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Preliminary Close Out Report

NATICK LABORATORY ARMY RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER

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(Natick Soldier Systems Center)

Middlesex County

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Prepared by:

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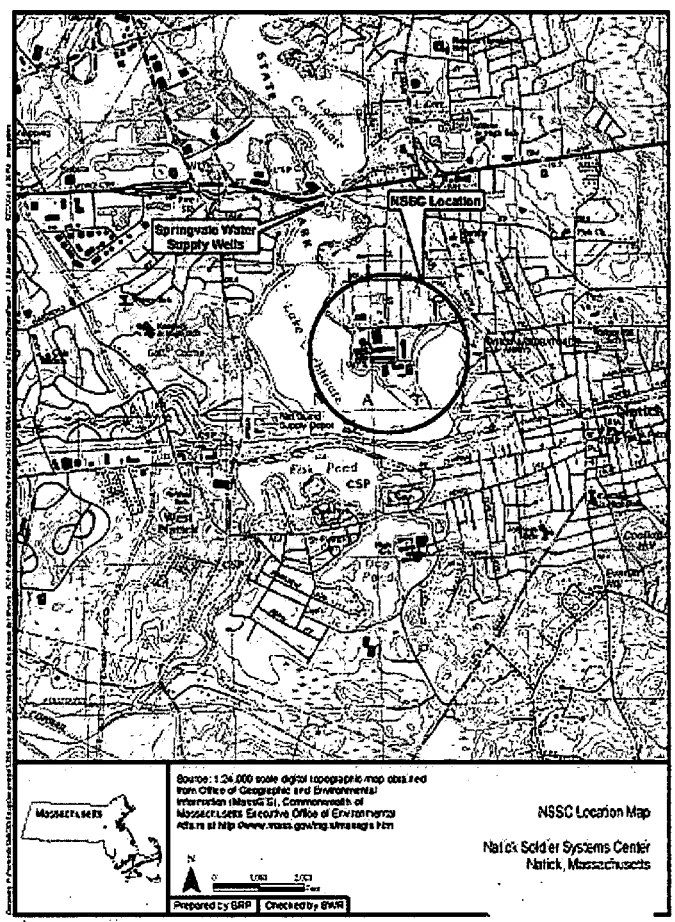


TABLE OF CONTENTS PAGE

FIGURES 3

EXECUTIVE SUMMARY 4

1.0 PRELIMINARY CLOSEOUT REPORT OVERVIEW 5
1.1 BACKGROUND ON NSSC 5

2.0 REMEDIAL CONSTRUCTION ACTIVITIES 8
2.1 Operable Unit 1, T-25 Area & Facility Wide Groundwater 8
2.1.1 Summary of Site Conditions 8
2.1.2 Demonstration of Cleanup Activity Quality Assurance and Quality Control 12
2.1.3 Site Completion 12

2.2 Operable Unit 2, Sediments 14
2.2.1.1 Summary of Site Conditions 14
2.2.1.2 Green Remediation 15
2.2.2 Demonstration of Cleanup Activity Quality Assurance and Quality Control 15
2.2.3 Site Completion 16

2.3 Operable Unit 3, former proposed Gymnasium Site and Buildings 62&68 Area and Operable Unit 4, Former Building 13 and Building 14 Area, Boiler Plant Area and T-25 Area 17
2.3.1 Summary of Site Conditions 17
2.3.1.1 Former Proposed Gymnasium Site 17
2.3.1.2 Buildings 62&68 Area 18
2.3.1.3 Former Building 13 and Building 14 Area 19
2.3.1.4 Boiler Plant Area 21
2.3.1.5 T-25 Area 22
2.3.2 Demonstration of Cleanup Activity Quality Assurance and Quality Control 25
2.3.3 Site Completion 25
2.4 Vapor Intrusion (VI) 25
2.5 Emerging Contaminants 26
2.5.1 1,4 Dioxane 26
2.5.2 Perfluorinated Compounds 27

4.0 Institutional Controls 28

5.0 Five Year Reviews 29

6.0 Activities and Schedule for Site Completion 29

FIGURES

TITLE	PAGE NUMBER
Location of NSSC Operable Units	7
Plume map (OU1)	11
Groundwater Treatment System	13
OU2 Sediment Dewatering Area	16
OU2 Dredge Pictures	16
OU3 Former Proposed Gymnasium Site	18
OU3-Buildings 62 & 86 Area	19
OU4- Building 14 & Former Building 13 Area	21
OU4 Boiler Plant Area	22
OU4 T-25 Area	24
Vapor Intrusion Investigation Sampling Areas	26
1,4-Dioxane Treatment System	28

EXECUTIVE SUMMARY

Introduction

At the Natick Laboratory Army Research, Development, and Engineering Center, currently named Natick Soldier Systems Center (NSSC), National Priorities List (NPL) Site, all remedial actions have been completed or are being performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). In accordance with Executive Order 12580, the United States Army is designated the lead agency to conduct CERCLA cleanup activities at NSSC and is responsible for all costs associated with the cleanup. U.S. EPA New England and the Commonwealth of Massachusetts Department of Environmental Protection (MassDEP) are the agencies responsible for the oversight of the Army's cleanup actions.

This Preliminary Close Out Report (PCOR) summarizes the completion of all construction activities at the NSSC NPL Site and identifies the remaining tasks and associated schedule for final Site close out and de-listing.

Organization

This PCOR covers the Operable Units (OUs) where construction activities have been completed. OUs that did not require construction of a remedy are also briefly summarized in the respective sections of the PCOR. The table on the next page summarizes when the cleanup remedy was selected in a Record of Decision (ROD) for each OU and the status of response actions for each OU. Other than operation and maintenance (O&M) and long-term monitoring (LTM) activities that will be conducted by the Army to demonstrate continued remedy performance and the achievement of performance standards, all response actions have been completed for the Site.

Summary

This PCOR documents that the Army has completed all construction activities at the NSSC NPL Site. The report was prepared in accordance with *Close Out Procedures for National Priorities List Sites* (OSWER Directive 9320.2-09A-P). Representatives from the EPA and the MassDEP conducted pre-final inspections on April 23, 2013 and June 9, 2014 and determined that the Army has completed all construction in accordance with the remedial design/construction plans and specifications. No further response actions are anticipated for this Site.

Operable Unit	Operable Unit Name	ROD/Decision Document	Date	All Response Actions Taken?
1	T-25 Area Groundwater and Facility Wide Groundwater	ROD & ESD	4/2001 & 5/2013	Yes
2	Sediments	ROD	9/2009	Yes
3	Soil Removal Actions at the former Proposed Gym Site & Buildings T62 & T68Area	ROD	9/2007	Yes
4	Soil Removal Actions at former Buildings 13 & 14 Area, Boiler Plant Area, and T-25 Area	ROD	9/2008	Yes

See figure on page 7.

1.0 PRELIMINARY CLOSE-OUT REPORT OVERVIEW

At the Natick Laboratory Army Research, Development, and Engineering Center, currently named Natick Soldiers System Center (NSSC), all site-specific remedial actions have been constructed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This Preliminary Close-Out Report (PCOR) documents the completion of construction activities at this National Priorities List (NPL) Site and summarizes follow-on actions remaining before NSSC can be de-listed.

1.1 BACKGROUND

NSSC is an active research and testing facility, owned and operated by the federal government through the Department of the Army. NSSC is located approximately 17 miles west-southwest of Boston in the Town of Natick, Middlesex County, Massachusetts. NSSC has been a permanent Army installation since October 1954, and its mission includes research and development activities in food engineering; food science; clothing, equipment, and materials engineering; and aero-mechanical engineering. The Site occupies a 74-acre area on a small peninsula extending from the eastern shoreline of South Pond in Lake Cochituate. Future land use is expected to remain consistent with current use as an active Army facility.

