**

| ARARs | REQUIREMENT | STATUS | REQUIREMENT SYNOPSIS | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT |
|---|---|---|---|---|
| | Massachusetts Hazardous Waste Management Regulations (HWMR), Requirements for Generators, 310 CMR 30.300 | Applicable | These regulations contain requirements for generators, including testing of wastes to determine if they are hazardous wastes and accumulation of hazardous waste prior to off-facility disposal. | Any hazardous waste generated from ground water treatment will be managed in accordance with these regulations. |
| | Massachusetts HWMR, Use and Management of Containers, 310 CMR 30.689 | Applicable | These regulations set forth requirements. for use and management of containers at hazardous waste facilities. | Any hazardous waste generated from ground water treatment will be managed in accordance with these regulations. |
| | Massachusetts HWMR, Storage and Treatment in Tanks, 310 CMR 30.699 | Applicable | These regulations set forth requirements, for use and management of tanks at hazardous waste facilities. | Any hazardous waste generated from ground water treatment will be managed in accordance with these regulations. |
| | MADEP Off-Gas Treatment of Point Source Remedial Air Emissions (Policy No. WSC-94-150) | To Be Considered | This policy establishes permitting requirements for air stripper installations. | This policy will be considered when planning and designing the use of air strippers in remedial activities at the site. |

**NOTES:**
ARARs Applicable or Relevant and Appropriate Requirements
CFR Code of Federal Regulations
CMR Code of Massachusetts Regulations
MADEP Massachusetts Department of Environmental Protection

# APPENDIX D

# ANALYTICAL DATA SUMMARY

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-1 | 3/28/2006 | FS | | | | | | | | |
| MW-1 | 12/19/2006 | FS | - | | 0.0024 | | - | | - | |
| MW-1 | 9/11/2007 | FS | | | | | | | | |
| MW-1 | 12/17/2007 | FS | - | | 0.0029 | | - | | - | |
| MW-1 | 12/2/2008 | FS | - | | 0.0022 | | 0.00047 | J | - | |
| MW-1 | 1/11/2010 | FS | - | | 0.0033 | | - | | - | |
| MW-1 | 11/3/2010 | FS | - | | 0.0017 | | - | | - | |
| MW-2 | 3/31/2006 | FS | - | | - | | - | | - | |
| MW-2 | 6/22/2006 | FS | - | | - | | - | | - | |
| MW-2 | 9/28/2006 | FD | - | | - | | - | | - | |
| MW-2 | 9/28/2006 | FS | - | | - | | - | | - | |
| MW-2 | 12/20/2006 | FS | - | | - | | - | | - | |
| MW-2 | 3/20/2007 | FS | - | | - | | - | | - | |
| MW-2 | 6/5/2007 | FS | - | | - | | - | | - | |
| MW-2 | 9/11/2007 | FS | - | | - | | - | | - | |
| MW-2 | 12/17/2007 | FS | - | | - | | - | | - | |
| MW-2 | 3/4/2008 | FS | - | | - | | - | | - | |
| MW-2 | 6/25/2008 | FS | - | | - | | - | | - | |
| MW-2 | 9/2/2008 | FS | - | | - | | - | | - | |
| MW-2 | 12/3/2008 | FS | - | | - | | - | | - | |
| MW-2B | 12/20/2006 | FS | - | | - | | - | | - | |
| MW-2B | 6/5/2007 | FS | - | | - | | - | | - | |
| MW-2B | 9/12/2007 | FS | | | | | | | | |
| MW-2B | 12/10/2008 | FS | - | | - | | - | | - | |
| MW-2B | 3/16/2009 | FS | | | | | | | | |
| MW-2B | 1/4/2010 | FS | - | | - | | - | | - | |
| MW-2B | 1/8/2010 | FD | - | | - | | - | | - | |
| MW-2B | 11/3/2010 | FS | - | | - | | - | | - | |
| MW-3 | 12/22/2006 | FS | - | | - | | - | | - | |
| MW-3 | 6/5/2007 | FS | - | | - | | - | | - | |
| MW-3 | 12/17/2007 | FS | - | | - | | - | | - | |
| MW-3 | 6/25/2008 | FS | - | | - | | - | | - | |
| MW-3 | 12/1/2008 | FS | - | | - | | - | | - | |
| MW-3B | 12/22/2006 | FS | - | | - | | - | | - | |
| MW-3B | 6/5/2007 | FS | - | | - | | - | | - | |
| MW-3B | 12/17/2007 | FS | - | | - | | - | | - | |
| MW-3B | 6/25/2008 | FS | - | | - | | - | | - | |
| MW-3B | 12/1/2008 | FS | - | | - | | 0.0004 | J | - | |
| MW-9 | 12/18/2006 | FS | - | | - | | - | | - | |
| MW-9 | 6/5/2007 | FS | - | | - | | - | | - | |
| MW-9 | 12/18/2007 | FS | - | | - | | - | | - | |
| MW-9 | 6/24/2008 | FS | - | | - | | - | | - | |
| MW-9 | 12/1/2008 | FS | - | | - | | 0.00063 | J | - | |
| MW-12A | 12/21/2006 | FS | - | | - | | - | | - | |
| MW-12A | 6/5/2007 | FS | - | | - | | - | | - | |
| MW-12A | 6/26/2008 | FS | - | | - | | - | | - | |
| MW-12A | 12/1/2008 | FS | - | | - | | 0.00058 | J | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-15B | 3/31/2006 | FS | | | | | | | | |
| MW-15B | 9/29/2006 | FS | - | | 0.0003 | J | 0.001 | | - | |
| MW-15B | 12/18/2006 | FS | - | | - | | 0.00077 | | - | |
| MW-15B | 3/20/2007 | FS | - | | - | | 0.001 | | - | |
| MW-15B | 6/4/2007 | FS | - | | 0.00044 | J | 0.0011 | | - | |
| MW-15B | 9/11/2007 | FS | - | | - | | 0.00065 | | - | |
| MW-15B | 12/18/2007 | FS | - | | 0.00032 | J | 0.0065 | | - | |
| MW-15B | 3/6/2008 | FS | - | | 0.00063 | | 0.0018 | | - | |
| MW-15B | 6/27/2008 | FS | - | | 0.00046 | J | 0.0032 | | - | |
| MW-15B | 9/3/2008 | FS | - | | 0.0003 | J | 0.0029 | | - | |
| MW-15B | 12/3/2008 | FS | - | | 0.00092 | J | 0.0083 | | - | |
| MW-15B | 3/17/2009 | FS | - | | - | | 0.0027 | | - | |
| MW-15B | 6/8/2009 | FS | - | | - | | 0.0016 | | - | |
| MW-15B | 9/2/2009 | FS | - | | - | | 0.002 | | - | |
| MW-15B | 12/3/2009 | FS | - | | - | | 0.0017 | | - | |
| MW-15B | 3/5/2010 | FS | - | | - | | 0.0019 | | - | |
| MW-15B | 11/9/2010 | FS | - | | - | | 0.0034 | | - | |
| MW-15B | 5/10/2011 | FS | - | | 0.00085 | J | - | | - | |
| MW-18B-HP2 | 3/27/2006 | FS | 0.00014 | J | 0.0017 | | 0.0054 | | - | |
| MW-18B-HP2 | 6/21/2006 | FS | - | | 0.0011 | | 0.0011 | | - | |
| MW-18B-HP2 | 9/29/2006 | FS | - | | 0.00061 | | 0.00056 | | - | |
| MW-18B-HP2 | 12/19/2006 | FS | - | | 0.00061 | | 0.0022 | | - | |
| MW-18B-HP2 | 3/19/2007 | FS | - | | 0.00065 | | 0.00045 | | - | |
| MW-18B-HP2 | 6/5/2007 | FS | 0.00055 | | 0.0008 | | 0.019 | | - | |
| MW-18B-HP2 | 9/12/2007 | FS | 0.0026 | J | 0.0059 | J | 0.063 | J | - | |
| MW-18B-HP2 | 12/18/2007 | FS | - | | 0.00044 | J | 0.0074 | | - | |
| MW-18B-HP2 | 3/4/2008 | FS | 0.0012 | | 0.0073 | | 0.021 | | - | |
| MW-18B-HP2 | 6/26/2008 | FS | 0.0015 | | 0.014 | | 0.025 | | - | |
| MW-18B-HP2 | 9/2/2008 | FS | 0.0024 | | 0.013 | | 0.048 | | - | |
| MW-18B-HP2 | 12/2/2008 | FS | - | | - | | 0.001 | | - | |
| MW-18B-HP2 | 3/12/2009 | FS | 0.0076 | | 0.0012 | | 0.0988 | | - | |
| MW-18B-HP2 | 6/3/2009 | FS | 0.0058 | | 0.0056 | | 0.0709 | | - | |
| MW-18B-HP2 | 8/28/2009 | FS | 0.0042 | | 0.0012 | | 0.1 | | - | |
| MW-18B-HP2 | 1/12/2010 | FS | 0.0033 | | 0.0042 | | 0.0651 | | - | |
| MW-18B-HP2 | 3/10/2010 | FS | - | | 0.0065 | | 0.0521 | | - | |
| MW-18B-HP2 | 11/3/2010 | FS | 0.0061 | | 0.0056 | | 0.104 | | - | |
| MW-18B-HP2 | 5/9/2011 | FS | 0.0033 | | 0.0206 | | 0.076 | | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-25B-2 | 3/29/2006 | FS | - | | 0.002 | | 0.0019 | | - | |
| MW-25B-2 | 6/22/2006 | FS | - | | 0.002 | | 0.0017 | | - | |
| MW-25B-2 | 9/28/2006 | FS | - | | 0.0017 | | 0.002 | | - | |
| MW-25B-2 | 12/21/2006 | FS | - | | 0.0016 | | 0.0016 | | - | |
| MW-25B-2 | 3/22/2007 | FS | - | | 0.0019 | | 0.002 | | - | |
| MW-25B-2 | 6/5/2007 | FS | - | | 0.0016 | | 0.0016 | | - | |
| MW-25B-2 | 9/12/2007 | FS | - | | 0.0013 | J | 0.0016 | J | - | |
| MW-25B-2 | 3/5/2008 | FS | - | | 0.0012 | | 0.0017 | | - | |
| MW-25B-2 | 6/24/2008 | FS | - | | 0.0013 | | 0.0017 | | - | |
| MW-25B-2 | 9/2/2008 | FS | - | | 0.00097 | | 0.0015 | | - | |
| MW-25B-2 | 12/2/2008 | FS | - | | 0.0012 | | 0.0022 | | - | |
| MW-25B-2 | 6/3/2009 | FS | - | | 0.0013 | | 0.0015 | | - | |
| MW-25B-2 | 1/8/2010 | FS | - | | 0.0014 | | 0.0016 | | - | |
| MW-25B-2 | 3/11/2010 | FS | - | | 0.0009 | J | 0.0013 | | - | |
| MW-25B-2 | 11/8/2010 | FS | - | | 0.0011 | | 0.0013 | | - | |
| MW-25B-2 | 5/10/2011 | FS | - | | 0.001 | | 0.0014 | | - | |
| MW-27B-HP2 | 3/29/2006 | FS | - | | - | | - | | - | |
| MW-27B-HP2 | 6/21/2006 | FS | - | | - | | - | | - | |
| MW-27B-HP2 | 9/28/2006 | FS | - | | 0.00014 | J | - | | - | |
| MW-27B-HP2 | 12/19/2006 | FS | - | | - | | - | | - | |
| MW-27B-HP2 | 3/19/2007 | FS | - | | - | | 0.00026 | | - | |
| MW-27B-HP2 | 6/4/2007 | FS | - | | - | | - | | - | |
| MW-27B-HP2 | 9/11/2007 | FS | - | | 0.00024 | J | - | | - | |
| MW-27B-HP2 | 12/19/2007 | FS | - | | - | | - | | - | |
| MW-27B-HP2 | 3/4/2008 | FS | - | | - | | - | | - | |
| MW-27B-HP2 | 6/23/2008 | FS | - | | - | | - | | - | |
| MW-27B-HP2 | 9/2/2008 | FS | - | | - | | - | | - | |
| MW-27B-HP2 | 12/3/2008 | FS | - | | - | | - | | - | |
| MW-32B-HP2 | 3/27/2006 | FS | | | | | | | | |
| MW-32B-HP2 | 6/22/2006 | FS | | | | | | | | |
| MW-32B-HP2 | 12/22/2006 | FS | - | | - | | - | | - | |
| MW-32B-HP2 | 6/5/2007 | FS | - | | - | | - | | - | |
| MW-32B-HP2 | 12/21/2007 | FS | - | | - | | - | | - | |
| MW-32B-HP2 | 6/24/2008 | FS | - | | - | | - | | - | |
| MW-32B-HP2 | 12/2/2008 | FS | - | | - | | 0.00041 | J | - | |