The land surrounding NSSC includes residential, commercial/retail, and light industrial areas. The ground water beneath the Site is designated as a Zone II wellhead protection area for the Town of Natick Springvale municipal water supply well field.

NSSC was proposed to the NPL on May 10, 1993 (58 FR 27507) and listed on the NPL on May 31, 1994 (59 FR 27989) to evaluate and implement response actions to cleanup past releases of hazardous substances, pollutants, and contaminants.

A Federal Facility Agreement (FFA) between the U.S. Department of the Army and the U.S. Environmental Protection Agency (EPA) was signed in August 2006 to establish a legal and procedural framework for ensuring that appropriate response actions are implemented at NSSC. The Army is the lead agency responsible for environmental cleanup at this Site.

The environmental investigations started in 1980 with the U.S. Army Environmental Center (USAEC) performing 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 various governmental agencies; interviews with current and former employees; and an inspection of the installation. The assessment identified 15 Areas of Concern (AOCs). These AOCs were grouped into four operable units (OUs) by EPA as follows:

EPA Operable Unit	Army Designation
OU1	All facility contaminated groundwater including: T-25 Area, Buildings 22 & 36 Area, Buildings 63, 2 & 45 Area, Monitoring Well 114B-2 Area, and ARIEM Building Area
OU2	Sediment at Transitory Shelter Area of T-25 and Building 2 &45 Parking Lot Outfall. Soil and Sediment at Building 5, PCB Contamination Site and PAD
OU3	Soil at Former Proposed Gymnasium Site and at the Buildings T-62 and T-68 Area
OU4	Soil at former Building 13 classified Incinerator, Boiler Plant Area (Building 19), Chlordane Contamination, Pit Area Waste Oil Storage Tank, T-25 Bulk Hazardous Waste Storage Area, and at the Building 14 POL Hazardous Area

OU1, which includes all groundwater contamination from the site, is the only OU currently undergoing long term remediation. The remedial action for OU2, sediment contamination, was completed and a long term response action was not required. Removal actions at OU3 and OU4, soil contamination, eliminated the need for long term remedial actions at these two OUs.

SOURCES
ICF Consulting
Office of Geographic and Environmental Information (MassGIS)
Commonwealth of Massachusetts Executive Office of Environmental Affairs
U.S. Geological Survey

ICF INTERNATIONAL

Meters
0 75 150 225 300

N

U.S. Army SSC Operable Units and Outfall Locations

2.0 REMEDIAL CONSTRUCTION ACTIVITIES

2.1 Operable Unit 1, Facility Wide Groundwater

2.1.1 Summary of Site Conditions

Operable Unit 1 includes all of the contaminated groundwater at NSSC, (see plume map on page 11). The original Record of Decision (ROD) was signed in 2001 and only included one area of concern, the T-25 area. Subsequently, additional areas of concern were added through an Explanation of Significant Difference (ESD) signed on May 13, 2013 (SDMS DocID 530806). The T-25 Area is a 15.6-acre, rectangular plot located in the northwestern portion of the NSSC facility. Past and present operations within the T-25 Area have included: quarrying; indoor and outdoor storage of bulk items, wastes, petroleum, solvents, antifreeze, pesticides, and Freon 113; warehouse operations (shipping and receiving); laboratory research, including the testing of petroleum, oil and lubricant pumping equipment, refrigeration units, and various types of fuel in engines; clothing and textile research; drop-testing; waste incineration; and garage operations, including spray painting, vehicle maintenance, insect and rodent control, metal parts and brush cleaning, battery charging, silk screening, and rubber adhesive thinning. Site-related contaminants are trichloroethene (TCE) and perchloroethene (PCE) in groundwater. The maximum concentration found in groundwater was 2000 ppb for PCE and 1100 ppb for TCE. Currently the maximum concentration of TCE is 60.2 ppb and the maximum concentration of PCE is 18.3 ppb. Concentrations have been decreasing, but are still above MCLs.

The RAOs for the OU1 ROD are:

- 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

The AOC for Buildings 22 and 36 was added to the OU1 ROD through an ESD signed in 2013. This AOC is located in the southwestern portion of the facility. The primary site-related contaminant at this AOC is PCE in groundwater above MCLs. The plume of PCE contamination contains two lobes originating beneath Building 36 with one lobe migrating to the southeast and the other migrating to the west and northwest. Both lobes discharge to Lake Cochituate. The maximum concentrations of PCE in monitoring well samples at the Buildings 22 and 36 AOC were 230 ppb in June 2002 and 300 ppb in June 2001. Concentrations of PCE in groundwater appear to be decreasing. Currently, the maximum PCE concentration is 78 ppb in this plume.

The AOC for Buildings 63, 2, and 45 , also added to the OU1 ROD in the 2013 ESD, is located several hundred feet east of Buildings 22 and 36. The primary site-related contaminant at this AOC is TCE in groundwater above MCLs. The majority of TCE contamination exists as a plume with its origin in the vicinity of Buildings 2 and 45. The plume is migrating to the south and also discharges to Lake Cochituate. The maximum observed TCE concentration was 170 ppb. Concentrations of TCE in monitoring well samples appear to be decreasing. Currently the maximum concentration in this plume is 136 ppb.

The MW114B-2 Area, also added to the OU1 ROD through the 2013 ESD, is located directly east of Building 1. The associated parking lot runs adjacent to the shore of Pegan Cove for a distance of approximately 600 feet,

is approximately 200 feet wide, and separates Building 1 from the cove. The primary contaminant in groundwater in the small area surrounding MW114B-2 is PCE which has fluctuated between 54 ppb in September 2006 and non-detect in May 2012. Currently the concentration is 6 ppb. This small area of groundwater contamination is limited to contamination in only one well.

The ARIEM Building Area is located approximately 100 feet east of Building 2 on the east side of the peninsula along the shore of Pegan Cove. The maximum TCE groundwater concentration found was 23 ppb in a monitoring well located 17 feet north of the building, and the area of groundwater contamination extends in a northerly and easterly direction toward Pegan Cove. The concentration of TCE in a monitoring well 40 feet from the shore of Pegan Cove has been found to be 10.3 ppb in 2012 and currently is 8.6 ppb.

While the groundwater in OU1 discharges to Lake Cochituate on both sides of the peninsula, the contamination does not pose a risk to the environment.

The selected remedy for the T-25 Area, and subsequently the rest of the contaminated groundwater at the site, was groundwater extraction with air stripping/carbon adsorption and long-term monitoring, institutional controls, and monitored natural attenuation. The groundwater extraction and treatment system is constructed to contain T-25 Area groundwater contamination within NSSC boundaries while monitored natural attenuation will address on- and off-installation contamination not captured by the extraction and treatment system. Institutional controls required by the T-25 ROD are contained in the NSSC Master Plan (SDMS DocID 261870) which prohibit potable use of facility groundwater. In addition, the ROD required the Natick Board of Health to implement regulations prohibiting installation of potable drinking water wells in the area surrounding NSSC. The regulations were established between 1999 and 2001. Long-term monitoring and operations data are being used to assess whether the remedy continues to be effective. Extracted groundwater is treated by air stripping and activated carbon adsorption at a treatment facility constructed for that purpose at the T-25 area. Treated groundwater is delivered to a storage tank behind Building 10 that supplies the installation's non-potable water distribution system. Non-potable water is supplied to lawn sprinklers, cooling tower makeup, and restroom flushing water piping. Overflow from this system is discharged to the storm sewer system which discharges to Lake Cochituate. The T-25 Area groundwater extraction and treatment system has been in operation since November 1997. The 2013 ESD optimized the treatment system by removal of the air-strippers and relying on carbon adsorption as the only remaining treatment.

NSSC implemented a groundwater containment pilot study for contaminated groundwater at the area near Buildings 22 and 36 Area and the area near Buildings 63, 2, and 45 for the purpose of reducing migration of contaminated groundwater to Lake Cochituate. The Pilot Study containment system consists of groundwater extraction wells at each area and a buried force main. Extracted groundwater is pumped and combined with extracted groundwater from the T-25 Area for treatment and subsequent discharge. No changes to the treatment processes were necessary to treat the additional PCE and TCE from this area. The capacity of the treatment facility is approximately 160 gallons per minute (gpm). In 2013, the average flow from the T-25 Area was 68 gpm, while the flow from the Buildings 22 and 36 and Buildings 63, 2, and 45 areas was approximately 10 gpm, resulting in a combined flow of 78 gpm.

The pilot study containment system has been shown to be effective in shrinking the size of the plumes, and concentrations show a general decreasing trend. Operation is currently anticipated to continue until cleanup goals are reached.

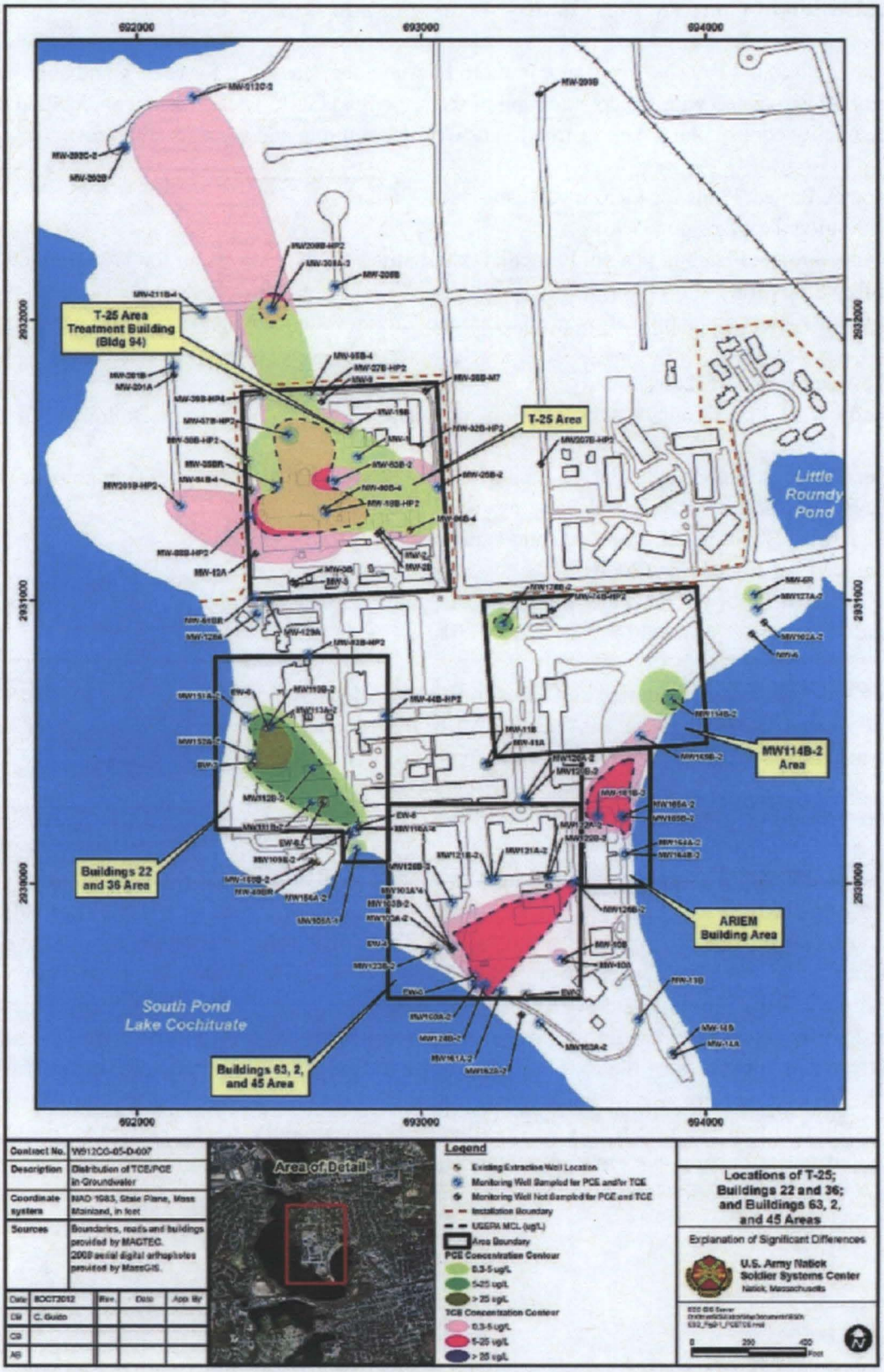
The 2013 ESD also included periodic slug volume removal of contaminated groundwater from two localized areas outside of the capture zones for the extraction and treatment system. These two localized areas are at the north end of the ARIEM Building [Building 42] at MW165B-2 and MW-181B-2; and at the east side of the

parking lot east of Building 1 at MW114B-2. The slug volume removal system will consist of periodic pumping of selected wells (MW165B-2, MW-181B-2 and MW114B-2) to remove a sufficient volume of contaminated groundwater to prevent the migration into Pegan Cove. The slug volumes of groundwater from the ARIEM Building Area will be approximately 960 gallons, equally divided between MW165B-2 and MW-181B-2, every 3 months, and from the MW114B-2 Area will be approximately 2,400 gallons every 3 months. These volumes will be fed into the T-25 treatment facility, Building 94, (see pictures on page 13).

One additional well (MW-178B-2) installed for the MW114B-2 investigation, had PCE contamination at 6.7 ppb in October 2012 and currently is 6 ppb. To address this exceedance of the MCL, extraction well MW-96B-4 was restarted in 2014 and operated for a period of two years to evaluate its effect on reducing the contamination in MW-178B-2. If contamination is not reduced to below MCLs after the two years, slug volume removals from MW-178B-2 will be initiated similar to the slug removals planned for monitoring wells in the ARIEM Building Area and the MW114B-2 Area.

Long Term Monitoring (LTM) has occurred over 69 events since 1993. The LTM plan currently includes semi-annual water quality sampling and analysis of groundwater from 56 selected wells for VOCs, EPH/VPH, 1, 4-dioxane, and pesticides at a fixed laboratory as well as field analysis for dissolved iron and water quality parameters. Dissolved metals is also evaluated to support the Five Year Review evaluation. Regular water-level monitoring of all wells within, up gradient, and downgradient of the three areas is conducted during every monitoring episode. The data is used to evaluate whether the extraction systems adequately contain the plumes and to assess the effectiveness of the remedial action in cleaning up the groundwater.

Other than O&M and long term monitoring activities specified for this OU, no further response actions are expected for this operable unit. The TCE and PCE plumes included in OU1 are depicted in the following figure.