**Table D1 - VOC Data Summary**
**NSSC Five Year Review**

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **Qc Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-37B-HP2 | 3/28/2006 | FS | 0.00027 | J | 0.0083 | | 0.016 | | - | |
| MW-37B-HP2 | 3/28/2006 | FD | 0.00028 | J | 0.0085 | | 0.016 | | - | |
| MW-37B-HP2 | 6/22/2006 | FS | 0.00038 | J | 0.0085 | J | 0.017 | J | - | |
| MW-37B-HP2 | 9/28/2006 | FS | - | | 0.0086 | | 0.017 | | - | |
| MW-37B-HP2 | 12/19/2006 | FS | 0.00033 | J | 0.0093 | | 0.018 | | - | |
| MW-37B-HP2 | 3/20/2007 | FS | 0.00067 | | 0.011 | | 0.033 | | - | |
| MW-37B-HP2 | 6/7/2007 | FS | 0.00042 | J | 0.0089 | | 0.019 | | - | |
| MW-37B-HP2 | 9/11/2007 | FS | 0.0004 | J | 0.0078 | | 0.016 | | - | |
| MW-37B-HP2 | 12/18/2007 | FS | 0.00055 | | 0.0047 | | 0.019 | | - | |
| MW-37B-HP2 | 3/3/2008 | FS | 0.00033 | J | 0.0065 | | 0.011 | | - | |
| MW-37B-HP2 | 6/24/2008 | FS | 0.00032 | J | 0.0059 | | 0.012 | | - | |
| MW-37B-HP2 | 9/3/2008 | FS | 0.00023 | J | 0.0053 | | 0.0099 | | - | |
| MW-37B-HP2 | 12/5/2008 | FS | - | | 0.0049 | | 0.0044 | | - | |
| MW-37B-HP2 | 3/11/2009 | FD | - | | 0.0062 | | 0.0078 | | - | |
| MW-37B-HP2 | 3/11/2009 | FS | - | | 0.0059 | | 0.0073 | | - | |
| MW-37B-HP2 | 6/2/2009 | FD | - | | 0.0035 | | 0.0015 | | - | |
| MW-37B-HP2 | 6/2/2009 | FS | - | | 0.0036 | | 0.0015 | | - | |
| MW-37B-HP2 | 8/28/2009 | FS | 0.00049 | J | 0.0031 | | 0.0121 | | - | |
| MW-37B-HP2 | 8/28/2009 | FD | - | | 0.0035 | | 0.0101 | | - | |
| MW-37B-HP2 | 1/11/2010 | FS | 0.0009 | J | 0.0027 | | 0.0229 | | - | |
| MW-37B-HP2 | 3/25/2010 | FS | - | | 0.00133 | J | 0.00194 | J | - | |
| MW-37B-HP2 | 11/15/2010 | FS | 0.0012 | | 0.002 | | 0.0297 | | - | |
| MW-37B-HP2 | 5/9/2011 | FS | 0.0015 | | 0.0014 | | 0.0461 | | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-38B-HP2 | 3/28/2006 | FS | - | | 0.0012 | | - | | - | |
| MW-38B-HP2 | 6/22/2006 | FS | - | | 0.0014 | | 0.00022 | J | - | |
| MW-38B-HP2 | 9/28/2006 | FS | - | | 0.0012 | | - | | - | |
| MW-38B-HP2 | 12/19/2006 | FD | - | | 0.00096 | | 0.00015 | J | - | |
| MW-38B-HP2 | 12/19/2006 | FS | - | | 0.00094 | | 0.00014 | J | - | |
| MW-38B-HP2 | 3/19/2007 | FD | - | | 0.00039 | | 0.00037 | | - | |
| MW-38B-HP2 | 3/19/2007 | FS | - | | 0.00038 | | 0.00028 | | - | |
| MW-38B-HP2 | 6/6/2007 | FD | - | | 0.0011 | | - | | - | |
| MW-38B-HP2 | 6/6/2007 | FS | - | | 0.0011 | | - | | - | |
| MW-38B-HP2 | 9/11/2007 | FD | - | | 0.00046 | J | - | | - | |
| MW-38B-HP2 | 9/11/2007 | FS | - | | 0.0005 | | - | | - | |
| MW-38B-HP2 | 12/19/2007 | FD | - | | 0.00038 | J | 0.0007 | | - | |
| MW-38B-HP2 | 12/19/2007 | FS | - | | 0.00039 | J | 0.00071 | | - | |
| MW-38B-HP2 | 3/3/2008 | FS | - | | 0.0019 | | - | | - | |
| MW-38B-HP2 | 3/3/2008 | FD | - | | 0.0019 | | - | | - | |
| MW-38B-HP2 | 6/23/2008 | FD | - | | 0.00079 | | - | | - | |
| MW-38B-HP2 | 6/23/2008 | FS | - | | 0.0006 | | - | | - | |
| MW-38B-HP2 | 9/3/2008 | FD | - | | 0.00072 | | - | | - | |
| MW-38B-HP2 | 9/3/2008 | FS | - | | 0.00069 | | - | | - | |
| MW-38B-HP2 | 12/3/2008 | FD | - | | 0.00049 | J | - | | - | |
| MW-38B-HP2 | 12/3/2008 | FS | - | | 0.00048 | J | - | | - | |
| MW-38B-HP2 | 6/2/2009 | FS | - | | 0.0007 | J | - | | - | |
| MW-38B-HP2 | 1/4/2010 | FS | - | | 0.00068 | J | - | | - | |
| MW-38B-HP2 | 1/4/2010 | FD | - | | 0.00074 | J | - | | - | |
| MW-38B-HP2 | 3/11/2010 | FS | - | | 0.00068 | J | - | | - | |
| MW-38B-HP2 | 3/11/2010 | FD | - | | - | | - | | - | |
| MW-38B-HP2 | 11/8/2010 | FS | - | | - | | - | | - | |
| MW-38B-HP2 | 11/8/2010 | FD | - | | - | | - | | - | |
| MW-38B-HP2 | 5/10/2011 | FD | - | | - | | - | | - | |
| MW-38B-HP2 | 5/10/2011 | FS | - | | - | | - | | - | |
| MW-39B-HP4 | 3/28/2006 | FS | - | | 0.0051 | | 0.0011 | | - | |
| MW-39B-HP4 | 6/22/2006 | FS | - | | 0.0046 | J | 0.001 | J | - | |
| MW-39B-HP4 | 9/28/2006 | FS | - | | 0.003 | | 0.00077 | | - | |
| MW-39B-HP4 | 12/18/2006 | FS | - | | 0.0029 | | 0.00064 | | - | |
| MW-39B-HP4 | 3/19/2007 | FS | - | | 0.003 | | 0.00062 | | - | |
| MW-39B-HP4 | 6/4/2007 | FS | - | | 0.0034 | | 0.00073 | | - | |
| MW-39B-HP4 | 9/10/2007 | FS | - | | 0.0034 | | 0.00076 | | - | |
| MW-39B-HP4 | 12/19/2007 | FS | - | | 0.0095 | | 0.002 | | - | |
| MW-39B-HP4 | 3/3/2008 | FS | - | | 0.0044 | | 0.00078 | | - | |
| MW-39B-HP4 | 6/23/2008 | FS | - | | 0.0041 | | 0.00081 | | - | |
| MW-39B-HP4 | 9/3/2008 | FS | - | | 0.0034 | | 0.00064 | | - | |
| MW-39B-HP4 | 12/3/2008 | FS | - | | 0.0025 | | 0.0004 | J | - | |
| MW-39B-HP4 | 6/3/2009 | FS | - | | 0.0024 | | - | | - | |
| MW-39B-HP4 | 12/29/2009 | FS | - | | 0.0042 | | 0.00076 | J | - | |
| MW-39B-HP4 | 3/23/2010 | FS | - | | 0.0029 | | 0.0005 | J | - | |
| MW-39B-HP4 | 11/16/2010 | FS | - | | 0.0044 | | - | | - | |
| MW-39B-HP4 | 5/24/2011 | FS | - | | 0.0032 | | 0.0012 | | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-51BR | 3/30/2006 | FS | | | | | | | | |
| MW-51BR | 6/23/2006 | FS | | | | | | | | |
| MW-51BR | 12/21/2006 | FS | - | | 0.00041 | J | 0.0027 | | - | |
| MW-51BR | 12/21/2007 | FS | - | | 0.0003 | J | 0.0032 | | - | |
| MW-51BR | 12/10/2008 | FS | - | | 0.00041 | J | 0.0018 | | - | |
| MW-51BR | 12/30/2009 | FS | - | | - | | 0.0014 | | - | |
| MW-51BR | 11/9/2010 | FS | - | | - | | 0.0036 | | - | |
| MW-74B-HP2 | 3/30/2006 | FS | - | | - | | - | | - | |
| MW-74B-HP2 | 6/21/2006 | FS | - | | - | | - | | - | |
| MW-74B-HP2 | 12/22/2006 | FS | - | | - | | - | | - | |
| MW-74B-HP2 | 12/18/2007 | FS | - | | - | | - | | - | |
| MW-74B-HP2 | 12/5/2008 | FS | - | | - | | - | | - | |
| MW-83B-2 | 3/27/2006 | FS | 0.00021 | J | - | | 0.012 | | - | |
| MW-83B-2 | 3/27/2006 | FD | 0.00024 | J | - | | 0.013 | | - | |
| MW-83B-2 | 6/22/2006 | FS | - | | 0.00049 | J | 0.007 | J | - | |
| MW-83B-2 | 9/29/2006 | FS | 0.00026 | J | 0.00042 | J | 0.009 | | - | |
| MW-83B-2 | 12/20/2006 | FS | 0.00031 | J | 0.0016 | | 0.016 | | - | |
| MW-83B-2 | 3/19/2007 | FS | - | | 0.00021 | | 0.00061 | | - | |
| MW-83B-2 | 6/4/2007 | FS | 0.00028 | J | 0.00075 | | 0.012 | | - | |
| MW-83B-2 | 9/13/2007 | FS | 0.0005 | | 0.0015 | | 0.021 | | - | |
| MW-83B-2 | 12/17/2007 | FS | 0.00022 | J | 0.00038 | J | 0.0042 | | - | |
| MW-83B-2 | 3/3/2008 | FS | 0.00065 | | 0.002 | | 0.015 | | - | |
| MW-83B-2 | 6/26/2008 | FS | 0.00082 | | 0.0006 | | 0.012 | | - | |
| MW-83B-2 | 9/3/2008 | FS | 0.0014 | | 0.0017 | | 0.033 | | - | |
| MW-83B-2 | 12/2/2008 | FS | - | | - | | 0.0016 | | - | |
| MW-83B-2 | 3/12/2009 | FS | 0.0022 | | - | | 0.0206 | | - | |
| MW-83B-2 | 6/3/2009 | FS | 0.0027 | | - | | 0.0198 | | - | |
| MW-83B-2 | 8/28/2009 | FS | 0.0013 | | - | | 0.0195 | | - | |
| MW-83B-2 | 1/11/2010 | FS | 0.003 | | - | | 0.0377 | | - | |
| MW-83B-2 | 3/12/2010 | FS | 0.003 | | - | | 0.0377 | | - | |
| MW-83B-2 | 11/4/2010 | FS | 0.0024 | | - | | 0.0169 | | - | |
| MW-83B-2 | 5/9/2011 | FS | 0.00072 | J | 0.00077 | J | 0.019 | | - | |
| MW-88B-HP2 | 3/30/2006 | FS | - | | 0.0012 | | 0.0045 | | - | |
| MW-88B-HP2 | 6/22/2006 | FS | 0.00043 | J | 0.00084 | | 0.02 | | - | |
| MW-88B-HP2 | 9/28/2006 | FS | - | | 0.001 | | 0.008 | | - | |
| MW-88B-HP2 | 12/20/2006 | FS | 0.00023 | J | 0.00079 | | 0.013 | | - | |
| MW-88B-HP2 | 3/19/2007 | FS | 0.0023 | | 0.00076 | | 0.089 | | - | |
| MW-88B-HP2 | 6/5/2007 | FS | - | | 0.00097 | | 0.0096 | | - | |
| MW-88B-HP2 | 9/13/2007 | FS | - | | 0.00095 | J | 0.0089 | J | - | |
| MW-88B-HP2 | 12/19/2007 | FS | 0.00034 | J | 0.00057 | | 0.017 | | - | |
| MW-88B-HP2 | 3/3/2008 | FS | - | | 0.002 | | 0.0063 | | - | |
| MW-88B-HP2 | 6/25/2008 | FS | - | | - | | 0.0024 | | - | |
| MW-88B-HP2 | 9/3/2008 | FS | - | | 0.00077 | | 0.0066 | | - | |
| MW-88B-HP2 | 12/9/2008 | FS | - | | 0.00092 | J | 0.0065 | | - | |
| MW-88B-HP2 | 3/11/2009 | FS | - | | - | | 0.0058 | | - | |
| MW-88B-HP2 | 6/9/2009 | FS | - | | 0.00067 | J | 0.0046 | | - | |
| MW-88B-HP2 | 8/28/2009 | FS | - | | 0.00064 | J | 0.0041 | | - | |
| MW-88B-HP2 | 1/12/2010 | FS | - | | 0.00085 | J | 0.0052 | | - | |
| MW-88B-HP2 | 3/12/2010 | FS | - | | - | | 0.0053 | | - | |
| MW-88B-HP2 | 11/9/2010 | FS | - | | - | | 0.0031 | | - | |
| MW-88B-HP2 | 5/10/2011 | FS | - | | - | | 0.0048 | | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-90B-4 | 6/7/2006 | FS | 0.00047 | J | 0.0014 | J | 0.012 | J | - | |
| MW-90B-4 | 9/22/2006 | FS | 0.00028 | J | 0.0011 | | 0.0099 | | - | |
| MW-90B-4 | 12/5/2006 | FS | 0.00028 | J | 0.0011 | | 0.0089 | | - | |
| MW-90B-4 | 6/1/2007 | FS | - | | 0.0007 | | 0.0055 | | - | |
| MW-90B-4 | 9/5/2007 | FS | 0.00016 | J | 0.0014 | | 0.0063 | | - | |
| MW-90B-4 | 12/10/2007 | FS | - | | 0.0027 | | 0.0067 | | - | |
| MW-90B-4 | 3/13/2008 | FS | 0.00022 | J | 0.0033 | | 0.0066 | | - | |
| MW-90B-4 | 6/11/2008 | FS | - | | 0.0038 | | 0.0071 | | - | |
| MW-90B-4 | 9/11/2008 | FS | - | | 0.004 | | 0.0078 | | - | |
| MW-90B-4 | 12/11/2008 | FS | - | | 0.0051 | | 0.0094 | | - | |
| MW-90B-4 | 3/9/2009 | FS | - | | 0.0054 | J | 0.0095 | | - | |
| MW-90B-4 | 6/8/2009 | FS | - | | 0.0052 | | 0.0083 | | - | |
| MW-90B-4 | 9/2/2009 | FS | - | | 0.006 | | 0.0105 | | - | |
| MW-90B-4 | 12/3/2009 | FS | - | | 0.0074 | J | 0.0101 | | - | |
| MW-90B-4 | 3/5/2010 | FS | - | | 0.0053 | | 0.0117 | | - | |
| MW-90B-4 | 11/16/2010 | FS | - | | 0.0041 | | 0.0092 | | - | |
| MW-90B-4 | 5/24/2011 | FS | - | | 0.0035 | | 0.0043 | | - | |
| MW-94B-4 | 6/7/2006 | FS | - | | 0.00055 | J | 0.0018 | J | - | |
| MW-94B-4 | 9/22/2006 | FS | - | | 0.00048 | J | 0.0013 | | - | |
| MW-94B-4 | 12/5/2006 | FS | - | | 0.0004 | J | 0.0013 | | - | |
| MW-94B-4 | 3/14/2007 | FS | - | | 0.00041 | J | 0.0014 | | - | |
| MW-94B-4 | 6/1/2007 | FS | - | | 0.00041 | J | 0.0013 | | - | |
| MW-94B-4 | 9/5/2007 | FS | - | | 0.00047 | J | 0.0014 | | - | |
| MW-94B-4 | 12/10/2007 | FS | - | | 0.00029 | J | 0.001 | | - | |
| MW-94B-4 | 3/13/2008 | FS | - | | 0.0004 | J | 0.00098 | | - | |
| MW-94B-4 | 6/11/2008 | FS | - | | 0.00045 | J | 0.001 | | - | |
| MW-94B-4 | 9/11/2008 | FS | - | | 0.0004 | J | 0.00096 | | - | |
| MW-94B-4 | 12/11/2008 | FS | - | | 0.00045 | J | 0.0012 | | - | |
| MW-94B-4 | 3/9/2009 | FS | - | | - | | 0.0012 | | - | |
| MW-94B-4 | 6/8/2009 | FS | - | | - | | 0.00088 | | - | |
| MW-94B-4 | 9/2/2009 | FS | - | | - | | 0.00099 | J | - | |
| MW-94B-4 | 12/3/2009 | FS | - | | 0.00079 | J | 0.00084 | J | - | |
| MW-94B-4 | 3/5/2010 | FS | - | | - | | 0.00062 | J | - | |
| MW-94B-4 | 11/16/2010 | FS | - | | - | | - | | - | |
| MW-94B-4 | 5/24/2011 | FS | - | | - | | - | | - | |
| MW-95B-4 | 6/7/2006 | FS | - | | 0.0003 | J | 0.0032 | J | - | |
| MW-95B-4 | 9/22/2006 | FS | - | | 0.00022 | J | 0.00037 | J | - | |
| MW-95B-4 | 12/5/2006 | FS | - | | 0.00014 | J | 0.00042 | J | - | |
| MW-95B-4 | 3/14/2007 | FS | - | | 0.00019 | J | 0.00037 | J | - | |
| MW-95B-4 | 6/1/2007 | FS | - | | 0.00023 | J | 0.00031 | J | - | |
| MW-95B-4 | 9/5/2007 | FS | - | | 0.00024 | J | 0.00046 | J | - | |
| MW-95B-4 | 12/10/2007 | FS | - | | - | | 0.0003 | J | - | |
| MW-95B-4 | 3/13/2008 | FS | - | | - | | 0.00032 | J | - | |
| MW-95B-4 | 6/11/2008 | FS | - | | - | | 0.00032 | J | - | |
| MW-95B-4 | 9/11/2008 | FS | - | | - | | 0.00032 | J | - | |
| MW-95B-4 | 12/11/2008 | FS | - | | - | | - | | - | |
| MW-95B-4 | 9/1/2009 | FS | - | | - | | - | | - | |
| MW-95B-4 | 1/4/2010 | FS | - | | - | | - | | - | |
| MW-95B-4 | 3/12/2010 | FS | - | | - | | - | | - | |
| MW-95B-4 | 11/16/2010 | FS | - | | - | | - | | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-95B-4 | 5/24/2011 | FS | - | | 0.0025 | | 0.0012 | | - | |
| MW-96B-4 | 6/7/2006 | FS | 0.00069 | J | 0.023 | J | 0.012 | J | - | |
| MW-96B-4 | 9/22/2006 | FS | 0.00058 | | 0.024 | | 0.01 | | - | |
| MW-96B-4 | 3/13/2008 | FS | 0.00085 | | 0.024 | | 0.0021 | | - | |
| MW-96B-4 | 6/20/2008 | FS | 0.0018 | | 0.043 | | 0.0053 | | - | |
| MW-96B-4 | 9/11/2008 | FS | 0.0023 | | 0.052 | | 0.0054 | | - | |
| MW-96B-4 | 12/11/2008 | FS | 0.0031 | | 0.0572 | | 0.0066 | | - | |
| MW-128A | 3/31/2006 | FS | - | | - | | - | | - | |
| MW-128A | 3/31/2006 | FD | - | | - | | - | | - | |
| MW-128A | 6/23/2006 | FD | - | | - | | - | | - | |
| MW-128A | 6/23/2006 | FS | - | | - | | - | | - | |
| MW-128A | 12/21/2006 | FS | - | | - | | - | | - | |
| MW-128A | 12/18/2007 | FS | - | | - | | - | | - | |
| MW-128A | 6/25/2008 | FS | | | | | | | | |
| MW-128A | 12/10/2008 | FS | - | | - | | - | | - | |
| MW-128A | 3/17/2009 | FD | | | | | | | | |
| MW-128A | 3/17/2009 | FS | | | | | | | | |
| MW-128A | 12/22/2009 | FS | - | | - | | - | | - | |
| MW-128A | 12/22/2009 | FD | | | | | | | | |
| MW-128A | 11/4/2010 | FS | - | | - | | - | | - | |
| MW-128A | 11/4/2010 | FD | | | | | | | | |
| MW-129A | 3/31/2006 | FS | - | | - | | 0.00032 | J | - | |
| MW-129A | 6/23/2006 | FS | - | | - | | 0.00016 | J | - | |
| MW-129A | 12/21/2006 | FS | - | | - | | - | | - | |
| MW-129A | 12/18/2007 | FS | - | | - | | - | | - | |
| MW-129A | 12/9/2008 | FS | - | | - | | - | | - | |
| MW-129A | 1/4/2010 | FS | - | | - | | - | | - | |
| MW-129A | 11/15/2010 | FS | - | | - | | - | | - | |
| MW-26B-M7 | 12/22/2006 | FS | - | | - | | - | | - | |
| MW-26B-M7 | 12/10/2008 | FS | - | | - | | - | | - | |
| MW-35BR | 3/31/2006 | FS | 0.0012 | | - | | 0.049 | | - | |
| MW-35BR | 6/22/2006 | FS | 0.0011 | | 0.001 | | 0.049 | | - | |
| MW-35BR | 9/29/2006 | FS | - | | 0.0016 | | 0.008 | | - | |
| MW-35BR | 12/22/2006 | FS | - | | - | | 0.011 | | - | |
| MW-35BR | 3/19/2007 | FS | - | | - | | 0.036 | | - | |
| MW-35BR | 6/8/2007 | FS | - | | - | | 0.005 | | - | |
| MW-35BR | 9/12/2007 | FS | - | | 0.0013 | | 0.0054 | | - | |
| MW-35BR | 3/4/2008 | FS | - | | 0.0012 | | 0.0035 | | - | |
| MW-35BR | 6/27/2008 | FS | - | | 0.0012 | | 0.0037 | | - | |
| MW-35BR | 9/2/2008 | FS | 0.00021 | J | - | | 0.0043 | | - | |
| MW-35BR | 12/3/2008 | FS | 0.00059 | J | 0.00044 | J | 0.0042 | | - | |
| MW-35BR | 3/17/2009 | FS | - | | 0.00078 | J | 0.0043 | | - | |
| MW-35BR | 6/5/2009 | FS | - | | - | | 0.0034 | | - | |
| MW-35BR | 9/1/2009 | FS | - | | - | | 0.0056 | | - | |
| MW-35BR | 1/8/2010 | FS | - | | 0.00072 | J | 0.0051 | | - | |
| MW-35BR | 3/29/2010 | FS | - | | 0.00107 | J | 0.00205 | J | - | |
| MW-35BR | 11/15/2010 | FS | - | | - | | 0.0061 | | - | |
| MW-35BR | 5/16/2011 | FS | - | | 0.0013 | J | 0.0015 | | - | |
| MW-201A | 12/22/2006 | FS | - | | - | | - | | - | |
| MW-201A | 12/20/2007 | FS | - | | - | | - | | - | |
| MW-201A | 12/4/2008 | FS | - | | - | | - | | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-201B | 3/29/2006 | FS | - | | - | | - | | - | |
| MW-201B | 3/29/2006 | FD | - | | - | | - | | - | |
| MW-201B | 6/21/2006 | FS | - | | 0.00027 | J | - | | - | |
| MW-201B | 6/21/2006 | FD | - | | 0.00029 | J | - | | - | |
| MW-201B | 9/27/2006 | FD | - | | - | | - | | - | |
| MW-201B | 9/27/2006 | FS | - | | - | | - | | - | |
| MW-201B | 12/19/2006 | FD | - | | 0.00044 | J | - | | - | |
| MW-201B | 12/19/2006 | FS | - | | 0.00041 | J | - | | - | |
| MW-201B | 3/21/2007 | FD | - | | 0.00044 | J | - | | - | |
| MW-201B | 3/21/2007 | FS | - | | 0.00027 | J | - | | - | |
| MW-201B | 6/6/2007 | FD | - | | 0.00015 | J | - | | - | |
| MW-201B | 6/6/2007 | FS | - | | 0.00034 | J | - | | - | |
| MW-201B | 9/12/2007 | FD | - | | - | | - | | - | |
| MW-201B | 9/12/2007 | FS | - | | - | | - | | - | |
| MW-201B | 12/20/2007 | FD | - | | 0.0062 | | 0.001 | | - | |
| MW-201B | 12/20/2007 | FS | - | | 0.0062 | | 0.0011 | | - | |
| MW-201B | 3/4/2008 | FS | - | | 0.0018 | | 0.00042 | J | - | |
| MW-201B | 3/4/2008 | FD | - | | 0.0017 | | 0.00041 | J | - | |
| MW-201B | 6/24/2008 | FD | - | | 0.00028 | J | - | | - | |
| MW-201B | 6/24/2008 | FS | - | | 0.00023 | J | - | | - | |
| MW-201B | 9/3/2008 | FD | - | | 0.0002 | J | - | | - | |
| MW-201B | 9/3/2008 | FS | - | | 0.00019 | J | - | | - | |
| MW-201B | 12/4/2008 | FD | - | | - | | - | | - | |
| MW-201B | 12/4/2008 | FS | - | | - | | - | | - | |
| MW-201B | 1/8/2010 | FS | - | | - | | - | | - | |
| MW-201B | 10/28/2010 | FS | - | | 0.0089 | J | 0.00073 | J | - | |
| MW-201B | 10/28/2010 | FD | - | | 0.0054 | J | - | | - | |
| MW-202C-2 | 3/29/2006 | FS | - | | - | | 0.0011 | | - | |
| MW-202C-2 | 6/21/2006 | FS | - | | - | | 0.00081 | | - | |
| MW-202C-2 | 9/27/2006 | FS | - | | - | | 0.00076 | | - | |
| MW-202C-2 | 12/20/2006 | FS | - | | - | | 0.00061 | | - | |
| MW-202C-2 | 3/22/2007 | FS | - | | 0.00037 | J | 0.0015 | | - | |
| MW-202C-2 | 6/6/2007 | FS | - | | 0.00015 | J | 0.00069 | | - | |
| MW-202C-2 | 9/12/2007 | FS | - | | - | | 0.00078 | | - | |
| MW-202C-2 | 12/20/2007 | FS | - | | - | | 0.00074 | | - | |
| MW-202C-2 | 3/4/2008 | FS | - | | - | | 0.00086 | | - | |
| MW-202C-2 | 6/24/2008 | FS | - | | 0.00023 | J | 0.0012 | | - | |
| MW-202C-2 | 8/28/2008 | FS | - | | - | | 0.00098 | | - | |
| MW-202C-2 | 12/4/2008 | FS | - | | - | | 0.0013 | | - | |
| MW-202C-2 | 3/16/2009 | FS | - | | - | | 0.0013 | | - | |
| MW-202C-2 | 6/5/2009 | FS | - | | - | | - | | - | |
| MW-202C-2 | 9/1/2009 | FS | - | | - | | 0.0011 | | - | |
| MW-202C-2 | 1/5/2010 | FS | - | | - | | 0.00098 | J | - | |
| MW-202C-2 | 3/16/2010 | FS | - | | - | | 0.00086 | J | - | |
| MW-202C-2 | 11/1/2010 | FS | - | | - | | - | | - | |
| MW-202C-2 | 5/19/2011 | FS | - | | - | | - | | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-202B | 3/29/2006 | FS | - | | - | | - | | - | |
| MW-202B | 6/21/2006 | FS | - | | - | | 0.0006 | | - | |
| MW-202B | 9/27/2006 | FS | - | | - | | 0.00015 | J | - | |
| MW-202B | 12/20/2006 | FS | - | | - | | 0.0004 | J | - | |
| MW-202B | 3/22/2007 | FS | - | | - | | 0.00017 | J | - | |
| MW-202B | 6/6/2007 | FS | - | | - | | 0.00047 | J | - | |
| MW-202B | 9/12/2007 | FS | - | | - | | - | | - | |
| MW-202B | 12/20/2007 | FD | - | | - | | - | | - | |
| MW-202B | 12/20/2007 | FS | - | | - | | - | | - | |
| MW-202B | 3/4/2008 | FS | - | | - | | 0.00035 | J | - | |
| MW-202B | 6/24/2008 | FS | - | | - | | 0.00038 | J | - | |
| MW-202B | 8/28/2008 | FS | - | | - | | 0.00071 | | - | |
| MW-202B | 12/4/2008 | FS | - | | - | | - | | - | |
| MW-202B | 3/13/2009 | FS | - | | - | | - | | - | |
| MW-202B | 6/5/2009 | FS | - | | - | | - | | - | |
| MW-202B | 9/1/2009 | FS | - | | - | | - | | - | |
| MW-202B | 1/5/2010 | FS | - | | - | | - | | - | |
| MW-202B | 3/16/2010 | FS | - | | - | | - | | - | |
| MW-202B | 11/1/2010 | FS | - | | - | | - | | - | |
| MW-202B | 5/18/2011 | FS | - | | - | | - | | - | |
| MW-203B | 12/22/2006 | FS | - | | - | | - | | - | |
| MW-203B | 6/6/2007 | FS | - | | - | | - | | - | |
| MW-203B | 12/20/2007 | FS | - | | - | | - | | - | |
| MW-203B | 6/25/2008 | FS | - | | - | | - | | - | |
| MW-203B | 12/5/2008 | FS | - | | - | | - | | - | |
| MW-205B | 3/29/2006 | FS | - | | - | | - | | - | |
| MW-205B | 6/21/2006 | FS | - | | - | | 0.00019 | J | - | |
| MW-205B | 9/27/2006 | FS | - | | - | | 0.00022 | J | - | |
| MW-205B | 12/19/2006 | FS | - | | - | | 0.00017 | J | - | |
| MW-205B | 3/22/2007 | FS | - | | - | | 0.00019 | J | - | |
| MW-205B | 6/6/2007 | FS | - | | - | | 0.00016 | J | - | |
| MW-205B | 9/12/2007 | FS | - | | - | | 0.00016 | J | - | |
| MW-205B | 12/20/2007 | FS | - | | - | | - | | - | |
| MW-205B | 3/5/2008 | FS | - | | - | | - | | - | |
| MW-205B | 6/24/2008 | FS | - | | - | | - | | - | |
| MW-205B | 9/2/2008 | FS | - | | - | | - | | - | |
| MW-205B | 12/5/2008 | FS | - | | - | | - | | - | |
| MW-205B | 1/6/2010 | FS | - | | - | | - | | - | |
| MW-205B | 11/2/2010 | FS | - | | - | | - | | - | |
| MW207B-HP2 | 3/29/2006 | FS | | | | | | | | |
| MW207B-HP2 | 6/23/2006 | FS | | | | | | | | |
| MW207B-HP2 | 12/20/2006 | FS | - | | - | | - | | - | |
| MW207B-HP2 | 9/12/2007 | FS | | | | | | | | |
| MW207B-HP2 | 12/21/2007 | FS | - | | - | | - | | - | |
| MW207B-HP2 | 12/4/2008 | FS | - | | - | | - | | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-208A-2 | 3/29/2006 | FS | - | | - | | - | | - | |
| MW-208A-2 | 6/20/2006 | FS | - | | 0.00014 | J | - | | - | |
| MW-208A-2 | 9/27/2006 | FS | - | | - | | - | | - | |
| MW-208A-2 | 12/19/2006 | FS | - | | - | | - | | - | |
| MW-208A-2 | 3/21/2007 | FS | - | | - | | - | | - | |
| MW-208A-2 | 6/6/2007 | FS | - | | - | | - | | - | |
| MW-208A-2 | 9/13/2007 | FS | - | | - | | - | | - | |
| MW-208A-2 | 12/20/2007 | FS | - | | - | | - | | - | |
| MW-208A-2 | 3/5/2008 | FS | - | | - | | - | | - | |
| MW-208A-2 | 6/24/2008 | FS | - | | - | | - | | - | |
| MW-208A-2 | 9/2/2008 | FS | - | | - | | - | | - | |
| MW-208A-2 | 12/4/2008 | FS | - | | - | | - | | - | |
| MW-208A-2 | 1/6/2010 | FS | - | | - | | - | | - | |
| MW-208A-2 | 10/28/2010 | FS | - | | - | | - | | - | |
| MW208B-HP2 | 3/29/2006 | FS | - | | 0.002 | | 0.013 | | - | |
| MW208B-HP2 | 6/20/2006 | FS | - | | 0.002 | | 0.018 | | - | |
| MW208B-HP2 | 9/27/2006 | FS | 0.00016 | J | 0.0016 | | 0.032 | | - | |
| MW208B-HP2 | 12/19/2006 | FS | 0.00017 | J | 0.0015 | | 0.035 | | - | |
| MW208B-HP2 | 3/21/2007 | FS | 0.00028 | J | 0.0013 | | 0.052 | | - | |
| MW208B-HP2 | 6/6/2007 | FS | - | | 0.0019 | | 0.0027 | | - | |
| MW208B-HP2 | 9/13/2007 | FS | - | | 0.0016 | | 0.0077 | | - | |
| MW208B-HP2 | 12/20/2007 | FS | 0.00034 | J | 0.00087 | | 0.057 | | - | |
| MW208B-HP2 | 3/5/2008 | FS | - | | 0.0014 | | 0.021 | | - | |
| MW208B-HP2 | 6/24/2008 | FS | 0.0002 | J | 0.0012 | | 0.037 | | - | |
| MW208B-HP2 | 9/2/2008 | FS | - | | 0.0011 | | 0.039 | | - | |
| MW208B-HP2 | 12/5/2008 | FS | - | | 0.0013 | | 0.0586 | | - | |
| MW208B-HP2 | 3/12/2009 | FS | - | | 0.0012 | | 0.0376 | | - | |
| MW208B-HP2 | 6/8/2009 | FS | - | | 0.0013 | | 0.0275 | | - | |
| MW208B-HP2 | 9/2/2009 | FS | 0.00043 | J | 0.0011 | | 0.041 | | - | |
| MW208B-HP2 | 1/6/2010 | FS | - | | 0.0012 | | 0.0363 | | - | |
| MW208B-HP2 | 3/19/2010 | FS | - | | 0.00074 | J | 0.0382 | | - | |
| MW208B-HP2 | 10/28/2010 | FS | - | | 0.0049 | | 0.0488 | | - | |
| MW208B-HP2 | 5/19/2011 | FS | - | | 0.001 | | 0.0316 | | - | |
| MW209B-HP2 | 3/29/2006 | FS | 0.00038 | J | - | | 0.0092 | | - | |
| MW209B-HP2 | 6/21/2006 | FS | 0.00027 | J | 0.00027 | J | 0.0054 | | - | |
| MW209B-HP2 | 9/27/2006 | FS | 0.00027 | J | - | | 0.0061 | | - | |
| MW209B-HP2 | 12/19/2006 | FS | 0.00023 | J | 0.00034 | J | 0.0041 | | - | |
| MW209B-HP2 | 3/19/2007 | FS | 0.00032 | | 0.00025 | | 0.0073 | | - | |
| MW209B-HP2 | 6/6/2007 | FS | 0.00032 | J | 0.00026 | J | 0.0073 | | - | |
| MW209B-HP2 | 9/12/2007 | FS | - | | 0.00037 | J | 0.0061 | J | - | |
| MW209B-HP2 | 12/20/2007 | FS | - | | 0.00029 | J | 0.0039 | | - | |
| MW209B-HP2 | 3/5/2008 | FS | 0.0002 | J | 0.00023 | J | 0.0044 | | - | |
| MW209B-HP2 | 6/24/2008 | FS | - | | 0.00028 | J | 0.0007 | | - | |
| MW209B-HP2 | 9/2/2008 | FS | - | | 0.00024 | J | 0.0038 | | - | |
| MW209B-HP2 | 12/4/2008 | FS | - | | - | | 0.0038 | | - | |
| MW209B-HP2 | 3/13/2009 | FS | - | | - | | 0.0033 | | - | |
| MW209B-HP2 | 6/8/2009 | FS | - | | - | | 0.0025 | | - | |
| MW209B-HP2 | 9/2/2009 | FS | 0.00045 | J | - | | 0.0049 | | - | |
| MW209B-HP2 | 1/6/2010 | FS | - | | - | | 0.0031 | | - | |
| MW209B-HP2 | 3/24/2010 | FS | - | | - | | 0.00479 | J | - | |
| MW209B-HP2 | 11/2/2010 | FS | - | | - | | 0.004 | | - | |
| MW209B-HP2 | 5/19/2011 | FS | - | | - | | 0.00091 | J | - | |

| | | Analysis | VOCs | | VOCs | | VOCs | | VOCs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Parameter | Cis-1,2-DCE | | Tetrachloroethene | | Trichloroethene | | Vinyl chloride | |
| | | Fraction | Total | | Total | | Total | | Total | |
| | | Units | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | Qc Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-211B-4 | 3/29/2006 | FS | - | | 0.0057 | | 0.0061 | | - | |
| MW-211B-4 | 6/21/2006 | FS | - | | 0.0012 | | 0.00087 | | - | |
| MW-211B-4 | 9/27/2006 | FS | - | | 0.0043 | | 0.0059 | | - | |
| MW-211B-4 | 12/19/2006 | FS | - | | 0.0048 | | 0.0079 | | - | |
| MW-211B-4 | 3/21/2007 | FS | 0.00016 | J | 0.0076 | | 0.017 | | - | |
| MW-211B-4 | 6/6/2007 | FS | - | | 0.0021 | | 0.0047 | | - | |
| MW-211B-4 | 9/12/2007 | FS | - | | 0.0055 | | 0.0073 | | - | |
| MW-211B-4 | 12/21/2007 | FS | - | | 0.0093 | | 0.012 | | - | |
| MW-211B-4 | 3/6/2008 | FS | - | | 0.0044 | | 0.0058 | | - | |
| MW-211B-4 | 6/24/2008 | FS | - | | 0.0085 | | 0.01 | | - | |
| MW-211B-4 | 9/2/2008 | FS | - | | 0.0051 | | 0.0053 | | - | |
| MW-211B-4 | 12/4/2008 | FS | - | | 0.0072 | | 0.0067 | | - | |
| MW-211B-4 | 3/12/2009 | FS | - | | - | | - | | - | |
| MW-211B-4 | 6/8/2009 | FS | - | | - | | - | | - | |
| MW-211B-4 | 9/2/2009 | FS | - | | - | | - | | - | |
| MW-211B-4 | 1/5/2010 | FS | - | | - | | - | | - | |
| MW-211B-4 | 3/19/2010 | FS | - | | - | | - | | - | |
| MW-211B-4 | 11/2/2010 | FS | - | | 0.0056 | | 0.0024 | | - | |
| MW-211B-4 | 5/17/2011 | FS | - | | 0.0025 | J | 0.0028 | | - | |
| MW-212C-2 | 3/29/2006 | FS | 0.00051 | | - | | 0.002 | | - | |
| MW-212C-2 | 6/21/2006 | FS | 0.00032 | J | - | | 0.0019 | | - | |
| MW-212C-2 | 9/27/2006 | FS | - | | - | | 0.0024 | | - | |
| MW-212C-2 | 12/20/2006 | FS | 0.00036 | J | - | | 0.0025 | | - | |
| MW-212C-2 | 3/22/2007 | FS | 0.0004 | J | - | | 0.0026 | | - | |
| MW-212C-2 | 6/6/2007 | FS | 0.00044 | J | - | | 0.0021 | | - | |
| MW-212C-2 | 9/12/2007 | FS | 0.0004 | J | - | | 0.0022 | J | - | |
| MW-212C-2 | 12/20/2007 | FS | 0.00029 | J | - | | 0.0023 | | - | |
| MW-212C-2 | 3/4/2008 | FS | 0.00037 | J | - | | 0.0022 | | - | |
| MW-212C-2 | 6/25/2008 | FS | 0.00036 | J | - | | 0.0023 | | - | |
| MW-212C-2 | 9/2/2008 | FS | 0.00052 | | - | | 0.002 | | - | |
| MW-212C-2 | 12/4/2008 | FS | 0.00083 | J | - | | 0.0025 | | - | |
| MW-212C-2 | 3/16/2009 | FS | 0.00089 | J | - | | 0.0025 | | - | |
| MW-212C-2 | 6/9/2009 | FS | 0.0012 | | - | | 0.002 | | - | |
| MW-212C-2 | 9/2/2009 | FS | 0.00084 | J | - | | 0.0025 | | - | |
| MW-212C-2 | 1/8/2010 | FS | 0.0006 | J | - | | 0.0019 | | - | |
| MW-212C-2 | 3/24/2010 | FS | - | | - | | 0.0023 | J | - | |
| MW-212C-2 | 11/2/2010 | FS | - | | - | | 0.0021 | | - | |
| MW-212C-2 | 5/19/2011 | FS | - | | - | | 0.0015 | | - | |

Notes
MG/L = milligram per liter
Cis-1,2-DCE = Cis-1,2-Dichloroethene
FS = Field Sample
FD = Field Duplicate
J = Estimated
- = analyzed, but not detected
Blank cells indicate not analyzed

| | | Group of Analysis | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Table_Param | Chromium | | Chromium | | Lead | | Lead | |
| | | Group of Fraction | Total | | Dissolved | | Total | | Dissolved | |
| | | Ppm Uom | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | QC Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-1 | 3/28/2006 | FS | 0.0036 | | | | 0.0016 | | | |
| MW-1 | 12/19/2006 | FS | | | | | | | | |
| MW-1 | 9/11/2007 | FS | | | | | | | | |
| MW-1 | 12/2/2008 | FS | | | | | | | | |
| MW-1 | 1/11/2010 | FS | | | | | | | | |
| MW-2 | 3/31/2006 | FS | 0.0224 | | | | 0.0035 | | | |
| MW-2 | 6/22/2006 | FS | 0.0012 | | | | - | | | |
| MW-2B | 12/20/2006 | FS | | | | | | | | |
| MW-2B | 9/12/2007 | FS | | | | | | | | |
| MW-2B | 12/10/2008 | FS | | | | | | | | |
| MW-2B | 3/16/2009 | FS | | | 0.0031 | J | | | 0.00017 | J |
| MW-2B | 1/4/2010 | FS | | | | | | | | |
| MW-2B | 11/3/2010 | FS | | | 0.00097 | J | | | - | |
| MW-15B | 3/31/2006 | FS | 1.113 | | | | 0.0148 | | | |
| MW-15B | 12/18/2007 | FS | 0.4653 | | 0.0071 | | 0.0039 | | - | |
| MW-15B | 3/6/2008 | FS | 0.0605 | | 0.0041 | | 0.0007 | | 0.00017 | J |
| MW-15B | 6/27/2008 | FS | 0.0099 | | 0.2169 | | - | | - | |
| MW-18B-HP2 | 3/27/2006 | FS | 0.0006 | | | | 0.0009 | | | |
| MW-18B-HP2 | 6/21/2006 | FS | 0.0196 | | | | - | | | |
| MW-18B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW-18B-HP2 | 9/12/2007 | FS | | | | | | | | |
| MW-18B-HP2 | 12/2/2008 | FS | | | | | | | | |
| MW-18B-HP2 | 3/12/2009 | FS | | | - | | | | - | |
| MW-18B-HP2 | 1/12/2010 | FS | | | | | | | | |
| MW-18B-HP2 | 11/3/2010 | FS | | | - | | | | 0.00008 | J |
| MW-27B-HP2 | 3/29/2006 | FS | 0.0139 | | | | - | | | |
| MW-27B-HP2 | 6/21/2006 | FS | 0.0504 | | | | 0.00018 | J | | |
| MW-27B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW-27B-HP2 | 9/11/2007 | FS | | | | | | | | |
| MW-27B-HP2 | 12/3/2008 | FS | | | | | | | | |
| MW-32B-HP2 | 3/27/2006 | FS | 0.0024 | | | | - | | | |
| MW-32B-HP2 | 6/22/2006 | FS | 0.0013 | | | | 0.0047 | | | |
| MW-37B-HP2 | 3/28/2006 | FS | 0.004 | | | | - | | | |
| MW-37B-HP2 | 3/28/2006 | FD | 0.0038 | | | | - | | | |
| MW-37B-HP2 | 6/22/2006 | FS | 0.0098 | | | | 0.00042 | J | | |
| MW-37B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW-37B-HP2 | 9/11/2007 | FS | | | | | | | | |
| MW-37B-HP2 | 12/5/2008 | FS | | | | | | | | |
| MW-37B-HP2 | 1/11/2010 | FS | | | | | | | | |
| MW-38B-HP2 | 3/28/2006 | FS | 0.0046 | | | | - | | | |
| MW-38B-HP2 | 6/22/2006 | FS | 0.0267 | | | | - | | | |
| MW-38B-HP2 | 12/19/2006 | FD | | | | | | | | |
| MW-38B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW-38B-HP2 | 9/11/2007 | FD | | | | | | | | |
| MW-38B-HP2 | 9/11/2007 | FS | | | | | | | | |
| MW-38B-HP2 | 12/3/2008 | FD | | | | | | | | |
| MW-38B-HP2 | 12/3/2008 | FS | | | | | | | | |
| MW-38B-HP2 | 1/4/2010 | FS | | | | | | | | |
| MW-38B-HP2 | 1/4/2010 | FD | | | | | | | | |