692000
693000
694000
2932000
2931000
2930000
T-25 Area Treatment Building (Bldg 94)
T-25 Area
Little Roundy Pond
MW114B-2 Area
Buildings 22 and 36 Area
ARIEM Building Area
South Pond
Lake Cochituate
Buildings 63, 2, and 45 Area
Contract No. W912CO-05-D-007
Description Distribution of TCE/PCE in Groundwater
Coordinate system NAD 1983, State Plane, Mass Mainland, in feet
Sources Boundaries, roads and buildings provided by MAGTEC. 2009 aerial digital orthophotos provided by MassGIS.
Date 8OCT2012
C. Guido
Area of Detail
Legend
Existing Extraction Well Location
Monitoring Well Sampled for PCE and/or TCE
Monitoring Well Not Sampled for PCE and TCE
Installation Boundary
USEPA MCL (ug/L)
Area Boundary
PCE Concentration Contour
0.3-5 ug/L
5-25 ug/L
> 25 ug/L
TCE Concentration Contour
0.3-5 ug/L
5-25 ug/L
> 25 ug/L
Locations of T-25; Buildings 22 and 36; and Buildings 63, 2, and 45 Areas
Explanation of Significant Differences
U.S. Army Natick Soldier Systems Center
Natick, Massachusetts
0 200 400 Feet

2.1.2 Demonstration of Construction Quality Assurance and Quality Control

In accordance with the NSSC FFA, the Army submitted to EPA and the MassDEP for review and approval all work plans and other deliverables associated with the construction of the remedy at OU1. These documents include the following quality assurance/quality control plans for construction as well as sampling and analysis activities:

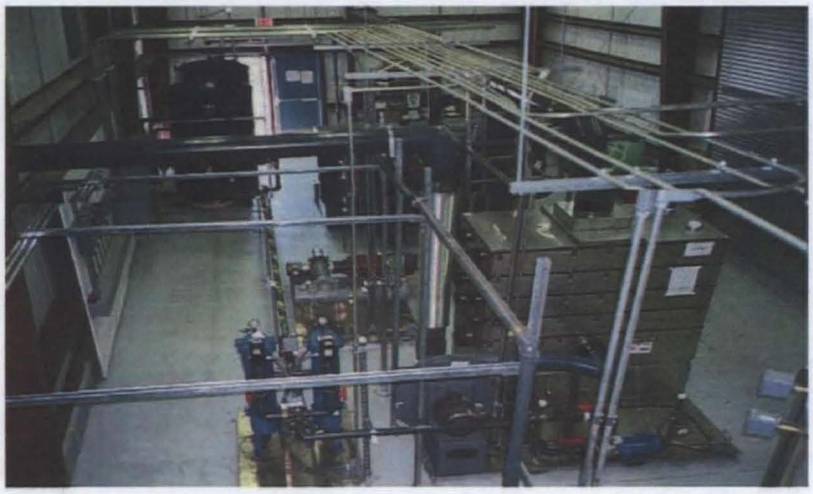
(1) Quality Assurance Project Plans for Field Investigations (1996 through 2008)
(2) Stepped Rate Aquifer Test Design (1996)
(3) Quality assurance Project Plan and Interim Remedial Alternatives Study and Design for T-25 (1996)
(4) Final Treatability Study for T-25 (1999)
(5) Final Report, development and Application of a Calibrated Groundwater Flow and Transport Model for the T-25 Area (2002)
(6) Extraction Well Letter Report (2004)
(7) Final Pilot Study Work Plan Groundwater Containment at Buildings 22 &36 Area and Buildings 63, 2 & 45 Area (2006)
(8) Technical Specifications for Groundwater Containment Pilot Study Final Groundwater containment Demonstration Report for the Buildings 22 &36 Area and Buildings 63, 2 & 45 Area (2008)
(9) LTM Plan T-25 Area, Buildings 22 &36 Area and Buildings 63, 2 & 45 Area (2008)
(10)Quality Assurance Plan Addendum (2008)
(11)Capture zone Assessment for Groundwater Plumes at Buildings 22 &36 Area and Buildings 63, 2 & 45 Area (2009)
(12)Operations and Maintenance Manual for OU1 (2004, 2010)

These plans along with the design, modeling and other construction deliverables were reviewed to ensure that they were consistent with all relevant EPA guidance. EPA and the MassDEP conducted numerous site visits to ensure that the proper procedures were being followed in accordance with the approved documents.

2.1.3 Site Completion

The construction of the initial groundwater treatment system for OU1 was completed in 2005. The approval of the OU1 Interim Remedial Action Completion Report occurred in April 2005 (SDMS DocID 000222202). An ESD was signed in May 2013 requiring additional work. This work was completed and approved in September 2014 (SDMS DocID 565445). As discussed in Section 2.1.1 above, O&M and long-term monitoring activities are conducted as part of the remedial activities at OU1. A comprehensive monitoring program was developed by the Army and approved by the regulatory agencies. Approximately 56 monitoring wells are sampled on a regular basis to track the progress of the extraction activities. There have been several optimizations that have occurred over the years since the size of the original plumes have reduced in size considerably. Based on modeling, it is estimated that cleanup levels will be met in approximately 2025. However, the Army is continually evaluating the current system in place and may make necessary modifications to reduce that time frame. Section 7.0 Activities and Schedule for Site Completion, details OU1 activities remaining until site completion is achieved.

Ground Water Treatment System Building and Components



2.2 Operable Unit 2, Sediments

2.2.1.1 Summary of Site Conditions

Most surface drainage at the NSSC facility is controlled by the storm sewer system, which discharges to Lake Cochituate at two main locations (the T-25 Area outfall and the Main Stormwater Outfall (MSO)) and at a number of other smaller outfalls. The T-25 Area outfall drains the entire northern end of the facility. The MSO drains much of the central and southern portions of the NSSC property, which is comprised primarily of administration/office buildings, grassy areas, and parking lots. Other smaller active and historic outfalls at the Former Proposed Gymnasium Site (FPGS), U.S. ARIEM Building, Buildings 2/45, the Boiler Plant, Building 36, and Building 16 drain the smaller localized parking areas and roofs of their associated buildings. Prior to the late 1990s and early 2000, runoff to the lake also occurred via sheet flow (over land) in other areas not controlled by the storm sewer system. Many of the outfalls and their associated storm drainage systems were constructed in the mid-1950s to early 1960s for the collection and management of storm water runoff and non-contact cooling waters. In the late 1990s and early 2000 all active outfalls were retrofitted with new oil/water separators to improve storm water quality and minimize future impacts to Lake Cochituate. The oil/water separators are routinely maintained and cleaned and any solids removed from the separators are properly disposed off-site. Therefore, the NSSC storm water drainage system is no longer a continuing contaminant source to Lake Cochituate.

One confirmed PCB release occurred at the NSSC facility during the mid-1980s, when there was a leak at transformer H, located on an outdoor pad immediately west of Building 5. The release resulted in PCB contamination of the concrete pad, soil within the fenced transformer area, and soil at least 8 feet outside of the fenced area. Soil concentrations up to 14,000 parts per million (ppm) were detected. The transformer pad was scarified and sealed, and the surrounding soil was removed in accordance with the Toxic Substances Control Act (TSCA) during the summer of 1992. Analyses of the pad and surrounding soil following the cleanup indicated that further investigation was not required. This release of PCBs in the mid-1980s is believed to be the primary cause of the elevated PCB concentrations observed in sediment at the MSO. Storm drains in the area west of Building 5 drain to Lake Cochituate via the MSO. PCBs in the concrete and soil at transformer H likely migrated into the storm water drainage system and into Lake Cochituate. In 1990, the facility performed a preventative maintenance program on all of its transformers that included removal, replacement with PCB-free units, refilling with PCB-free oil, and washing/rinsing transformer pads. In addition, all active storm drains direct storm water through oil/water separators prior to discharge to the lake. Therefore, there are no continuing PCB sources at NSSC.

The OU2 ROD was signed in September 2009 and called for dredging of three (3) hotspots in Pegan Cove. The sediment cleanup goal is defined as the concentration of PCBs in sediment at the Fisk Pond background location which is 1 ppm.

The RAO for the OU2 ROD is based on protection of human health since acceptable risk was determined for the environment:

> Reduce the potential for sediment-associated human health risks due to PCBs in native fish caught near the NSSC shoreline currently and in the future by reducing average PCB concentrations in sediment within Pegan Cove to less than 1 ppm.