| | | Group of Analysis | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Table_Param | Chromium | | Chromium | | Lead | | Lead | |
| | | Group of Fraction | Total | | Dissolved | | Total | | Dissolved | |
| | | Ppm Uom | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-39B-HP4 | 3/28/2006 | FS | 0.7165 | | | | - | | | |
| MW-39B-HP4 | 6/22/2006 | FS | 0.1964 | | | | - | | | |
| MW-39B-HP4 | 12/19/2007 | FS | 0.2047 | | 0.0113 | | 0.0006 | | - | |
| MW-39B-HP4 | 3/3/2008 | FS | 0.1378 | | 0.008 | | 0.00016 | J | - | |
| MW-39B-HP4 | 6/23/2008 | FS | 0.0124 | | 0.0043 | | - | | - | |
| MW-51BR | 3/30/2006 | FS | 0.005 | | | | - | | | |
| MW-51BR | 6/23/2006 | FS | 0.0039 | | | | - | | | |
| MW-83B-2 | 12/20/2006 | FS | | | | | | | | |
| MW-83B-2 | 9/13/2007 | FS | | | | | | | | |
| MW-83B-2 | 12/2/2008 | FS | | | | | | | | |
| MW-83B-2 | 3/12/2009 | FS | | | - | | | | 0.0039 | J |
| MW-83B-2 | 1/11/2010 | FS | | | | | | | | |
| MW-83B-2 | 11/4/2010 | FS | | | 0.00074 | | | | 0.00019 | J |
| MW-88B-HP2 | 3/30/2006 | FS | 0.0015 | | | | - | | | |
| MW-88B-HP2 | 6/22/2006 | FS | 0.0018 | | | | 0.0014 | | | |
| MW-88B-HP2 | 12/20/2006 | FS | | | | | | | | |
| MW-88B-HP2 | 9/13/2007 | FS | | | | | | | | |
| MW-88B-HP2 | 12/9/2008 | FS | | | | | | | | |
| MW-88B-HP2 | 1/12/2010 | FS | | | | | | | | |
| MW-90B-4 | 6/7/2006 | FS | - | | | | - | | | |
| MW-90B-4 | 9/22/2006 | FS | - | | | | 0.00004 | J | | |
| MW-90B-4 | 12/5/2006 | FS | 0.00041 | J | | | - | | | |
| MW-90B-4 | 6/1/2007 | FS | 0.0006 | | | | - | | | |
| MW-90B-4 | 9/5/2007 | FS | - | | | | - | | | |
| MW-90B-4 | 12/10/2007 | FS | 0.0005 | | | | - | | | |
| MW-90B-4 | 3/13/2008 | FS | - | | | | - | | | |
| MW-90B-4 | 6/11/2008 | FS | - | | | | - | | | |
| MW-90B-4 | 9/11/2008 | FS | - | | | | - | | | |
| MW-90B-4 | 3/9/2009 | FS | - | | | | - | | | |
| MW-94B-4 | 6/7/2006 | FS | 0.00037 | J | | | - | | | |
| MW-94B-4 | 9/22/2006 | FS | - | | | | - | | | |
| MW-94B-4 | 12/5/2006 | FS | 0.00043 | J | | | - | | | |
| MW-94B-4 | 3/14/2007 | FS | 0.0004 | J | | | - | | | |
| MW-94B-4 | 6/1/2007 | FS | 0.00039 | J | | | - | | | |
| MW-94B-4 | 9/5/2007 | FS | - | | | | - | | | |
| MW-94B-4 | 12/10/2007 | FS | 0.0006 | | | | - | | | |
| MW-94B-4 | 3/13/2008 | FS | - | | | | - | | | |
| MW-94B-4 | 6/11/2008 | FS | - | | | | - | | | |
| MW-94B-4 | 9/11/2008 | FS | - | | | | - | | | |
| MW-94B-4 | 3/9/2009 | FS | - | | | | - | | | |
| MW-95B-4 | 6/7/2006 | FS | - | | | | - | | | |
| MW-95B-4 | 9/22/2006 | FS | - | | | | 0.00003 | J | | |
| MW-95B-4 | 12/5/2006 | FS | 0.00032 | J | | | - | | | |
| MW-95B-4 | 3/14/2007 | FS | 0.00037 | J | | | - | | | |
| MW-95B-4 | 6/1/2007 | FS | - | | | | - | | | |
| MW-95B-4 | 9/5/2007 | FS | - | | | | - | | | |
| MW-95B-4 | 12/10/2007 | FS | 0.0003 | J | | | - | | | |
| MW-95B-4 | 39520.33333 | FS | - | | | | - | | | |
| MW-95B-4 | 39610.40417 | FS | - | | | | - | | | |
| MW-95B-4 | 39702.35556 | FS | - | | | | - | | | |

| | Group of Analysis | | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Table_Param | | Chromium | | Chromium | | Lead | | Lead | |
| | Group of Fraction | | Total | | Dissolved | | Total | | Dissolved | |
| | Ppm Uom | | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-96B-4 | 38875 | FS | - | | | | - | | | |
| MW-96B-4 | 38982.34931 | FS | - | | | | 0.00003 | J | | |
| MW-96B-4 | 3/13/2008 | FS | 0.0024 | | | | 0.0008 | | | |
| MW-96B-4 | 9/11/2008 | FS | 0.0015 | | | | 0.00049 | J | | |
| MW-128A | 3/31/2006 | FS | - | | | | - | | | |
| MW-128A | 3/31/2006 | FD | - | | | | - | | | |
| MW-128A | 6/23/2006 | FD | 0.0008 | J | | | 0.00024 | J | | |
| MW-128A | 6/23/2006 | FS | 0.0013 | J | | | - | | | |
| MW-128A | 6/25/2008 | FS | - | | - | | 0.0006 | | - | |
| MW-128A | 3/17/2009 | FD | | | - | | | | 0.000077 | J |
| MW-128A | 3/17/2009 | FS | | | - | | | | - | |
| MW-128A | 12/22/2009 | FS | | | - | | | | - | |
| MW-128A | 12/22/2009 | FD | | | - | | | | - | |
| MW-128A | 11/4/2010 | FS | | | - | | | | - | |
| MW-128A | 11/4/2010 | FD | | | - | | | | 0.0005 | J |
| MW-129A | 3/31/2006 | FS | 0.0018 | | | | - | | | |
| MW-129A | 6/23/2006 | FS | 0.002 | | | | 0.00021 | J | | |
| MW-201B | 3/29/2006 | FS | 0.0005 | | | | 0.0004 | J | | |
| MW-201B | 3/29/2006 | FD | 0.0005 | | | | 0.00039 | J | | |
| MW-201B | 6/21/2006 | FS | - | | | | - | | | |
| MW-201B | 6/21/2006 | FD | 0.00041 | J | | | - | | | |
| MW-201B | 12/19/2006 | FS | | | | | | | | |
| MW-201B | 9/12/2007 | FS | | | | | | | | |
| MW-201B | 12/4/2008 | FS | | | | | | | | |
| MW-201B | 1/8/2010 | FS | | | | | | | | |
| MW-202C-2 | 12/20/2006 | FS | | | | | | | | |
| MW-202C-2 | 9/12/2007 | FS | | | | | | | | |
| MW-202C-2 | 12/4/2008 | FS | | | | | | | | |
| MW-202C-2 | 1/5/2010 | FS | | | | | | | | |
| MW-202B | 3/29/2006 | FS | - | | | | - | | | |
| MW-202B | 6/21/2006 | FS | 0.0002 | J | | | - | | | |
| MW-202B | 12/20/2006 | FS | | | | | | | | |
| MW-202B | 9/12/2007 | FS | | | | | | | | |
| MW-202B | 12/4/2008 | FS | | | | | | | | |
| MW-202B | 1/5/2010 | FS | | | | | | | | |
| MW-205B | 12/19/2006 | FS | | | | | | | | |
| MW-205B | 9/12/2007 | FS | | | | | | | | |
| MW-205B | 12/5/2008 | FS | | | | | | | | |
| MW-205B | 1/6/2010 | FS | | | | | | | | |
| MW207B-HP2 | 3/29/2006 | FS | 0.0005 | | | | - | | | |
| MW207B-HP2 | 6/23/2006 | FS | 0.0006 | | | | - | | | |
| MW207B-HP2 | 12/20/2006 | FS | | | | | | | | |
| MW207B-HP2 | 9/12/2007 | FS | | | | | | | | |
| MW207B-HP2 | 12/4/2008 | FS | | | | | | | | |
| MW-208A-2 | 12/19/2006 | FS | | | | | | | | |
| MW-208A-2 | 9/13/2007 | FS | | | | | | | | |
| MW-208A-2 | 12/4/2008 | FS | | | | | | | | |
| MW-208A-2 | 1/6/2010 | FS | | | | | | | | |

**Table D2 - Metals Data Summary**
**NSSC Five Year Review**

| | Group of Analysis | | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Table_Param | | Chromium | | Chromium | | Lead | | Lead | |
| | Group of Fraction | | Total | | Dissolved | | Total | | Dissolved | |
| | Ppm Uom | | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW208B-HP2 | 3/29/2006 | FS | 0.0014 | | | | - | | | |
| MW208B-HP2 | 6/20/2006 | FS | 0.0273 | | | | - | | | |
| MW208B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW208B-HP2 | 9/13/2007 | FS | | | | | | | | |
| MW208B-HP2 | 12/5/2008 | FS | | | | | | | | |
| MW208B-HP2 | 1/6/2010 | FS | | | | | | | | |
| MW209B-HP2 | 3/29/2006 | FS | 0.0034 | | | | 0.00039 | J | | |
| MW209B-HP2 | 6/21/2006 | FS | 0.0028 | | | | - | | | |
| MW209B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW209B-HP2 | 9/12/2007 | FS | | | | | | | | |
| MW209B-HP2 | 12/4/2008 | FS | | | | | | | | |
| MW209B-HP2 | 3/13/2009 | FS | | | 0.0012 | J | | | - | |
| MW209B-HP2 | 1/6/2010 | FS | | | | | | | | |
| MW209B-HP2 | 11/2/2010 | FS | | | 0.00051 | | | | 0.00005 | J |
| MW-211B-4 | 12/19/2006 | FS | | | | | | | | |
| MW-211B-4 | 9/12/2007 | FS | | | | | | | | |
| MW-211B-4 | 12/4/2008 | FS | | | | | | | | |
| MW-211B-4 | 1/5/2010 | FS | | | | | | | | |
| MW-212C-2 | 12/20/2006 | FS | | | | | | | | |
| MW-212C-2 | 9/12/2007 | FS | | | | | | | | |
| MW-212C-2 | 12/4/2008 | FS | | | | | | | | |
| MW-212C-2 | 1/8/2010 | FS | | | | | | | | |

Notes
MG/L = milligram per liter
Cis-1,2-DCE = Cis-1,2-Dichloroethene
FS = Field Sample
FD = Field Duplicate
J = Estimated
- = analyzed, but not detected
Blank cells indicate not analyzed

| | | Group of Analysis | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Table_Param | Manganese | | Manganese | | Nickel | | Nickel | |
| | | Group of Fraction | Total | | Dissolved | | Total | | Dissolved | |
| | | Ppm Uom | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | QC Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-1 | 3/28/2006 | FS | 0.0042 | | | | 0.0013 | | | |
| MW-1 | 12/19/2006 | FS | | | - | | | | | |
| MW-1 | 9/11/2007 | FS | | | 0.0011 | J | | | | |
| MW-1 | 12/2/2008 | FS | | | - | | | | | |
| MW-1 | 1/11/2010 | FS | | | 0.0015 | J | | | | |
| MW-2 | 3/31/2006 | FS | 0.0446 | | | | 0.0165 | | | |
| MW-2 | 6/22/2006 | FS | 0.1393 | | | | 0.0023 | J | | |
| MW-2B | 12/20/2006 | FS | | | - | | | | | |
| MW-2B | 9/12/2007 | FS | | | 0.001 | | | | | |
| MW-2B | 12/10/2008 | FS | | | - | | | | | |
| MW-2B | 3/16/2009 | FS | | | - | | | | - | |
| MW-2B | 1/4/2010 | FS | | | - | | | | | |
| MW-2B | 11/3/2010 | FS | | | 0.01276 | | | | 0.00104 | |
| MW-15B | 3/31/2006 | FS | 0.0485 | | | | 0.0855 | | | |
| MW-15B | 12/18/2007 | FS | 0.174 | | 0.147 | | 0.2574 | | 0.2341 | |
| MW-15B | 3/6/2008 | FS | 0.048 | | 0.037 | | 0.0806 | | 0.0815 | |
| MW-15B | 6/27/2008 | FS | 0.068 | | 0.07 | | 0.1516 | | 0.1311 | |
| MW-18B-HP2 | 3/27/2006 | FS | 0.0332 | | | | 0.0013 | | | |
| MW-18B-HP2 | 6/21/2006 | FS | 0.0679 | | | | 0.0043 | J | | |
| MW-18B-HP2 | 12/19/2006 | FS | | | 0.062 | | | | | |
| MW-18B-HP2 | 9/12/2007 | FS | | | 1.644 | | | | | |
| MW-18B-HP2 | 12/2/2008 | FS | | | 0.043 | | | | | |
| MW-18B-HP2 | 3/12/2009 | FS | | | 1.76 | | | | 0.0084 | J |
| MW-18B-HP2 | 1/12/2010 | FS | | | 0.578 | | | | | |
| MW-18B-HP2 | 11/3/2010 | FS | | | 1.559 | | | | 0.00324 | |
| MW-27B-HP2 | 3/29/2006 | FS | 0.0022 | | | | 0.0066 | | | |
| MW-27B-HP2 | 6/21/2006 | FS | 0.0056 | | | | 0.0071 | J | | |
| MW-27B-HP2 | 12/19/2006 | FS | | | - | | | | | |
| MW-27B-HP2 | 9/11/2007 | FS | | | 0.0055 | J | | | | |
| MW-27B-HP2 | 12/3/2008 | FS | | | - | | | | | |
| MW-32B-HP2 | 3/27/2006 | FS | - | | | | 0.0011 | | | |
| MW-32B-HP2 | 6/22/2006 | FS | 0.0071 | | | | 0.0017 | J | | |
| MW-37B-HP2 | 3/28/2006 | FS | 0.5945 | | | | 0.0058 | | | |
| MW-37B-HP2 | 3/28/2006 | FD | 0.5633 | | | | 0.006 | | | |
| MW-37B-HP2 | 6/22/2006 | FS | 0.7751 | | | | 0.0073 | | | |
| MW-37B-HP2 | 12/19/2006 | FS | | | 0.287 | | | | | |
| MW-37B-HP2 | 9/11/2007 | FS | | | 0.1377 | J | | | | |
| MW-37B-HP2 | 12/5/2008 | FS | | | - | | | | | |
| MW-37B-HP2 | 1/11/2010 | FS | | | 0.504 | | | | | |
| MW-38B-HP2 | 3/28/2006 | FS | 0.0074 | | | | 0.0076 | | | |
| MW-38B-HP2 | 6/22/2006 | FS | 0.0428 | | | | 0.0056 | J | | |
| MW-38B-HP2 | 12/19/2006 | FD | | | - | | | | | |
| MW-38B-HP2 | 12/19/2006 | FS | | | - | | | | | |
| MW-38B-HP2 | 9/11/2007 | FD | | | 0.1387 | J | | | | |
| MW-38B-HP2 | 9/11/2007 | FS | | | 0.1398 | J | | | | |
| MW-38B-HP2 | 12/3/2008 | FD | | | 0.022 | | | | | |
| MW-38B-HP2 | 12/3/2008 | FS | | | 0.0214 | | | | | |
| MW-38B-HP2 | 1/4/2010 | FS | | | 0.0074 | J | | | | |
| MW-38B-HP2 | 1/4/2010 | FD | | | 0.0077 | J | | | | |

| | Group of Analysis | | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Table_Param | | Manganese | | Manganese | | Nickel | | Nickel | |
| | Group of Fraction | | Total | | Dissolved | | Total | | Dissolved | |
| | Ppm Uom | | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-39B-HP4 | 3/28/2006 | FS | 0.0075 | | | | 0.0289 | | | |
| MW-39B-HP4 | 6/22/2006 | FS | 0.0067 | | | | 0.021 | | | |
| MW-39B-HP4 | 12/19/2007 | FS | 0.174 | | 0.167 | | 0.4527 | | 0.4697 | |
| MW-39B-HP4 | 3/3/2008 | FS | 0.0088 | J | 0.0068 | J | 0.0319 | | 0.0274 | |
| MW-39B-HP4 | 6/23/2008 | FS | 0.0054 | J | 0.0061 | J | 0.0263 | | 0.0266 | |
| MW-51BR | 3/30/2006 | FS | 0.0117 | | | | 0.0059 | | | |
| MW-51BR | 6/23/2006 | FS | 0.011 | | | | 0.0043 | | | |
| MW-83B-2 | 12/20/2006 | FS | | | - | | | | | |
| MW-83B-2 | 9/13/2007 | FS | | | 0.3245 | | | | | |
| MW-83B-2 | 12/2/2008 | FS | | | 0.0341 | | | | | |
| MW-83B-2 | 3/12/2009 | FS | | | 0.372 | | | | - | |
| MW-83B-2 | 1/11/2010 | FS | | | 0.492 | | | | | |
| MW-83B-2 | 11/4/2010 | FS | | | 0.07839 | | | | 0.00041 | J |
| MW-88B-HP2 | 3/30/2006 | FS | - | | | | 0.0012 | | | |
| MW-88B-HP2 | 6/22/2006 | FS | 0.0139 | | | | 0.0017 | J | | |
| MW-88B-HP2 | 12/20/2006 | FS | | | - | | | | | |
| MW-88B-HP2 | 9/13/2007 | FS | | | - | | | | | |
| MW-88B-HP2 | 12/9/2008 | FS | | | - | | | | | |
| MW-88B-HP2 | 1/12/2010 | FS | | | - | | | | | |
| MW-90B-4 | 6/7/2006 | FS | 0.1285 | J | | | 0.0014 | J | | |
| MW-90B-4 | 9/22/2006 | FS | 0.0715 | | | | 0.0015 | | | |
| MW-90B-4 | 12/5/2006 | FS | 0.0843 | | | | 0.0017 | | | |
| MW-90B-4 | 6/1/2007 | FS | 0.0315 | | | | 0.0021 | | | |
| MW-90B-4 | 9/5/2007 | FS | 0.04 | | | | 0.0021 | | | |
| MW-90B-4 | 12/10/2007 | FS | 0.0359 | | | | 0.0022 | | | |
| MW-90B-4 | 3/13/2008 | FS | 0.0372 | | | | 0.0022 | | | |
| MW-90B-4 | 6/11/2008 | FS | 0.0352 | | | | 0.0019 | | | |
| MW-90B-4 | 9/11/2008 | FS | 0.0373 | | | | 0.002 | | | |
| MW-90B-4 | 3/9/2009 | FS | 0.0433 | | | | 0.0019 | J | | |
| MW-94B-4 | 6/7/2006 | FS | 0.0098 | J | | | 0.00039 | J | | |
| MW-94B-4 | 9/22/2006 | FS | 0.0084 | | | | 0.00032 | J | | |
| MW-94B-4 | 12/5/2006 | FS | 0.0096 | | | | - | | | |
| MW-94B-4 | 3/14/2007 | FS | 0.0104 | | | | - | | | |
| MW-94B-4 | 6/1/2007 | FS | 0.0106 | | | | 0.00046 | J | | |
| MW-94B-4 | 9/5/2007 | FS | 0.0095 | | | | 0.00049 | J | | |
| MW-94B-4 | 12/10/2007 | FS | 0.0103 | | | | - | | | |
| MW-94B-4 | 3/13/2008 | FS | 0.0105 | | | | - | | | |
| MW-94B-4 | 6/11/2008 | FS | 0.0106 | | | | 0.00029 | J | | |
| MW-94B-4 | 9/11/2008 | FS | 0.0108 | | | | 0.0004 | J | | |
| MW-94B-4 | 3/9/2009 | FS | 0.0177 | | | | - | | | |
| MW-95B-4 | 6/7/2006 | FS | 0.0155 | J | | | 0.0006 | J | | |
| MW-95B-4 | 9/22/2006 | FS | 0.0037 | | | | 0.00045 | J | | |
| MW-95B-4 | 12/5/2006 | FS | 0.0043 | | | | - | | | |
| MW-95B-4 | 3/14/2007 | FS | 0.005 | | | | - | | | |
| MW-95B-4 | 6/1/2007 | FS | 0.0052 | | | | 0.00049 | J | | |
| MW-95B-4 | 9/5/2007 | FS | 0.0047 | | | | 0.0005 | | | |
| MW-95B-4 | 12/10/2007 | FS | 0.0053 | | | | - | | | |
| MW-95B-4 | 39520.33333 | FS | 0.006 | | | | - | | | |
| MW-95B-4 | 39610.40417 | FS | 0.0047 | | | | 0.00043 | J | | |
| MW-95B-4 | 39702.35556 | FS | 0.005 | | | | 0.0006 | | | |

| | Group of Analysis | | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Table_Param | | Manganese | | Manganese | | Nickel | | Nickel | |
| | Group of Fraction | | Total | | Dissolved | | Total | | Dissolved | |
| | Ppm Uom | | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-96B-4 | 38875 | FS | 0.1228 | J | | | 0.0008 | J | | |
| MW-96B-4 | 38982.34931 | FS | 0.0935 | | | | 0.0007 | | | |
| MW-96B-4 | 3/13/2008 | FS | 0.2694 | | | | 0.0048 | | | |
| MW-96B-4 | 9/11/2008 | FS | 0.4706 | | | | 0.0019 | | | |
| MW-128A | 3/31/2006 | FS | 6.79 | J | | | 0.0058 | | | |
| MW-128A | 3/31/2006 | FD | 7.235 | | | | 0.0059 | | | |
| MW-128A | 6/23/2006 | FD | 10.87 | | | | 0.0131 | | | |
| MW-128A | 6/23/2006 | FS | 10.63 | | | | 0.013 | | | |
| MW-128A | 6/25/2008 | FS | 7.09 | | 7.38 | | 0.0083 | | 0.0075 | |
| MW-128A | 3/17/2009 | FD | | | 13.5 | | | | 0.0112 | J |
| MW-128A | 3/17/2009 | FS | | | 12.7 | | | | 0.0098 | J |
| MW-128A | 12/22/2009 | FS | | | 12.7 | | | | 0.0132 | J |
| MW-128A | 12/22/2009 | FD | | | 12.2 | | | | 0.0128 | J |
| MW-128A | 11/4/2010 | FS | | | 18.07 | | | | 0.02149 | |
| MW-128A | 11/4/2010 | FD | | | 17.59 | | | | 0.01978 | |
| MW-129A | 3/31/2006 | FS | 0.0238 | | | | 0.0079 | | | |
| MW-129A | 6/23/2006 | FS | 0.0243 | | | | 0.009 | | | |
| MW-201B | 3/29/2006 | FS | 0.0027 | | | | 0.00031 | J | | |
| MW-201B | 3/29/2006 | FD | 0.0022 | | | | 0.00026 | J | | |
| MW-201B | 6/21/2006 | FS | 0.0008 | | | | 0.0005 | J | | |
| MW-201B | 6/21/2006 | FD | 0.0007 | | | | 0.00046 | J | | |
| MW-201B | 12/19/2006 | FS | | | - | | | | | |
| MW-201B | 9/12/2007 | FS | | | - | | | | | |
| MW-201B | 12/4/2008 | FS | | | - | | | | | |
| MW-201B | 1/8/2010 | FS | | | - | | | | | |
| MW-202C-2 | 12/20/2006 | FS | | | - | | | | | |
| MW-202C-2 | 9/12/2007 | FS | | | 0.0216 | | | | | |
| MW-202C-2 | 12/4/2008 | FS | | | 0.117 | | | | | |
| MW-202C-2 | 1/5/2010 | FS | | | 0.0045 | J | | | | |
| MW-202B | 3/29/2006 | FS | - | | | | 0.00034 | J | | |
| MW-202B | 6/21/2006 | FS | 0.00047 | J | | | 0.0007 | J | | |
| MW-202B | 12/20/2006 | FS | | | - | | | | | |
| MW-202B | 9/12/2007 | FS | | | 0.001 | | | | | |
| MW-202B | 12/4/2008 | FS | | | - | | | | | |
| MW-202B | 1/5/2010 | FS | | | - | | | | | |
| MW-205B | 12/19/2006 | FS | | | - | | | | | |
| MW-205B | 9/12/2007 | FS | | | - | | | | | |
| MW-205B | 12/5/2008 | FS | | | - | | | | | |
| MW-205B | 1/6/2010 | FS | | | - | | | | | |
| MW207B-HP2 | 3/29/2006 | FS | 0.3334 | | | | 0.0006 | | | |
| MW207B-HP2 | 6/23/2006 | FS | 0.5595 | | | | 0.0013 | | | |
| MW207B-HP2 | 12/20/2006 | FS | | | 0.259 | | | | | |
| MW207B-HP2 | 9/12/2007 | FS | | | 0.0977 | | | | | |
| MW207B-HP2 | 12/4/2008 | FS | | | 0.77 | | | | | |
| MW-208A-2 | 12/19/2006 | FS | | | - | | | | | |
| MW-208A-2 | 9/13/2007 | FS | | | - | | | | | |
| MW-208A-2 | 12/4/2008 | FS | | | - | | | | | |
| MW-208A-2 | 1/6/2010 | FS | | | - | | | | | |

**Table D2 - Metals Data Summary**
**NSSC Five Year Review**

| | Group of Analysis | | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Table_Param | | Manganese | | Manganese | | Nickel | | Nickel | |
| | Group of Fraction | | Total | | Dissolved | | Total | | Dissolved | |
| | Ppm Uom | | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW208B-HP2 | 3/29/2006 | FS | 0.0034 | | | | 0.0015 | | | |
| MW208B-HP2 | 6/20/2006 | FS | 0.0052 | | | | 0.0016 | J | | |
| MW208B-HP2 | 12/19/2006 | FS | | | 0.055 | | | | | |
| MW208B-HP2 | 9/13/2007 | FS | | | - | | | | | |
| MW208B-HP2 | 12/5/2008 | FS | | | 0.204 | | | | | |
| MW208B-HP2 | 1/6/2010 | FS | | | 0.0909 | | | | | |
| MW209B-HP2 | 3/29/2006 | FS | 0.3058 | | | | 0.016 | | | |
| MW209B-HP2 | 6/21/2006 | FS | 0.1705 | | | | 0.0181 | J | | |
| MW209B-HP2 | 12/19/2006 | FS | | | 0.191 | | | | | |
| MW209B-HP2 | 9/12/2007 | FS | | | 0.0821 | | | | | |
| MW209B-HP2 | 12/4/2008 | FS | | | 0.178 | | | | | |
| MW209B-HP2 | 3/13/2009 | FS | | | 0.124 | | | | 0.0189 | J |
| MW209B-HP2 | 1/6/2010 | FS | | | 0.0656 | | | | | |
| MW209B-HP2 | 11/2/2010 | FS | | | 0.422 | | | | 0.01436 | |
| MW-211B-4 | 12/19/2006 | FS | | | 0.289 | | | | | |
| MW-211B-4 | 9/12/2007 | FS | | | 0.1106 | | | | | |
| MW-211B-4 | 12/4/2008 | FS | | | 0.0628 | | | | | |
| MW-211B-4 | 1/5/2010 | FS | | | 0.0015 | J | | | | |
| MW-212C-2 | 12/20/2006 | FS | | | 0.091 | | | | | |
| MW-212C-2 | 9/12/2007 | FS | | | 0.0753 | | | | | |
| MW-212C-2 | 12/4/2008 | FS | | | 0.0837 | | | | | |
| MW-212C-2 | 1/8/2010 | FS | | | 0.0809 | | | | | |

Notes
MG/L = milligram per liter
Cis-1,2-DCE = Cis-1,2-Dichloroethene
FS = Field Sample
FD = Field Duplicate
J = Estimated
- = analyzed, but not detected
Blank cells indicate not analyzed

| | | Group of Analysis | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Table_Param | Thallium | | Thallium | | Vanadium | | Vanadium | |
| | | Group of Fraction | Total | | Dissolved | | Total | | Dissolved | |
| | | Ppm Uom | MG/L | | MG/L | | MG/L | | MG/L | |
| Location | Date | QC Code | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-1 | 3/28/2006 | FS | - | | | | 0.00045 | J | | |
| MW-1 | 12/19/2006 | FS | | | | | | | | |
| MW-1 | 9/11/2007 | FS | | | | | | | | |
| MW-1 | 12/2/2008 | FS | | | | | | | | |
| MW-1 | 1/11/2010 | FS | | | | | | | | |
| MW-2 | 3/31/2006 | FS | - | | | | 0.0014 | | | |
| MW-2 | 6/22/2006 | FS | - | | | | - | | | |
| MW-2B | 12/20/2006 | FS | | | | | | | | |
| MW-2B | 9/12/2007 | FS | | | | | | | | |
| MW-2B | 12/10/2008 | FS | | | | | | | | |
| MW-2B | 3/16/2009 | FS | | | - | | | | - | |
| MW-2B | 1/4/2010 | FS | | | | | | | | |
| MW-2B | 11/3/2010 | FS | | | - | | | | 0.00027 | J |
| MW-15B | 3/31/2006 | FS | - | | | | - | | | |
| MW-15B | 12/18/2007 | FS | - | | - | | - | | - | |
| MW-15B | 3/6/2008 | FS | - | | - | | - | | 0.00023 | J |
| MW-15B | 6/27/2008 | FS | - | | - | | - | | - | |
| MW-18B-HP2 | 3/27/2006 | FS | - | | | | 0.0007 | | | |
| MW-18B-HP2 | 6/21/2006 | FS | - | | | | 0.0068 | | | |
| MW-18B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW-18B-HP2 | 9/12/2007 | FS | | | | | | | | |
| MW-18B-HP2 | 12/2/2008 | FS | | | | | | | | |
| MW-18B-HP2 | 3/12/2009 | FS | | | - | | | | - | |
| MW-18B-HP2 | 1/12/2010 | FS | | | | | | | | |
| MW-18B-HP2 | 11/3/2010 | FS | | | - | | | | 0.00021 | J |
| MW-27B-HP2 | 3/29/2006 | FS | - | | | | 0.00011 | J | | |
| MW-27B-HP2 | 6/21/2006 | FS | - | | | | 0.00015 | J | | |
| MW-27B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW-27B-HP2 | 9/11/2007 | FS | | | | | | | | |
| MW-27B-HP2 | 12/3/2008 | FS | | | | | | | | |
| MW-32B-HP2 | 3/27/2006 | FS | - | | | | 0.00024 | J | | |
| MW-32B-HP2 | 6/22/2006 | FS | - | | | | - | | | |
| MW-37B-HP2 | 3/28/2006 | FS | - | | | | 0.0003 | J | | |
| MW-37B-HP2 | 3/28/2006 | FD | - | | | | 0.00032 | J | | |
| MW-37B-HP2 | 6/22/2006 | FS | - | | | | 0.00027 | J | | |
| MW-37B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW-37B-HP2 | 9/11/2007 | FS | | | | | | | | |
| MW-37B-HP2 | 12/5/2008 | FS | | | | | | | | |
| MW-37B-HP2 | 1/11/2010 | FS | | | | | | | | |
| MW-38B-HP2 | 3/28/2006 | FS | - | | | | 0.0005 | | | |
| MW-38B-HP2 | 6/22/2006 | FS | - | | | | 0.0009 | | | |
| MW-38B-HP2 | 12/19/2006 | FD | | | | | | | | |
| MW-38B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW-38B-HP2 | 9/11/2007 | FD | | | | | | | | |
| MW-38B-HP2 | 9/11/2007 | FS | | | | | | | | |
| MW-38B-HP2 | 12/3/2008 | FD | | | | | | | | |
| MW-38B-HP2 | 12/3/2008 | FS | | | | | | | | |
| MW-38B-HP2 | 1/4/2010 | FS | | | | | | | | |
| MW-38B-HP2 | 1/4/2010 | FD | | | | | | | | |

| | | Group of Analysis | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Table_Param | Thallium | | Thallium | | Vanadium | | Vanadium | |
| | | Group of Fraction | Total | | Dissolved | | Total | | Dissolved | |
| | | Ppm Uom | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-39B-HP4 | 3/28/2006 | FS | - | | | | - | | | |
| MW-39B-HP4 | 6/22/2006 | FS | - | | | | - | | | |
| MW-39B-HP4 | 12/19/2007 | FS | - | | - | | - | | - | |
| MW-39B-HP4 | 3/3/2008 | FS | 0.00002 | J | - | | - | | 0.00012 | J |
| MW-39B-HP4 | 6/23/2008 | FS | - | | - | | - | | - | |
| MW-51BR | 3/30/2006 | FS | - | | | | - | | | |
| MW-51BR | 6/23/2006 | FS | - | | | | 0.00025 | J | | |
| MW-83B-2 | 12/20/2006 | FS | | | | | | | | |
| MW-83B-2 | 9/13/2007 | FS | | | | | | | | |
| MW-83B-2 | 12/2/2008 | FS | | | | | | | | |
| MW-83B-2 | 3/12/2009 | FS | | | - | | | | - | |
| MW-83B-2 | 1/11/2010 | FS | | | | | | | | |
| MW-83B-2 | 11/4/2010 | FS | | | - | | | | 0.00133 | |
| MW-88B-HP2 | 3/30/2006 | FS | - | | | | 0.00039 | J | | |
| MW-88B-HP2 | 6/22/2006 | FS | - | | | | 0.0008 | | | |
| MW-88B-HP2 | 12/20/2006 | FS | | | | | | | | |
| MW-88B-HP2 | 9/13/2007 | FS | | | | | | | | |
| MW-88B-HP2 | 12/9/2008 | FS | | | | | | | | |
| MW-88B-HP2 | 1/12/2010 | FS | | | | | | | | |
| MW-90B-4 | 6/7/2006 | FS | - | | | | - | | | |
| MW-90B-4 | 9/22/2006 | FS | - | | | | - | | | |
| MW-90B-4 | 12/5/2006 | FS | - | | | | - | | | |
| MW-90B-4 | 6/1/2007 | FS | - | | | | 0.00025 | J | | |
| MW-90B-4 | 9/5/2007 | FS | - | | | | 0.00024 | J | | |
| MW-90B-4 | 12/10/2007 | FS | - | | | | 0.00043 | J | | |
| MW-90B-4 | 3/13/2008 | FS | - | | | | 0.00029 | J | | |
| MW-90B-4 | 6/11/2008 | FS | - | | | | 0.0003 | J | | |
| MW-90B-4 | 9/11/2008 | FS | - | | | | 0.00019 | J | | |
| MW-90B-4 | 3/9/2009 | FS | - | | | | - | | | |
| MW-94B-4 | 6/7/2006 | FS | - | | | | 0.00031 | J | | |
| MW-94B-4 | 9/22/2006 | FS | - | | | | - | | | |
| MW-94B-4 | 12/5/2006 | FS | - | | | | - | | | |
| MW-94B-4 | 3/14/2007 | FS | - | | | | 0.00028 | J | | |
| MW-94B-4 | 6/1/2007 | FS | - | | | | 0.0004 | J | | |
| MW-94B-4 | 9/5/2007 | FS | - | | | | 0.00028 | J | | |
| MW-94B-4 | 12/10/2007 | FS | - | | | | 0.0006 | | | |
| MW-94B-4 | 3/13/2008 | FS | - | | | | 0.00032 | J | | |
| MW-94B-4 | 6/11/2008 | FS | - | | | | 0.00037 | J | | |
| MW-94B-4 | 9/11/2008 | FS | - | | | | 0.00025 | J | | |
| MW-94B-4 | 3/9/2009 | FS | - | | | | - | | | |
| MW-95B-4 | 6/7/2006 | FS | - | | | | - | | | |
| MW-95B-4 | 9/22/2006 | FS | - | | | | - | | | |
| MW-95B-4 | 12/5/2006 | FS | - | | | | - | | | |
| MW-95B-4 | 3/14/2007 | FS | - | | | | - | | | |
| MW-95B-4 | 6/1/2007 | FS | - | | | | 0.00026 | J | | |
| MW-95B-4 | 9/5/2007 | FS | - | | | | 0.00026 | J | | |
| MW-95B-4 | 12/10/2007 | FS | - | | | | 0.00021 | J | | |
| MW-95B-4 | 39520.33333 | FS | - | | | | 0.00028 | J | | |
| MW-95B-4 | 39610.40417 | FS | - | | | | 0.00023 | J | | |
| MW-95B-4 | 39702.35556 | FS | - | | | | 0.00019 | J | | |