Dredging of contaminated sediment began on July 21, 2010 within hot spot Area 3 and was completed on August 20, 2010 in hot spot Area 1. A post-remedial bathymetric survey was performed on August 23, 2010 across each hot spot area after dredging was completed and prior to backfilling to ensure the designed areal extents of each hot spot area were dredged. Results of the post-remedial bathymetric survey indicate that both areal extents and required dredge depths were attained within each hot spot area. Approximately 4,395 cubic yards of in-situ sediment were removed from the three hot spot areas (421 cubic yards from Area 1, 991 cubic yards from Area 2, and 2,983 cubic yards from Area 3). Dredging reduced the average cove-wide PCB concentration to 1.03 mg/kg. Backfilling each hot spot area with clean washed sand, reduced the average concentration to below the 1 mg/kg cleanup goal. Double silt curtains and turbidity monitoring results demonstrated that re-suspended sediments remained within the dredge area and within the primary silt curtain.

The dredged sediment was pumped onshore and filled Geotubes® to dewater by gravity. The decant water was drained into a holding pond, pumped through a decant water treatment system and then pumped back into Pegan Cove. The treatment system was in operation between July 21, 2010 and September 22, 2010 with no exceedances of effluent discharge criteria. A total volume of 3.9 million gallons of clean water was discharged back to the Cove.

Dredge material disposal was performed from September 16, 2010 to September 21, 2010 after allowing the geotextile tubes to dewater for a period of approximately 25 days. Dredge materials were disposed of at Waste Management's Turnkey Landfill in Rochester, New Hampshire. A total of 1,214 tons of dredge materials were disposed of. Although it was estimated that an in-situ volume of approximately 4,395 cubic yards of sediment would be removed, this is a saturated total in-situ volume. The 1,214 tons which was disposed offsite as ex situ post-desiccation mass.

Prior to disposal, characterization sediment samples were collected from the access ports of each geotextile tube and submitted for analytical analysis, including Toxicity Characteristic Leaching Procedure (TCLP), PCBs, pH, flash point, reactivity, and TPH. Analytical results were submitted to the disposal facility for acceptance of the dewatered dredge materials. The results confirmed the acceptability of the material. Prior to loading, Paint Filter Liquid Tests were also performed following the procedures outlined in USEPA Method 9095A. Results of each test indicated that the sediment did not contain any free liquid, which was necessary for acceptance to the disposal facility. However, as a contingency measure, it was decided to blend a volume of cement kiln dust (CKD) into the dewatered sediment to act as an additional drying agent. CKD is a byproduct material of the cement manufacturing industry and consists primarily of calcium carbonate and silicon dioxide. Approximately 25 tons of CKD was brought onsite on September 15, 2010, stockpiled within the dredge materials staging area, and incorporated into the dewatered sediment as needed using the excavator bucket.

2.2.1.2 Green Remediation

The remedy embraced a number of the goals stated in the EPA Region 1 Clean and Greener Policy for Contaminated Sites, including minimizing total energy use, maximizing use of renewable fuels, minimizing air emissions and greenhouse gas (GHG) generation, and minimizing impacts to water resources. A few examples of the green components included implementing a passive geotextile tube dewatering process which had a lower energy usage than other dewatering technologies (e.g.; mechanical presses); use of bio-based materials for all hydraulic dredging mechanisms in place of traditional petroleum-based hydraulic oils; powering water treatment system components, lighted warning buoys, and warning signs with solar panels; reuse of lake water in the slurry makeup and polymer conditioning phases of the dewatering process; and use of double silt curtains to minimize impacts to water resources. Use of the engine idling policy during the sediment dredge spoil loading phase significantly reduced GHG emissions. In addition, the on-site dewatering significantly reduced the volume and tonnage of sediment requiring ultimate off-site disposal avoiding significant fossil fuel consumption and GHG emissions associated with transportation and disposal of the contaminated sediment Collectively these components reduced the overall environmental footprint of the cleanup and restoration activities at the Site.

2.2.2 Demonstration of Cleanup Activity Quality Assurance and Quality Control

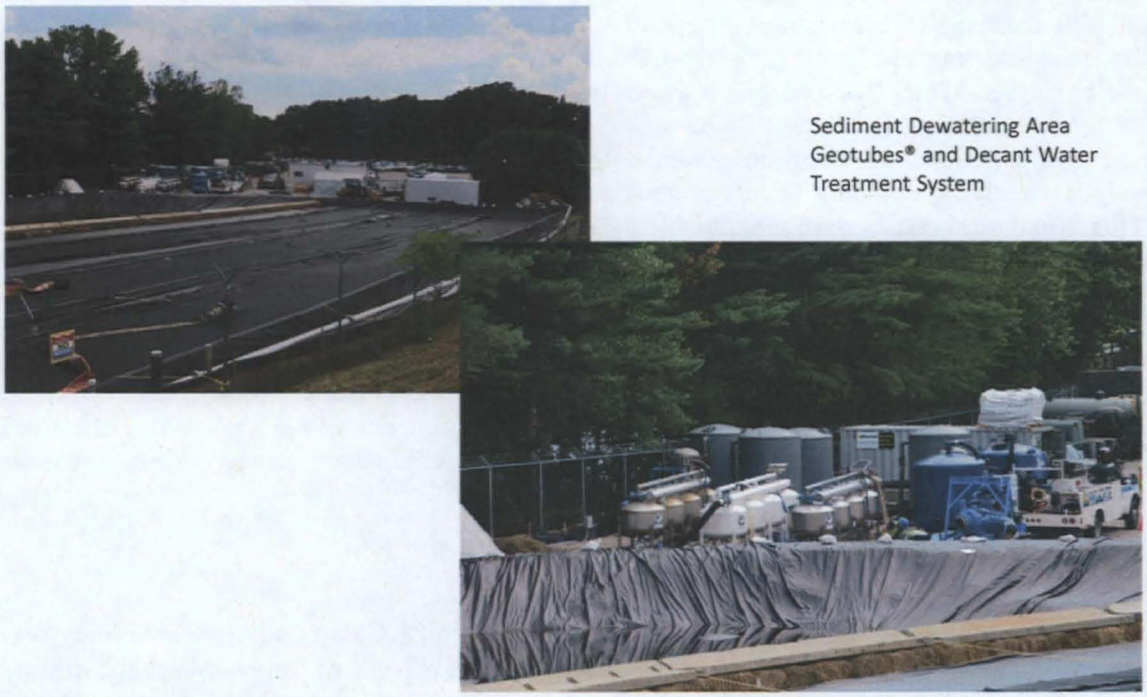
In accordance with the NSSC FFA, the Army submitted to EPA and the MassDEP for review and approval all work plans and other deliverables associated with the construction of the remedy at OU-2. These documents include the following quality assurance/quality control plans for construction as well as sampling and analysis activities:

(1) Final Quality Assurance Project Plan for Field Investigations (1998–2008)
(2) Final Sediment Remedial Design and Remediation Work Plan (2010)

These plans along with the design and other construction deliverables were reviewed to ensure that they were consistent with all relevant EPA guidance. EPA and the MassDEP conducted numerous site visits to ensure that the proper procedures were being followed in accordance with the approved documents.

2.2.3 Site Completion

Remedial action objectives were met at this OU, therefore no further O&M or LTM activities are required. The Remedial Action Complete Report was approved by EPA in May 2011 (SDMS DocID 477189).



Sediment Dewatering Area Geotubes® and Decant Water Treatment System

Dredge Placement in Pegan Cove

2.3 Operable Unit 3 & 4

2.3.1 Summary of Site Conditions

OU3 consists of the Former Proposed Gymnasium Site and Buildings 62 and 68 Area. OU4 consists of the Former Building 13 and Building 14 Area, the Boiler Plant Area, and the soil at the T-25 Area. These OUs contain several areas where removal actions have been performed in the past. RODs for both OUs selected "no further action" since the removal actions met unrestricted exposure levels. A brief summary of the activities that occurred at the different areas is given below.