| | | Group of Analysis | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Table_Param | Thallium | | Thallium | | Vanadium | | Vanadium | |
| | | Group of Fraction | Total | | Dissolved | | Total | | Dissolved | |
| | | Ppm Uom | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW-96B-4 | 38875 | FS | - | | | | - | | | |
| MW-96B-4 | 38982.34931 | FS | - | | | | - | | | |
| MW-96B-4 | 3/13/2008 | FS | - | | | | 0.0019 | | | |
| MW-96B-4 | 9/11/2008 | FS | - | | | | 0.0007 | | | |
| MW-128A | 3/31/2006 | FS | - | | | | - | | | |
| MW-128A | 3/31/2006 | FD | - | | | | - | | | |
| MW-128A | 6/23/2006 | FD | - | | | | 0.00045 | J | | |
| MW-128A | 6/23/2006 | FS | - | | | | 0.00046 | J | | |
| MW-128A | 6/25/2008 | FS | - | | - | | - | | - | |
| MW-128A | 3/17/2009 | FD | | | - | | | | - | |
| MW-128A | 3/17/2009 | FS | | | - | | | | - | |
| MW-128A | 12/22/2009 | FS | | | - | | | | - | |
| MW-128A | 12/22/2009 | FD | | | - | | | | - | |
| MW-128A | 11/4/2010 | FS | | | - | | | | - | |
| MW-128A | 11/4/2010 | FD | | | - | | | | - | |
| MW-129A | 3/31/2006 | FS | - | | | | 0.0009 | | | |
| MW-129A | 6/23/2006 | FS | - | | | | 0.0008 | | | |
| MW-201B | 3/29/2006 | FS | - | | | | 0.00032 | J | | |
| MW-201B | 3/29/2006 | FD | - | | | | 0.00031 | J | | |
| MW-201B | 6/21/2006 | FS | - | | | | 0.00032 | J | | |
| MW-201B | 6/21/2006 | FD | - | | | | - | | | |
| MW-201B | 12/19/2006 | FS | | | | | | | | |
| MW-201B | 9/12/2007 | FS | | | | | | | | |
| MW-201B | 12/4/2008 | FS | | | | | | | | |
| MW-201B | 1/8/2010 | FS | | | | | | | | |
| MW-202C-2 | 12/20/2006 | FS | | | | | | | | |
| MW-202C-2 | 9/12/2007 | FS | | | | | | | | |
| MW-202C-2 | 12/4/2008 | FS | | | | | | | | |
| MW-202C-2 | 1/5/2010 | FS | | | | | | | | |
| MW-202B | 3/29/2006 | FS | - | | | | 0.00017 | J | | |
| MW-202B | 6/21/2006 | FS | - | | | | - | | | |
| MW-202B | 12/20/2006 | FS | | | | | | | | |
| MW-202B | 9/12/2007 | FS | | | | | | | | |
| MW-202B | 12/4/2008 | FS | | | | | | | | |
| MW-202B | 1/5/2010 | FS | | | | | | | | |
| MW-205B | 12/19/2006 | FS | | | | | | | | |
| MW-205B | 9/12/2007 | FS | | | | | | | | |
| MW-205B | 12/5/2008 | FS | | | | | | | | |
| MW-205B | 1/6/2010 | FS | | | | | | | | |
| MW207B-HP2 | 3/29/2006 | FS | - | | | | 0.00048 | J | | |
| MW207B-HP2 | 6/23/2006 | FS | - | | | | 0.00041 | J | | |
| MW207B-HP2 | 12/20/2006 | FS | | | | | | | | |
| MW207B-HP2 | 9/12/2007 | FS | | | | | | | | |
| MW207B-HP2 | 12/4/2008 | FS | | | | | | | | |
| MW-208A-2 | 12/19/2006 | FS | | | | | | | | |
| MW-208A-2 | 9/13/2007 | FS | | | | | | | | |
| MW-208A-2 | 12/4/2008 | FS | | | | | | | | |
| MW-208A-2 | 1/6/2010 | FS | | | | | | | | |

**Table D2 - Metals Data Summary**
**NSSC Five Year Review**

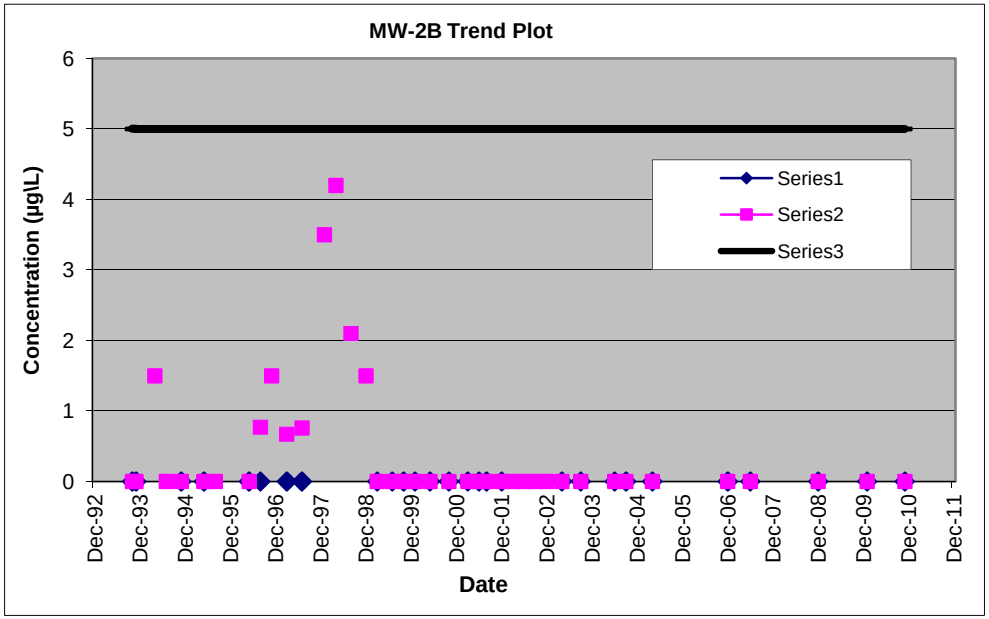
| | | Group of Analysis | Metals | | Metals | | Metals | | Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Table_Param | Thallium | | Thallium | | Vanadium | | Vanadium | |
| | | Group of Fraction | Total | | Dissolved | | Total | | Dissolved | |
| | | Ppm Uom | MG/L | | MG/L | | MG/L | | MG/L | |
| **Location** | **Date** | **QC Code** | Result | Qualifier | Result | Qualifier | Result | Qualifier | Result | Qualifier |
| MW208B-HP2 | 3/29/2006 | FS | - | | | | 0.00022 | J | | |
| MW208B-HP2 | 6/20/2006 | FS | - | | | | - | | | |
| MW208B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW208B-HP2 | 9/13/2007 | FS | | | | | | | | |
| MW208B-HP2 | 12/5/2008 | FS | | | | | | | | |
| MW208B-HP2 | 1/6/2010 | FS | | | | | | | | |
| MW209B-HP2 | 3/29/2006 | FS | - | | | | 0.0107 | | | |
| MW209B-HP2 | 6/21/2006 | FS | - | | | | 0.0144 | | | |
| MW209B-HP2 | 12/19/2006 | FS | | | | | | | | |
| MW209B-HP2 | 9/12/2007 | FS | | | | | | | | |
| MW209B-HP2 | 12/4/2008 | FS | | | | | | | | |
| MW209B-HP2 | 3/13/2009 | FS | | | - | | | | 0.0101 | J |
| MW209B-HP2 | 1/6/2010 | FS | | | | | | | | |
| MW209B-HP2 | 11/2/2010 | FS | | | - | | | | 0.00707 | |
| MW-211B-4 | 12/19/2006 | FS | | | | | | | | |
| MW-211B-4 | 9/12/2007 | FS | | | | | | | | |
| MW-211B-4 | 12/4/2008 | FS | | | | | | | | |
| MW-211B-4 | 1/5/2010 | FS | | | | | | | | |
| MW-212C-2 | 12/20/2006 | FS | | | | | | | | |
| MW-212C-2 | 9/12/2007 | FS | | | | | | | | |
| MW-212C-2 | 12/4/2008 | FS | | | | | | | | |
| MW-212C-2 | 1/8/2010 | FS | | | | | | | | |

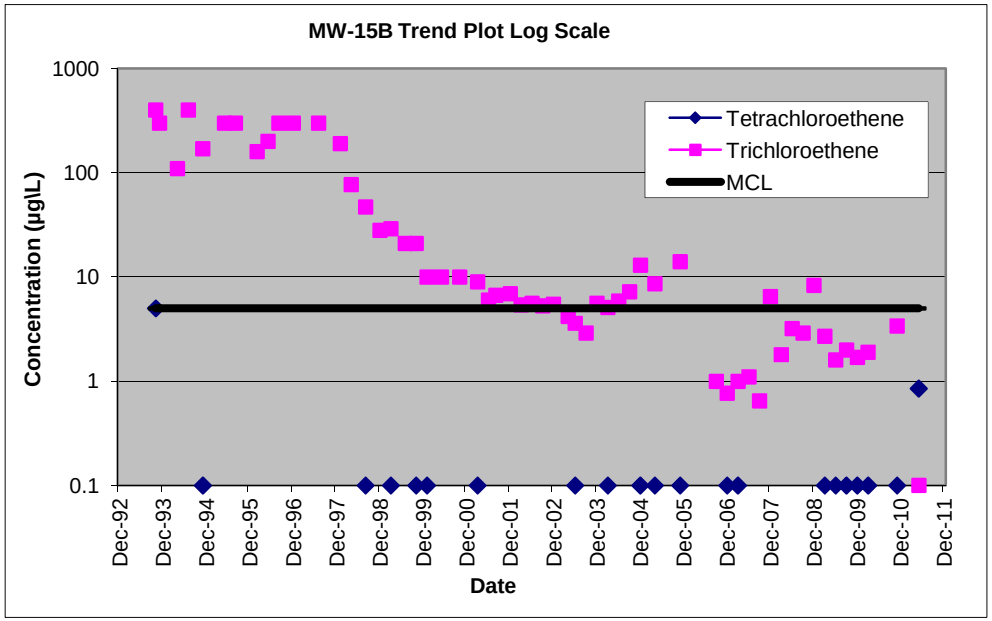
Notes
MG/L = milligram per liter
Cis-1,2-DCE = Cis-1,2-Dichloroethene
FS = Field Sample
FD = Field Duplicate
J = Estimated
- = analyzed, but not detected
Blank cells indicate not analyzed

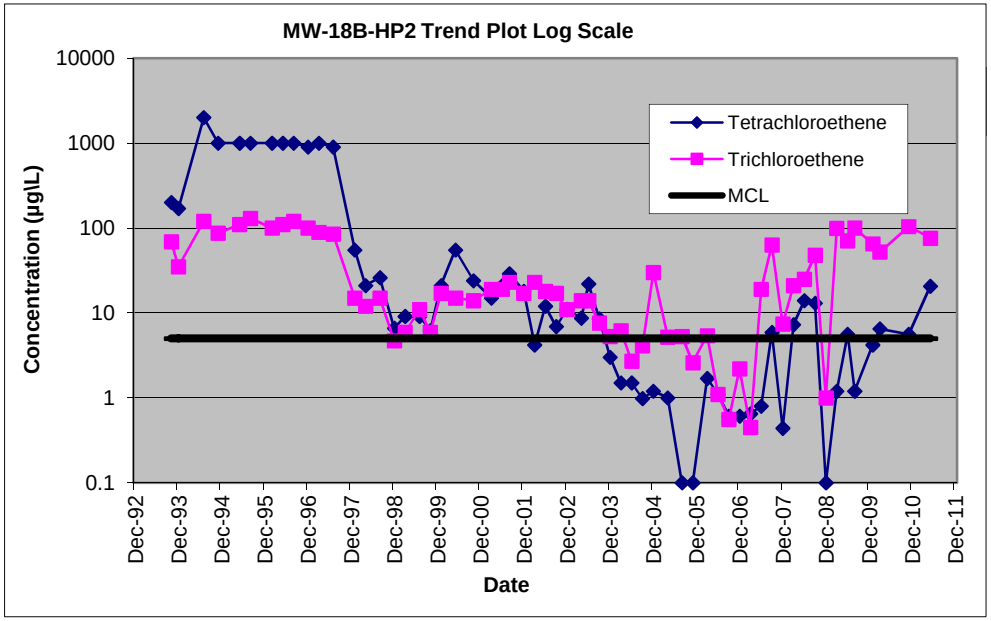
# APPENDIX E

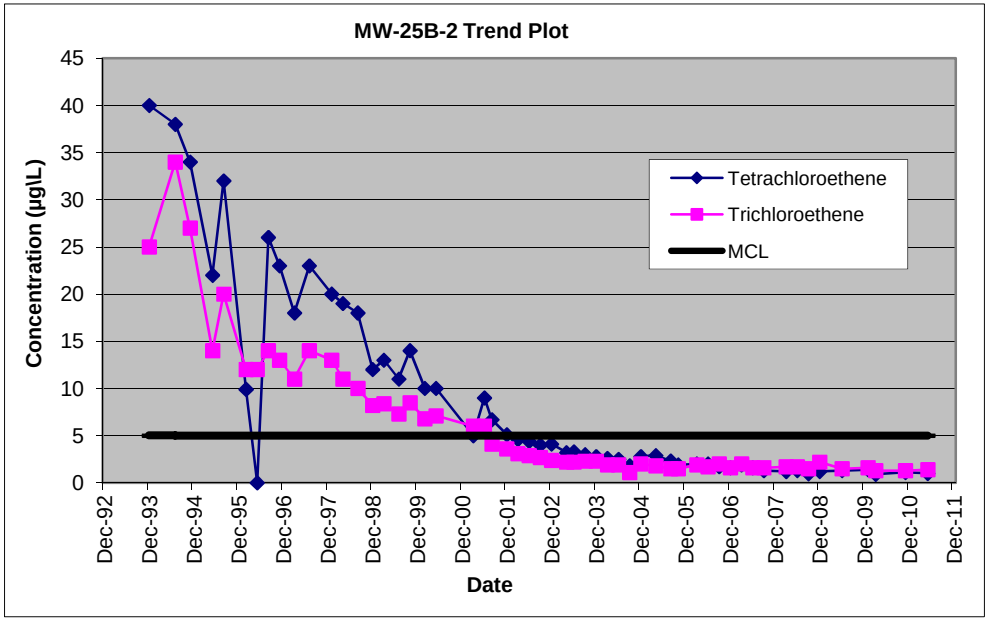
# LONG-TERM MONITORING DATA TIME SERIES PLOTS

PCE and TCE Concentrations in Selected T-25 Monitoring Wells



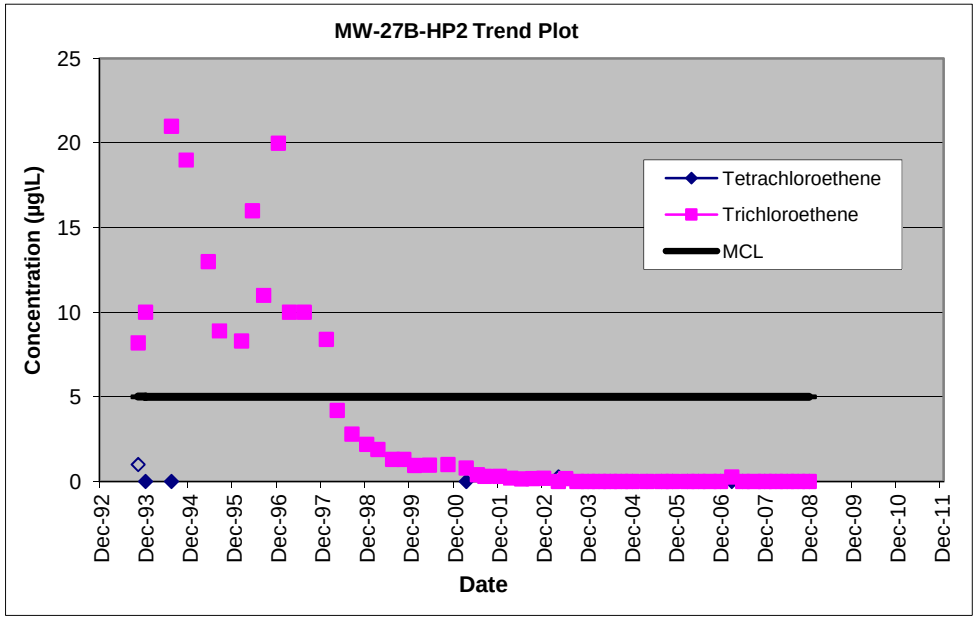



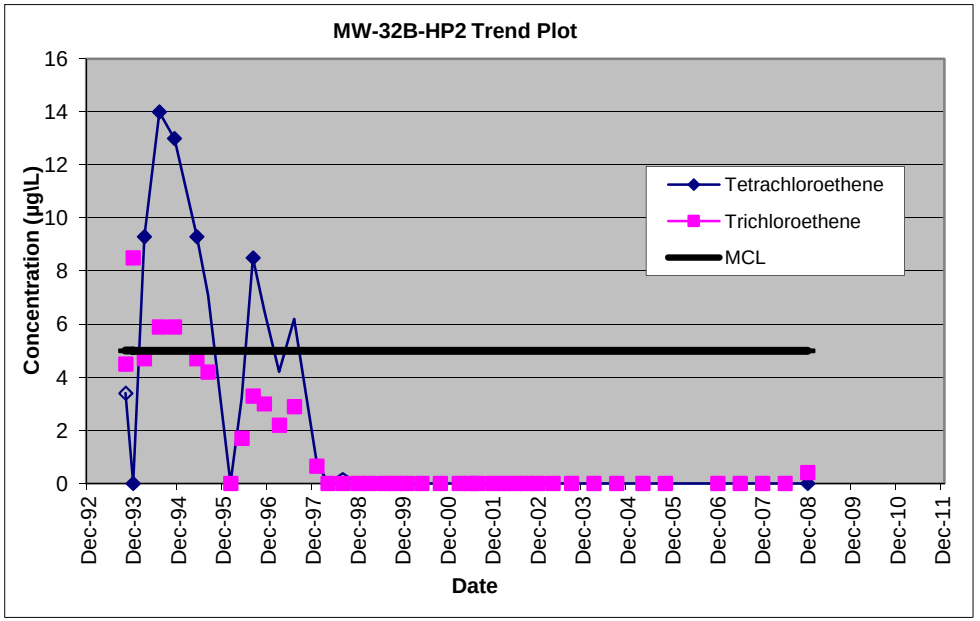



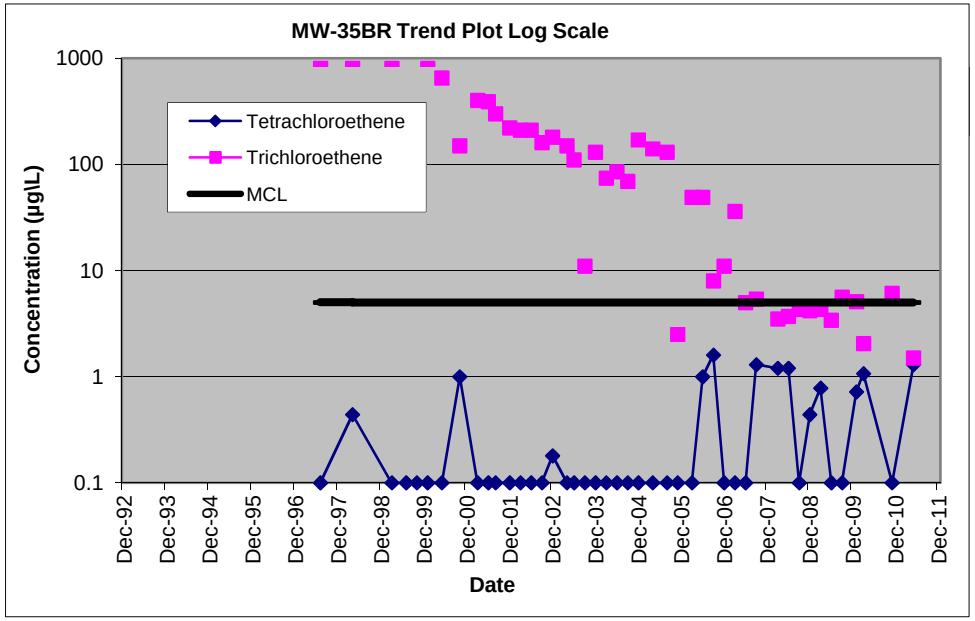



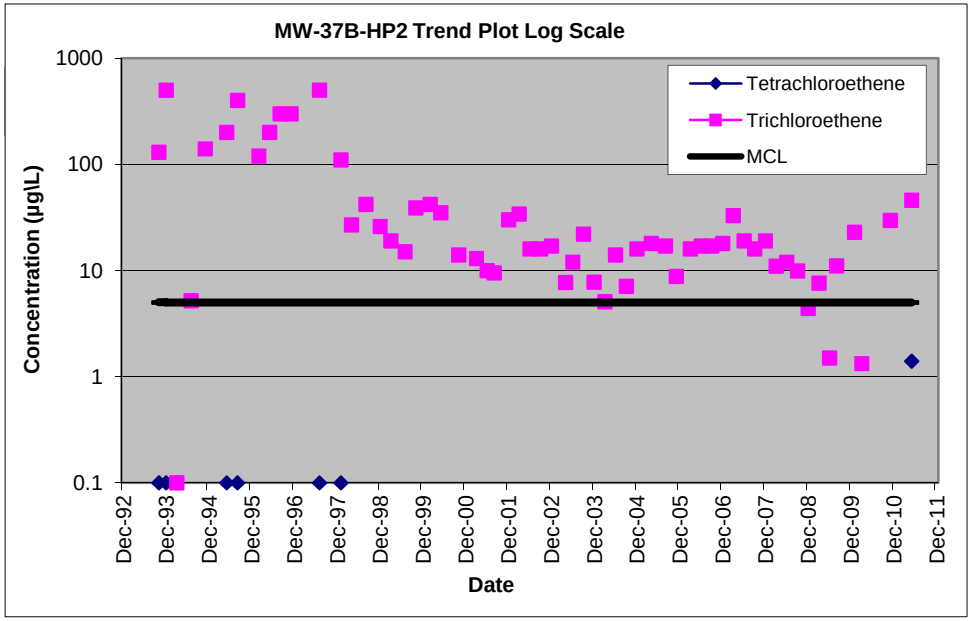

Prepared by DJC
Checked by WAM

PCE and TCE Concentrations in Selected T-25 Monitoring Wells

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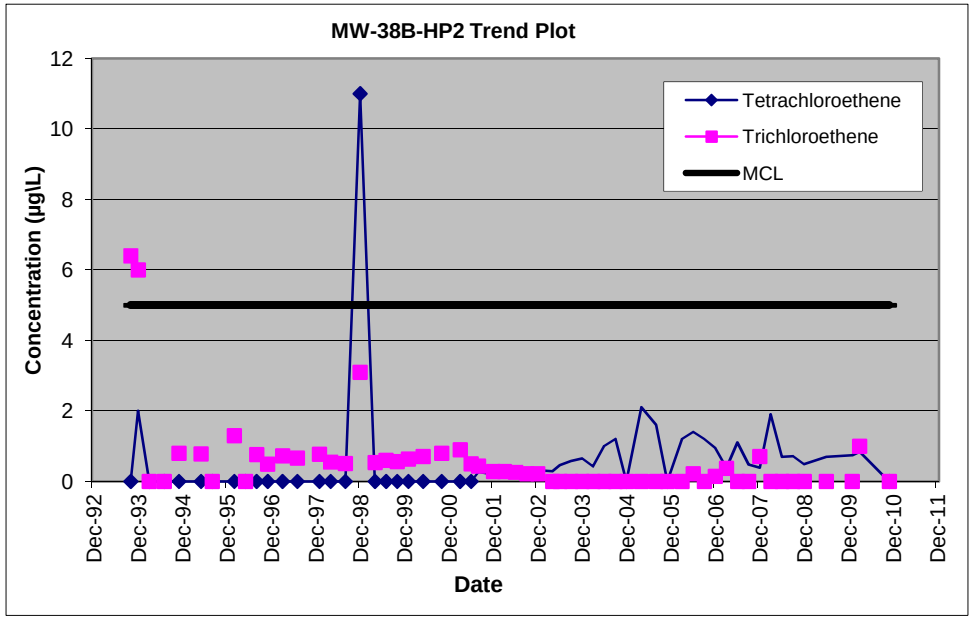
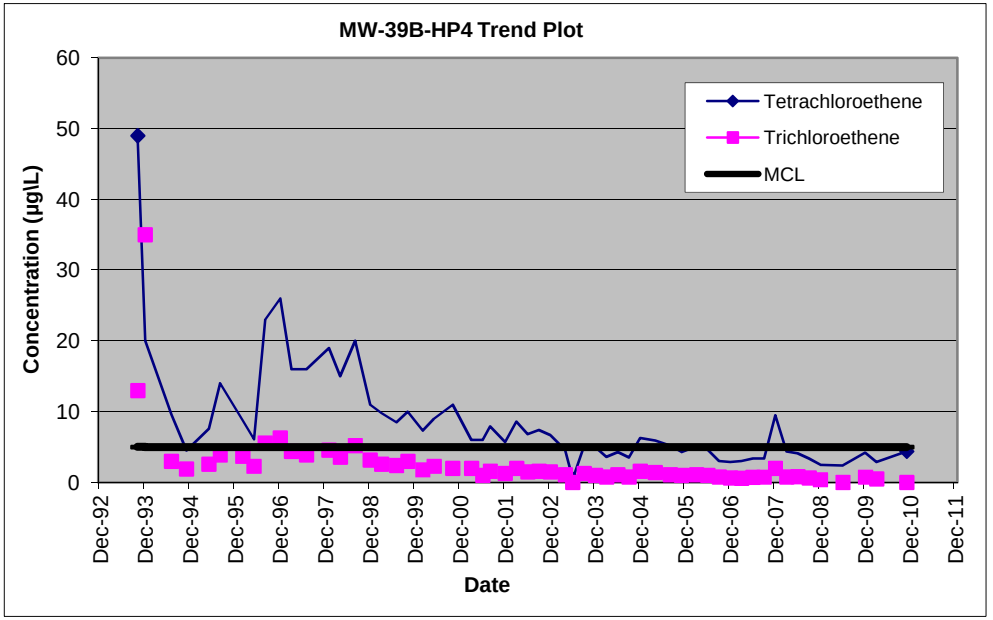
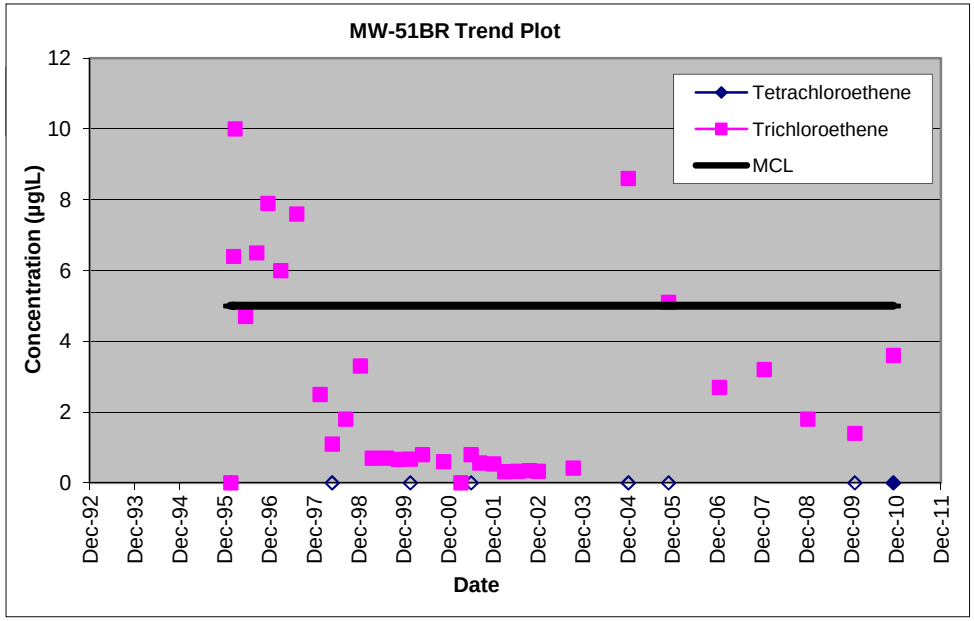
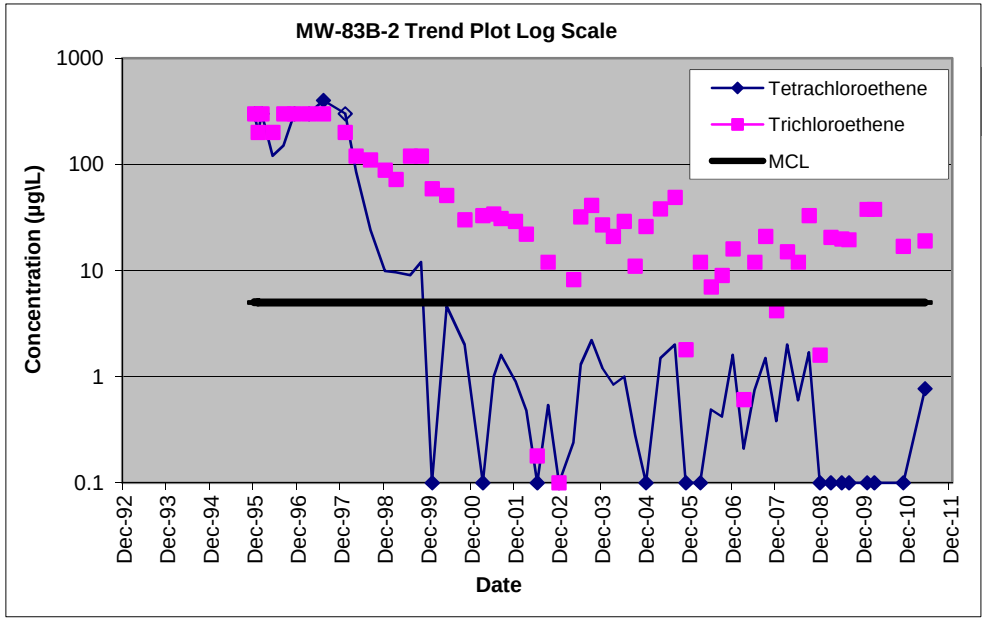
PCE and TCE Concentrations in Selected T-25 Monitoring Wells

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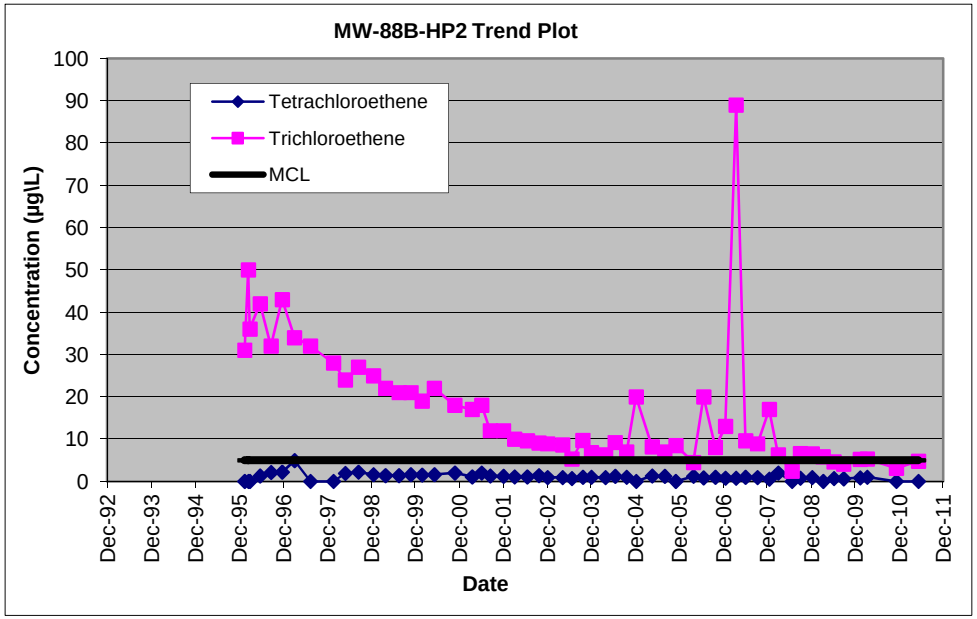
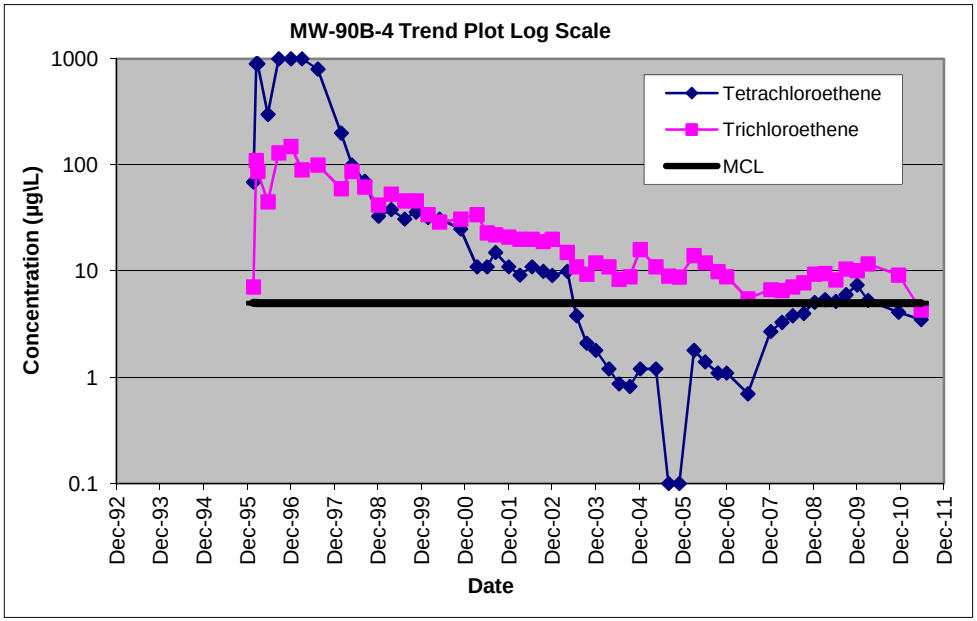
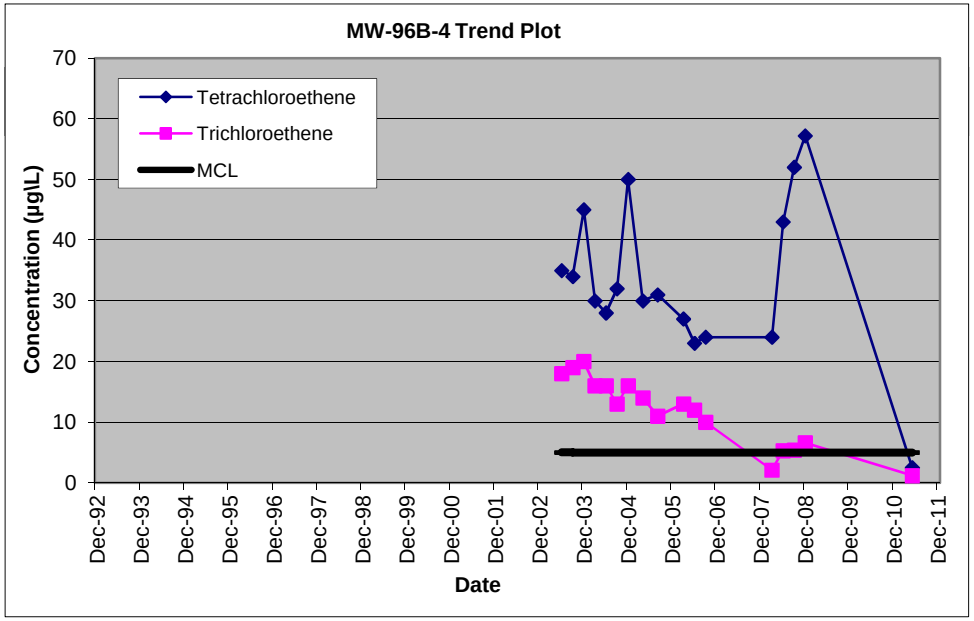
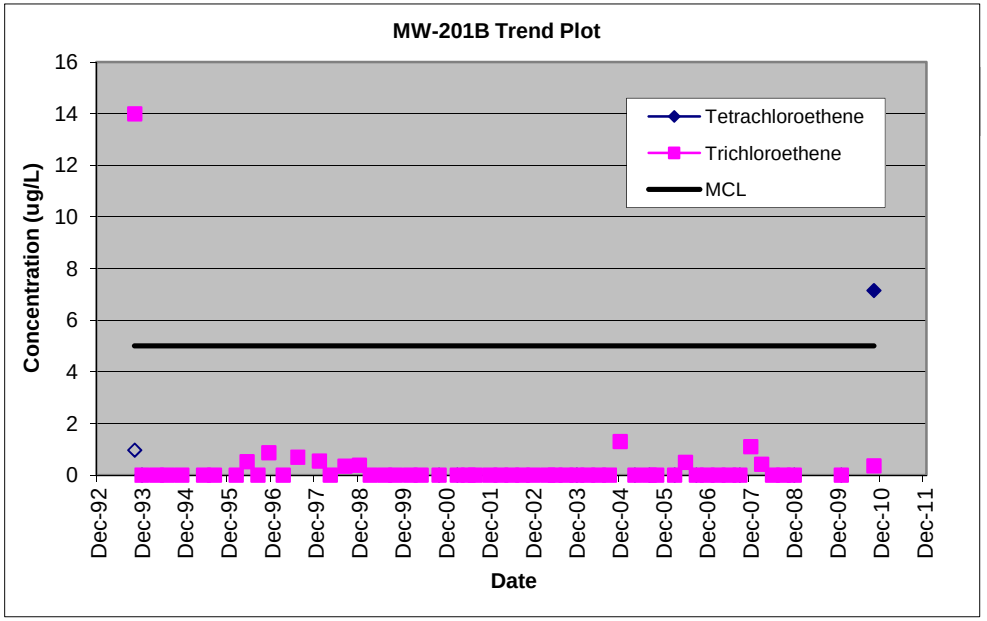
PCE and TCE Concentrations in Selected T-25 Monitoring Wells