2.3.1.1 Former Proposed Gymnasium Site

The former Proposed Gym Site (FPGS) is located on the eastern boundary of the NSSC near the installation's main gate. The site is named for a historically proposed location for a NSSC gymnasium; however, the site was never developed, and the gymnasium was never constructed. The FPGS is located on a former wet meadow and occupies approximately 1.6 acres. The site is bordered by a 10-foot-high slope to the north along Kansas Street, Lake Cochituate to the east-southeast, and a parking area to the west-southwest. The 10-foot-high slope to the north of the site contains the main SSC sanitary sewer line and the main NSSC water line. A french drain is located on the southwestern portion of the site to drain seasonally high groundwater and surface water. The drain discharges to South Pond Lake Cochituate. The FPGS has been used as a helicopter landing pad; and a petroleum, oil, and lubricant bladder test site; and a parking lot. The majority of the site is now grass-covered. A portion of the parking area to the west-southwest is also considered part of the FPGS.

2002 Time Critical Removal Action. A Time Critical Removal Action was completed by the Army at the FPGS between March and August 2002. As part of the removal action, approximately 1,233 tons of contaminated soil were excavated from a 40- by 40- by 10-foot deep area to meet State unrestricted residential (MCP Method 1 (S-1/GW-1)) standards .The excavation was performed to remove soils that were leaching contaminants, especially benzene, to groundwater. Other primary contaminants of concern were chlorobenzene, benzo (a)pyrene, and beryllium. Confirmation soil samples were collected from the sidewalls and bottom of the excavation were analyzed for VOCs, SVOCs, and metals. The area was then restored and re-vegetated. Monitoring well MW-5 was located in the center of the excavation and therefore removed during excavation activities. Upon completion of the removal action, monitoring well MW-5 was re-installed as MW-5R at the same location and constructed in the same configuration as the original well. The removal action complete was documented in a close out report that EPA approved on June 24, 2003 (SDMS DocID 46007).

2012 and 2014 Removal Actions. In 2012, approximately 10 cu yds. of laboratory debris/contaminated soil was removed by the Army near the 2002 removal action location. The delineation of the western and southern aerial extent of laboratory debris/contaminated soil was not completed at that time and remained a data gap. In 2014, approximately 85 tons of additional laboratory debris and contaminated soil was removed. Confirmation sampling demonstrated remedial goals of the State MCP GW1/S1 residential standards were met so that the area is not restricted. The removal action closeout report was approved by EPA on December 8, 2014 (SDMS DocID 568920).

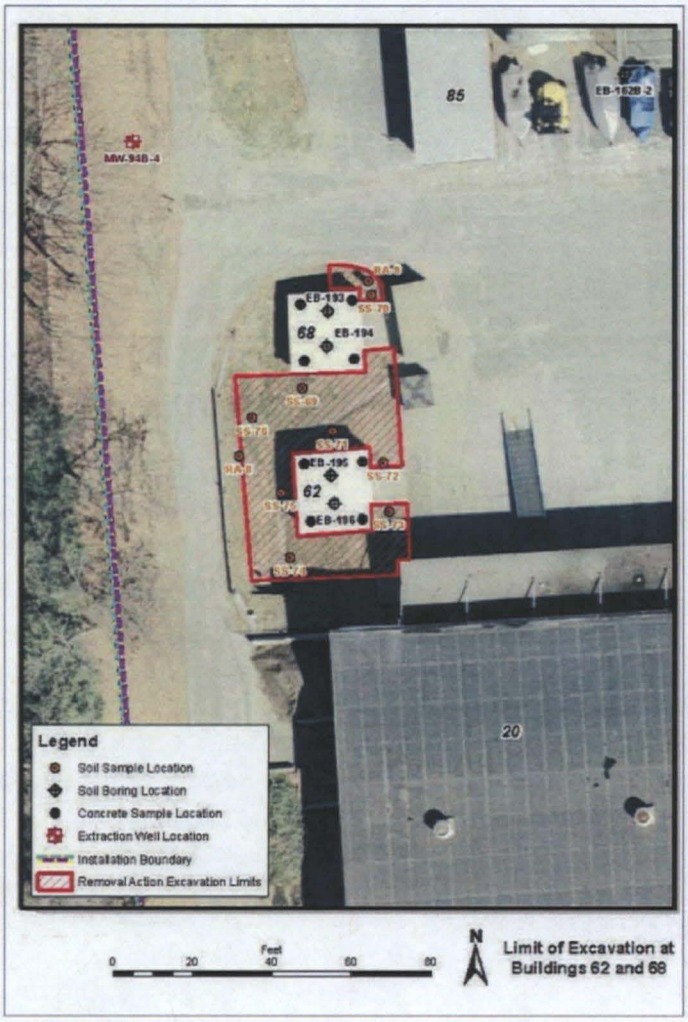
Photographs of FPGS Soil Removal Action

2.3.1.2 Buildings T-62 and T-68 Area

The Buildings T-62 and T-68 Area is located immediately northwest of the Building 20 (warehouse) loading platform in the southwestern portion of the T-25 area. Both buildings have 20- by 20-foot floor plans and are constructed of corrugated metal walls and roof with a poured concrete slab floor and concrete block frost walls. Buildings T-62 and T-68 each have an overhead door on their east side and a concrete apron which connects the door opening to the paved area. Site plan drawings indicate that Building T-62 was built in 1974-1975 and Building T-68 in 1980-1981. The immediate area south, west, and north of the buildings is unpaved and grassed with a shallow paved drainage swale running between the buildings to a storm sewer and headwall located southwest of Building T-62. The area east of the buildings is bordered by an extensive paved area used for parking and to provide vehicle access to several surrounding buildings. Building 20 is located south and southeast of the buildings, and an elevated paved access road runs west and north of the buildings. The swale drains surface water runoff from the paved area to the storm sewer. Buildings T-62 and T-68 were used for hazardous materials and chemical storage until the summer of 1991. At present, the buildings are used for the storage of non-hazardous materials.

2005 Removal Action. In September 2005, a removal action was initiated by the Army at Buildings T-62 and T-68 to remediate PAH- and EPH-contaminated soil with chemical concentrations above State MCP Method 1 (S-1/GW-1) unrestricted residential standards. Excavation activities proceeded in two stages with the initial stage completed to 2 feet below ground surface [bgs]. Confirmation soil samples collected from the initial excavation area in accordance with the requirements specified in the work plan showed that four PAHs were

detected at concentrations above MCP Method 1 (S-1/GW-1) criteria at two locations (SS-091 and SS-092). Results for the other samples were below MCP Method 1 (S-1/GW-1) criteria. Based on these results, the excavation was deepened to remove the additional contaminated soil. During the removal action, approximately 172 tons of contaminated soil were excavated and approximately 4 tons of asphalt pavement were removed from the drainage ditch. Final confirmation samples demonstrated the remedial goals were met for unrestricted use. EPA approved the removal action completion report in 2006 (SDMS DocID 248059).



2.3.1.3 Building 14 and the former Building 13 Area

The Building 14 and the former Building 13 Area is located in the western portion of NSSC, approximately 200 to 300 feet from Lake Cochituate. Building 14 consists of a two-story concrete structure measuring 50 feet wide by 135 feet long and is located upon a filled and re-graded former gravel pit that was owned and operated by the Town of Natick. Building 13 was located to the east of Building. The Building 13 Area is bordered to the north by Buildings 20 and 83, underground diesel and gas storage tanks, and a vehicle fuel dispensing station, to the east by Building 73, to the east by Building 15, to the south by an asphalt covered parking area, and to the west by a steep uphill slope and property fence line that marks the NSSC facility boundary. Building 14 and former Building 13 were both constructed in 1954. Building 14 has been used both currently and

historically for vehicle and equipment maintenance, administrative space, and storage. Building 13 was used as an incinerator for destroying classified paperwork from its installation until its closure in 1985 and the area was also used to decontaminate pesticide equipment and clean garbage cans. The aboveground structure and stack were removed in the late 1990s leaving the concrete foundation, which was partially removed in 2007 during a remedial action. .

2007 Removal Action. A removal action was conducted by the Army in 2007 to address contaminated soil that exceeded MCP residential soil standards in the two areas identified during the Site Investigation. At the Building 14 area, soils were excavated over a 1,260 square foot area at depths ranging up to 15 feet. At former Building 13, a portion of the concrete incinerator foundation and its associated piping were demolished. Approximately 75 percent of the sub grade footing for the flue stack and the gas line concrete enclosure were left in place due to concerns with the stability of the steep slope to the south of the excavation. Surface soils in a 3,300 square foot area surrounding the foundation were excavated to a depth of one foot. A total of 257 tons of soil was removed from the Building 13 excavation and 635 tons of soil was removed from the Building 14 excavation.

Confirmation samples were collected from both excavations. All samples were analyzed for petroleum hydrocarbons, and samples from the former Building 13 area were additionally analyzed for pesticides, PCBs, and metals. No contaminants were detected at concentrations above the cleanup action levels, which were the MCP S-1/GW-1 residential soil standards. Excavated soils were transported to Aggregate Industries in Stoughton, Massachusetts and Aggregate Recycling Corporation in Elliot, Maine for asphalt batch mixing. Both excavations were backfilled with clean soil and compacted. The Building 14 area was repaved and the former Building 13 area was hydroseeded. The removal action completion report was approved by EPA in November 2007 (SDMS DocID 283191).

Building 14 and Former Building 13 Excavation Areas

2.3.1.4 Former Boiler Plant Area

The Former Boiler Plant area is located in the southwest portion of the NSSC facility. It was taken out of service in 2013. It covers 1.8 acres and is located on a small south-facing peninsula on the South Pond of Lake Cochituate. The site includes the Former Boiler Plant (Building 19), the former Building 23 area, and a former piggery. Building 19 is located on a steep hillside; the basement floor of the building is below ground surface on the north side of the building, and is level with ground surface on the south side. Former Building 23 was a 12-foot by 12-foot steel-framed metal building located on the shore of Lake Cochituate southwest of Building 19. The former piggery was located in what is now the parking area, also located southwest of Building 19. The Former Boiler Plant area is bordered to the north by C Street, to the east by Building 22, to the west by a parking area, and to the south by another parking area and the South Pond of Lake Cochituate. From 1950 until 1982, the room in the southwestern corner of the basement of Building 19 was used as a pesticide storage and mixing area. A leach field was also present to the south of Building 19.

2001 Removal Action. Army removed soils with PAH, PCB, and lead in concentrations exceeding State S-1/GW-1 standards at the leech field. Excavation depths were approximately 10 feet bgs north of the retaining wall and up to approximately 5 feet bgs south of the retaining wall. A total of approximately 768 cubic yards of contaminated soil was shipped off-site for treatment. The confirmatory soil samples that were collected indicated that contaminant concentrations of soils remaining in place were below State MCP S-1/GW-1 standards. Review of the confirmatory sample analyses indicated that the removal action met all current State unrestricted residential (MCP S-1/GW-1) standards. Other activities performed during the removal action

included: removal of retaining wall (south of parking area); removal of Building 23 and associated piping, fittings, and accessories; removal of guardrails and asphalt pavement; removal of the former leach field; backfilling and compacting excavation; and removal of four monitoring wells (CHI-4, CHI-5, MW-91A-HP2, and MW-106A-2). This removal action was performed under the State regulations prior to the EPA FFA signature date. The removal was approved by EPA when the OU4 ROD was signed in September 2008 (SDMS DocID 295063).

N

Boiler Plant Building 19 Location Map

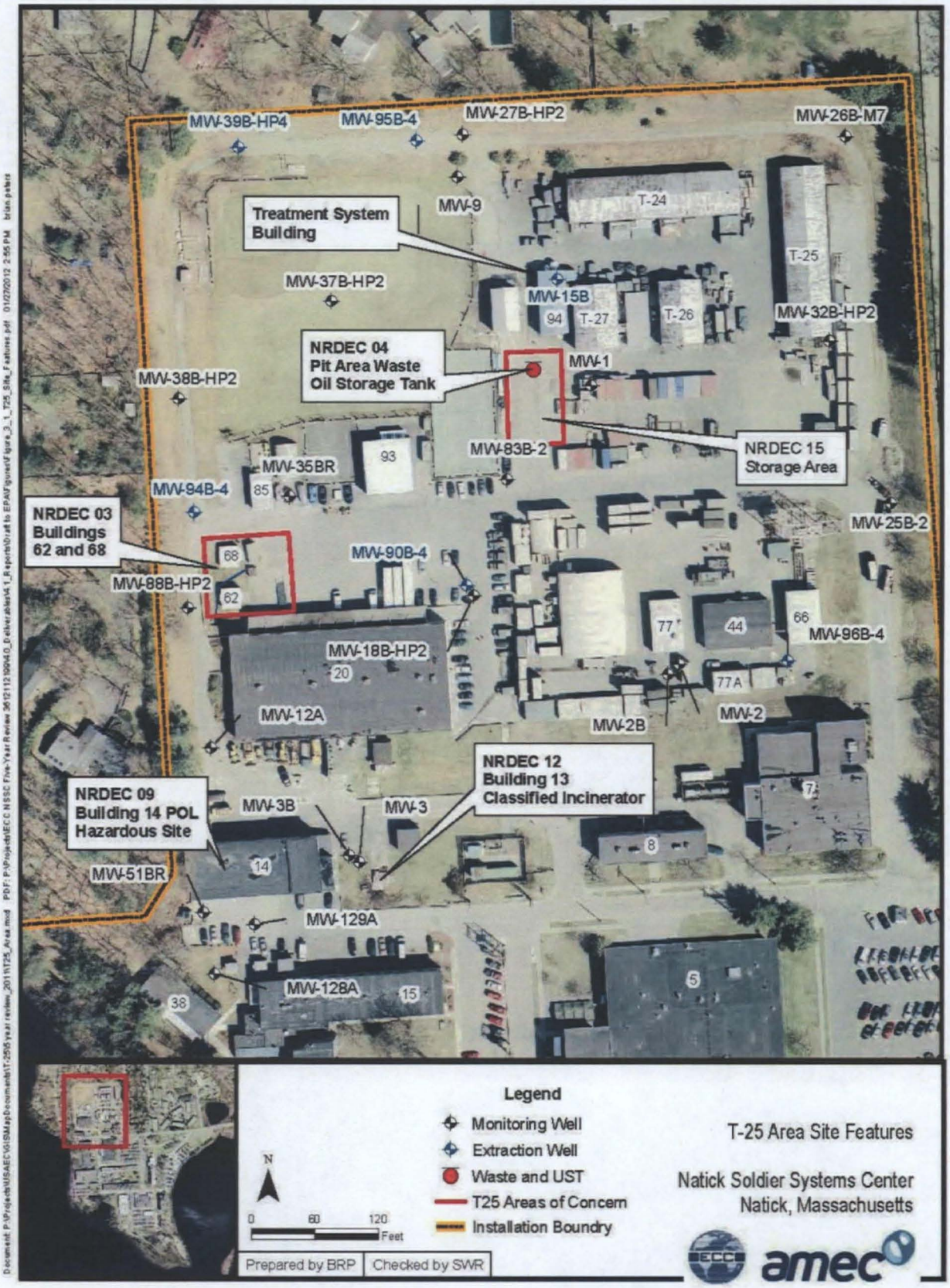
2.3.1.5 T-25 Soil Area

The T-25 Area is a 15.6-acre, rectangular plot located in the northwestern portion of the NSSC facility. The area is mostly covered with buildings or paved with asphalt. The largest unpaved portion of the T-25 Area is a baseball field in the northwest corner. The area is circled by an unpaved road on an earthen embankment, which is elevated between 5 and 10 feet above the rest of the site. The embankment rises an additional 10 feet above the dirt road and is topped with a chain link fence on the west, north, and east, where the T-25 Area abuts residential areas. To the south lies the rest of the NSSC facility.