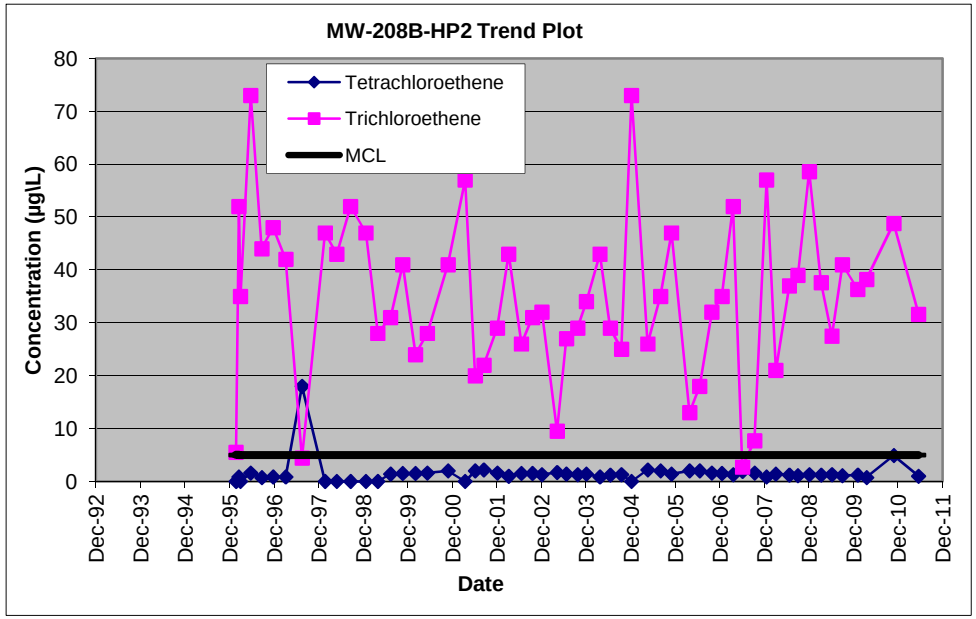



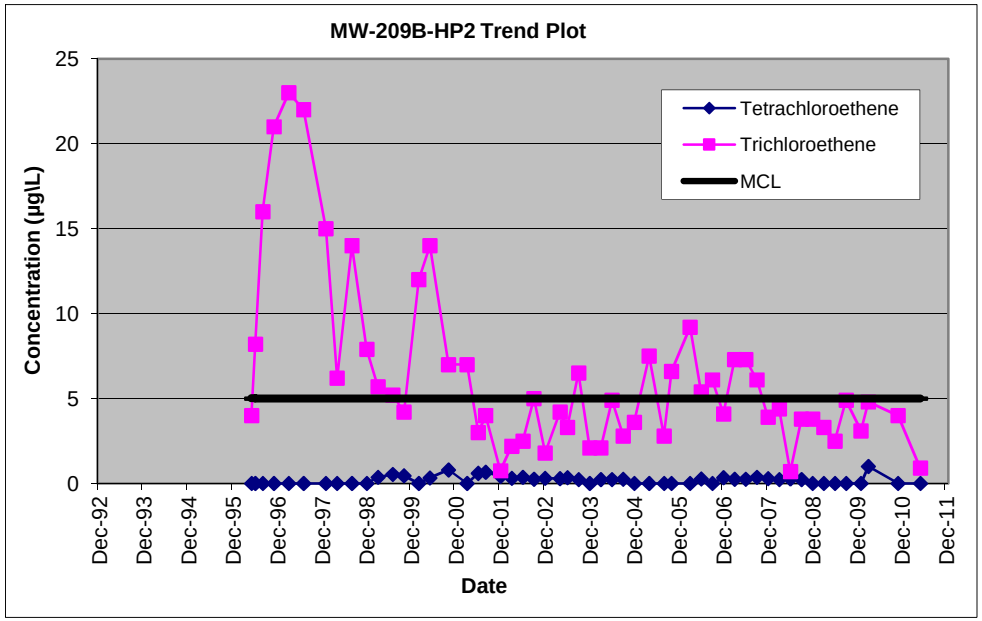



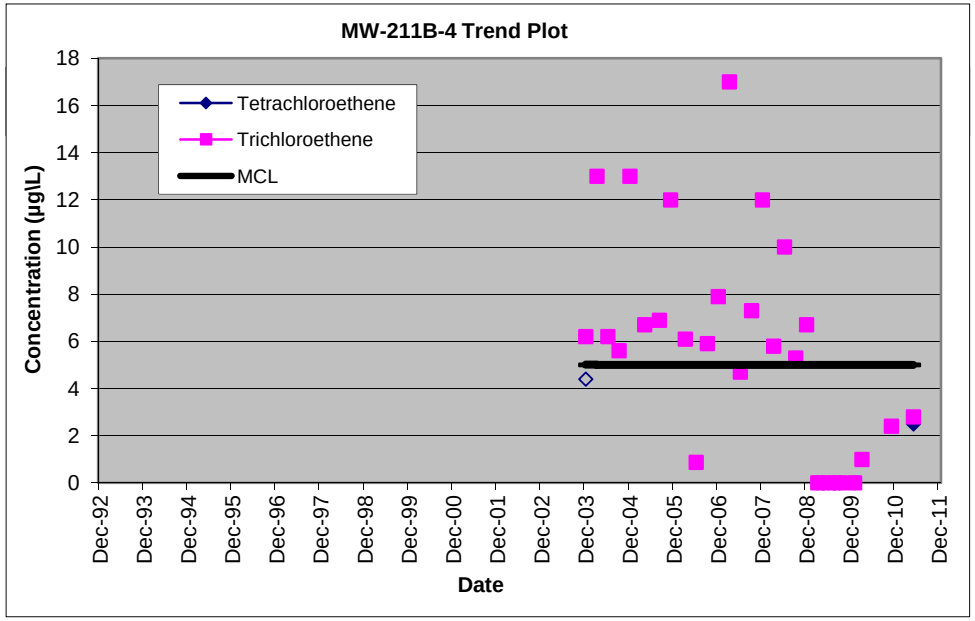




Prepared by DJC
Checked by WAM

Figure 2: PCE and TCE Concentrations in Selected T-25 Monitoring Wells




Prepared by DJC
Checked by WAM

# APPENDIX F

# INTERVIEWS

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Natick Soldier Systems Center, Natick, Massachusetts | | **EPA ID No.:** MA1210020631 |
| **Subject:** OU-1, T-25 Area Groundwater, Five-Year Review | **Time:** | **Date:** 12/15/2011 |

## Interviewer

| | | |
|---|---|---|
| **Name:** Stanley Reed | **Title:** Prin. Engineer | **Organization:** AMEC E&I |

## Individual Contacted

| | | |
|---|---|---|
| **Name:** James Connolly | **Title:** Restoration Program Manager | **Organization:** NSSC |
| **Telephone No:** 508.233.5550<br>**E-Mail Address:** james.b.connolly@us.army.mil | | **Street Address:** Kansas St<br>**City, State, Zip:** Natick, MA 01760-5049 |

## Summary Of Conversation

1. What building construction or other site changes have taken place at the T-25 Area during the past five years? Do these changes have the potential to significantly change storm water infiltration or groundwater flow?
   Completion of Building 110 (Thermal Test Facility) and 111, as well as expansion of Building 44. None of these have been shown to impact stormwater infiltration, groundwater flow, or remedy operation.

2. Are you aware of any planned construction or changes in land-use at the T-25 Area during the upcoming five years? Do these changes have potential to significantly change storm water infiltration, groundwater flow, or the groundwater remedy and its effectiveness?
   Replacement of the western half of Building T-24 with a new, permanent warehouse building is planned. The should not impact stormwater infiltration, groundwater flow, or remedy operation.

3. Are you aware of any plans to use groundwater beneath the T-25 Area or the neighboring downgradient area for potable use?
   No. This would not be allowed under the SSC Master Plan or the Town of Natick groundwater use bylaw, for operations outside the SSC fence line.

4. Are there any plans to modify the operation of the groundwater remedy?
   ECC has proposed suspending air-phase carbon treatment of effluent as a green initiative.

5. Are you aware of any community concerns regarding the T-25 Area groundwater remedy? If yes, please provide details.
   Not that I am aware of.

6. Are you aware of any issues that may call into question the short-term or long-term effectiveness of the remedy?
   Not that I am aware of

7. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.
   No.

8. What is your overall impression of the project and long-term monitoring activities at the T-25 Area?
   The project is operating according to plan and continues to be safe and effective.

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Natick Soldier Systems Center, Natick, Massachusetts | | **EPA ID No.:** MA1210020631 |
| **Subject:** OU-1, T-25 Area Groundwater, Five-Year Review | **Time:** ` | **Date:** |

## Interviewer

| | | |
|---|---|---|
| **Name:** Stanley Reed | **Title:** Prin. Engineer | **Organization:** AMEC E&I |

## Individual Contacted

| | | |
|---|---|---|
| **Name:** Marco Kaltolfen | **Title:** Community Cochair | **Organization:** Restoration Advisory Board |
| **Telephone No:** 5086511661<br>**E-Mail Address:** kaltofen@wpi.com | **Street Address:** 5 Water Street<br>**City, State, Zip:** Natick, MA 01760 | |

## Summary Of Conversation

1. What is your overall impression of the project and long-term monitoring activities at the T-25 Area?
   There was some difficulty getting this program moving, but outstanding issues appear to be resolved. After some back and forth, the overall program was much improved by a groundwater model which was much more precise than the original proposal. The addition of wells in the area offsite and to the North of the T25 area helped determine where the plume was headed, and at what rate. It is impossible to separate the need for continued monitoring and treatment at the Town of Natick wellfield to the North of the T25 area. The impact to this area is clear. The overall level of investigative active at the T25 area is sufficient so long as moniotoring and treatment continue at the Town of Natick wellfield. Should this change at the WTP in the future, then a much more aggressive effort would be required at the T25 area.
2. Do you feel well informed about the site's activities and progress?
   Generally yes.
3. Are you aware of any community concerns regarding the T-25 Area groundwater remedy? If yes, please provide details.
   Yes I am. The presence of PCE, TCE, and their degradation byproducts below homes is a concern due to the possibility of vapor intrusion. This is especially true of vinyl chloride, which is dificult to detect even at levels of concern, say 2.1 ug/L.
4. Are you aware of any issues that may call into question the short-term or long-term effectiveness of the effectiveness of the remedy?
   The continued appearance of new zones of detectable TCE, as well as the slow dissappearance of low levels of TCE throughout the site is a cause of stress for water users and adjacent homeowners.
5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?
   The site's in-house staff have been universally professional and courteous. After some intial head butting, the staff has been exceptionally forthcoming with imporatant data for the community. I have worked at other sites with a RAB, and Mr. McCassie and particularly, Mr. McHugh, have represented the Natick Command well.

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Natick Soldier Systems Center, Natick, Massachusetts | | **EPA ID No.:** MA1210020631 |
| **Subject:** OU-1, T-25 Area Groundwater, Five-Year Review | | **Time:** 1030 **Date:** 12/8/2011 |

## Interviewer

| | | |
|---|---|---|
| **Name:** Stanley Reed | **Title:** Prin. Engineer | **Organization:** AMEC E&I |

## Individual Contacted

| | | |
|---|---|---|
| **Name:** David Reault | **Title:** T-25 Treatment Facility Operator | **Organization:** ECC |
| **Telephone No:** 508-562-2092<br>**E-Mail Address:** Dreault@ecc.net | | **Street Address:** 33 Boston Post Rd., West, Sutie 340<br>**City, State, Zip:** Marlboro, MA 01752 |

## Summary Of Conversation

1. What is your overall impression of the project and long-term monitoring activities at the T-25 Area?
   Excellent. The T-25 systems runs consistently well with no compliance issues.
2. Is there a continuous on-site O&M presence? If yes, please describe staff and activities. If no, describe staff and frequency of site inspections and activities.
   On-site presence is approximately 20-24 hours per week, 24/7 remote monitoring and response capability.
3. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since start-up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts.
   No significant changes.
4. What measures have been taken to maintain or improve extraction well flow/performance during the last five years?
   Frequent pump cleanings and replacements are performed as needed to maintain adequate flow from the remote wells. Local wells run consistently with no issues.
5. Have there been unexpected O&M difficulties or costs at the site since start-up or in the last five years? If so, please give details.
   No.
6. Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
   Slight reduction in sampling frequency. Improved remote capabilities to allow reduction in on-site presence.
7. Do you have any comments, suggestions, or recommendations regarding the project?
   The use of the air stripper and GAC seem redundant for treatment of the influent concentrations, eliminating the air stripper and associated equipment (blowers, process heater, and VGAC) would significantly reduce electrical consumption and sampling requirements.

# INTERVIEW RECORD

| | | |
|---|---|---|
| **Site Name:** Natick Soldier Systems Center, Natick, Massachusetts | | **EPA ID No.:** MA1210020631 |
| **Subject:** OU-1, T-25 Area Groundwater, Five-Year Review | **Time:** | **Date:** |

## Interviewer

| | | |
|---|---|---|
| **Name:** Stanley Reed | **Title:** Prin. Engineer | **Organization:** AMEC E&I |

## Individual Contacted

| | | |
|---|---|---|
| **Name:** Christine Williams | **Title:** Remedial Project Manager | **Organization:** USEPA – Region 1 |
| **Telephone No:** 617.918.1384<br>**E-Mail Address:** williams.christine@epamail.epa.gov | **Street Address:** 5 Post Office Square, Suite 100<br>**City, State, Zip:** Boston, MA 02109 | |

## Summary Of Conversation

1. What is your overall impression of the project and long-term monitoring activities at the T-25 Area?
   My overall impression of the cleanup has been positive. The Army has been responsive to any concerns I've voiced.
2. Are you aware of any community concerns regarding the T-25 Area groundwater remedy? If yes, please provide details.
   No specific conerns have been brought to my attention.
3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.
   EPA has an oversight role under the Federal Faiclity Agreement. Any issues found during our oversight activities have been promptly dealt with and resolved.
4. Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? If so, please give details of the events and results of the responses.
   Not that I'm aware of.
5. Do you feel well informed about the site's activities and progress?
   Yes
6. Are you aware of changes in laws or regulations that may affect remedy implementation or protectiveness?
   In May 2011 MassDEP lowered the 1,4-dioxane standard. In 2011 EPA released new informaion in the IRIS database for TCE and screening values for many chemicals were updated on the EPA website.
7. Are you aware of any issues that may call into question the short-term or long-term effectiveness of the remedy?
   Not that I'm aware of at this time prior to the review of the document.
8. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?
   No

# APPENDIX G

# RESPONSE TO USEPA COMMENTS

# RESPONSE TO USEPA COMMENTS
# ON DRAFT SECOND FIVE-YEAR REVIEW REPORT

**NATICK SOLDIER SYSTEMS CENTER**
**NATICK, MASSACHSETTS**


**MARCH, 2012**

**USEPA Comments Dated March 16, 2012**

**Comment 1.** Figures and data are provided up to the November 2010 sampling round. Additional sampling occurred in both spring and fall of 2011, including MWs 169 and 178 which were sampled in ME#63 after a few years of not being sampled. Will you be including this data for evaluation in the five year review since the summary indicates the review period goes through December 31, 2011?

**Response:** The Five-Year Review includes data from May 2011 (Event 62) in Appendix D and includes discussion of May 2011 data in Subsection 6.4. Data for Event 63 (Fall 2011) were not available at the time that the Five-Year Review was drafted, and the report has not been edited to include the fall data. The first paragraph of Subsection 6.4 and first paragraph on page 7-6 have been edited to clarify that the most recent available data were used.

**Comment 2.** Please clarify when EW 96 B-4 will be sampled next and when it will be consistently pumping again.

**Response:** MW-96B was placed back online in March 2012. It will be on the same sampling schedule as all of the other T-25 extraction wells. The following sentence has been added to the first footnote to the table in Subsection 5.1.2:

"It was brought back online in March 2012."

**Comment 3.** The 5YR provides the updated toxicity values for TCE (available September 2011). The revised values, combined with the assumptions used in the Regional Screening Levels table, results in an HI of approximately 2 for TCE at the MCL cleanup level of 5. The inhalation of vapors from household use of groundwater is the largest contributor to the noncancer hazard. This pathway was not quantitatively assessed in the risk assessment; however, it was qualitatively addressed in the 5YR. To my knowledge, Region 1 has not ever set cleanup levels below the MCL.

**Response:** Comment noted. No change required.

**Comment 4.** Page 2-2; please include the 2007 and 2008 RODs for No Further Action for soils.

**Response:** The following items have been added to the OU-1 chronology table.

| | |
|---|---|
| 2007 | No Further Action ROD signed for soil at Buildings 62 and 68 (MACTEC, 2007) |
| 2008 | No Further Action ROD signed for soil at the T-25 Area, Building 14 and Former Building 13 (ICF, 2008). |

**Comment 5.** Page 3-3, second ¶, please add a sentence to explain that the subareas were subject to No Further Action RODs in 2007 & 2008.

**Response:** The following wording has been added at the end of the second full paragraph on page 3-3:

"No Further Action RODs were signed in 2007 for soil at Buildings 62 and 68 (MACTEC, 2007) and in 2008 for soil at the T-25 Area, Building 14 and Former Building 13 (ICF, 2008)."

**Comment 6.** Page 4-3, §4.3.1, Please re-write to clarify that the extraction and treatment system was constructed as a pilot study and that the ROD in 2001 was signed to document the remedy.

**Response:** The first sentence of Subsection 4.3.1 has been rewritten as follows:

"The Army completed construction of the groundwater extraction and treatment system in 1997 and began operation of the system as a pilot study in November of that year. The ROD was signed in 2001 to document the system as the T-25 groundwater remedy."

**Comment 7.** Page 5-1, last¶.§5.2.1 & §5.2.2, Please add a sentence to explain the Army's plans for evaluation of the improved capture/containment.

Response: The following sentence has been added at the end of Subsection 5.2.2:

"NSSC plans continued inclusion of the groundwater capture zone analysis in groundwater extraction and treatment system annual reports."

**Comment 8.** Page 7-7, 3rd¶, 2nd sentence: This sentence indicates that the risk assessment toxicity values have been updated through August 2011 as displayed in Table 7-2. However, in March 2012, revisions to published toxicity values for perchloroethylene were made within the Integrated Risk Information System (IRIS) database. These revised values should be updated in Table 7-2 and this

portion of text revised as necessary. The MCL of 5 ug/L is within the cancer risk range and well below HI=1 using the revised values.

**Response:** Table 7-2 has been updated to indicate the revisions to perchloroethylene made in March 2012. Also, the text on page 7-7 has been edited to indicate that human health toxicity values have been updated through March 2012.

**Comment 9.** Table 7-1, please note that the 300 ug/l cleanup level for Manganese is the health advisory and should also be included in the ROD ARAR tables as a TBC. Please also note that although currently there is no requirement for these secondary CoCs to be included in the LTMP, Army must demonstrate that the aquifer meets MCLs in order for the remedy to be considered complete.

**Response**: The following wording has been added for manganese in Table 7-1:

Revision of the Changes in ARARs and TBC column

> "In addition, USEPA Region 1 currently recommends the **health advisory** concentration of 300 µg/L as a manganese cleanup level."

Added to the Recommended Change column

> "USEPA considers 300 µg/L as TBC for manganese."

The Five-year Review is not able to change the ARARs listed in the ROD.

**Comment 10.** Table 7-2-Table note (2)-please indicate the units of measure of the Inhalation Concentration Slope Factors and resulting inhalation unit risk (IUR) used for this calculation.

**Response:** The table has been edited as requested.