1997 T-25 Area Time Critical Soil Removal Action. The Army performed the removal action between October and December 1997. The action resulted in the removal of approximately 1,380 tons of contaminated soil from the T-25 Area and the east side of the tennis courts, and excavated to depths between 1 and 10 feet bgs. Confirmatory soil samples were collected after additional excavation, revealing pesticide concentrations below action levels. DDT, DDE, and DDD were detected below 1 mg/kg, which is substantially below both the State S-1/GW-1 cleanup standard of 2 mg/kg at that time and the current MCP S-1/GW-1 standards for DDT (3 mg/kg), DDE (3 mg/kg), and DDD (4 mg/kg). Chlordane concentrations were considerably below both the 2005 MCP S-1/GW-1 standard (1 mg/kg) and the current MCP S-1/GW-1 standard (0.7 mg/kg).

Excavated soil was transported to Plainville Laidlaw Landfill in Plainville, Massachusetts on December 4, 5, and 8 in 1997 as non-hazardous/non-RCRA (Resource Conservation and Recovery Act) waste. After contaminated soils were removed, the Storage Area was backfilled with clean soil, compacted, and paved. During site restoration and cleanup, an additional 3,000 pounds of soil that was assumed to be contaminated was drummed and transported as non- regulated material to Pollution Control Industries in East Chicago, Indiana on December 10, 1997. The removal action eliminated contaminant sources (including the Pit Waste Oil Storage Tank residual contamination) at the T-25 Area of Concern. These actions were performed under MassDEP jurisdiction prior to FFA signature.

All removal responses for the T-25 Area were approved by EPA in the OU 4 "no further action" ROD signed in September 2008 (SDMS DocID 295063).


MW-39B-HP4
MW-95B-4
MW-27B-HP2
MW-26B-M7
Treatment System Building
MW-9
T-24
T-25
MW-37B-HP2
MW-15B
94
T-27
T-26
MW-32B-HP2
NRDEC 04 Pit Area Waste Oil Storage Tank
MW-1
MW-38B-HP2
MW-83B-2
NRDEC 15 Storage Area
93
MW-35BR
MW-94B-4
85
NRDEC 03 Buildings 62 and 68
MW-25B-2
68
MW-90B-4
MW-88B-HP2
62
77
44
66
MW-96B-4
MW-18B-HP2
20
77A
MW-12A
MW-2B
MW-2
NRDEC 12 Building 13 Classified Incinerator
NRDEC 09 Building 14 POL Hazardous Site
MW-3B
MW-3
7
8
14
MW-51BR
MW-129A
5
MW-128A
15
38
Legend
Monitoring Well
Extraction Well
Waste and UST
T25 Areas of Concern
Installation Boundry
N
0
60
120
Feet
Prepared by BRP
Checked by SWR
T-25 Area Site Features
Natick Soldier Systems Center
Natick, Massachusetts
amec

2.3.2 Demonstration of Cleanup Activity Quality Assurance and Quality Control

In accordance with the NSSC FFA, the Army submitted to EPA and the MassDEP for review and approval all work plans and other deliverables associated with the construction of the remedies at the various sites undergoing a removal action. These documents include the following quality assurance/quality control plans for construction as well as sampling and analysis activities:

(1) Quality Assurance Plans (2001 to 2014)
(2) Work Plan for former Building 13 and Building 14 (2002)
(3) Removal Action work Plan for Buildings T-62 & T-68 (2005)

These plans along with the design and other construction deliverables were reviewed to ensure that they were consistent with all relevant EPA guidance. EPA and the MassDEP conducted numerous site visits to ensure that the proper procedures were being followed in accordance with the approved documents.

2.3.3 Site Completion

All soil removal activities have been conducted and completed at all of the sites covered under these operable units. All remedies are functioning as intended by the appropriate decision documents noted above (RODs, Action Memorandum, Close-out Reports, etc.). Therefore, no additional activities are anticipated at any of these areas that are part of the No Action RODs for OUs3 & 4.

2.4 Vapor Intrusion

All of the groundwater data has been reviewed to determine if Vapor Intrusion (VI) could be an issue at NSSC. EPA conducted a screening of the VI pathway consistent with EPA guidance, and found only one area of concern. The groundwater plumes across the post are in the deep portion of the aquifer (30-70 feet below ground surface (ft. bgs)) except for the contamination at MW125B-2 which was found close to the basement floor at 15-25 ft. bgs). This area has been further evaluated by the Army to determine its potential for VI.

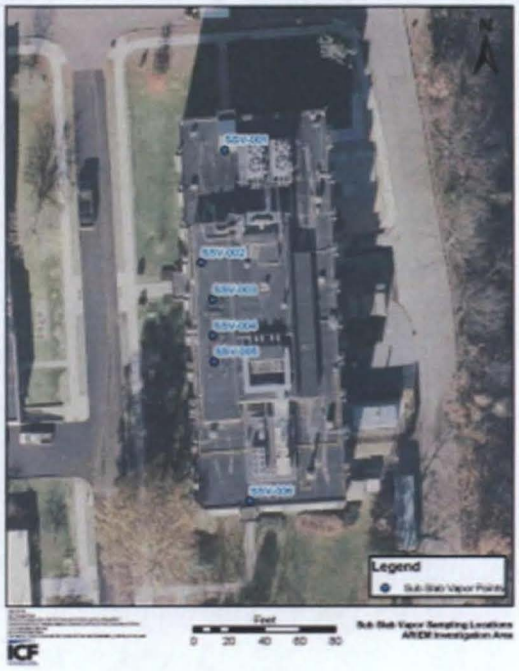
MW 125B-2 is located at the south west corner of the ARIEM building. The ARIEM Building (Building 42) investigation area is located within the southeast portion of the NSSC facility and is bordered by the main administration building (Building 1) to the north, the Navy Clothing and Textile Research Facility (Building 86) to the south, the Doriot Climatic Chamber building (Building 2) to the west, and Lake Cochituate to the east.

As a result of the continued detections of TCE above the MCL at MW125-B-2, two monitoring well couplets (MW-164A/B-2 and MW-165A/B-2 were installed along the east side of Building 42 and sampled. The B-interval wells (MW-164B-2 and MW-165B-2, each screened from 20 to 30 feet bgs) have been sampled at least annually since their installation. Since 2008, TCE has been detected at a concentrations ranging from non-detect to 10 ppb in MW-164B-2 and 10.9 ppb to 16.6 ppb in MW-165B-2. The co-located A-interval wells MW-164A-2 and MW-165A-2 (each screened from 10 to 20 feet bgs) were last sampled during Event 53 in June 2008, and had lower TCE concentrations of 0.77 ppb at MW-164A-2 and 0.18 ppb at MW-165A-2. TCE concentrations from additional upgradient A-interval monitoring wells have been non-detect.

Sub-slab vapor samples were collected on February 23, 2012 from six locations (SSV-001 through SSV-006) using evacuated (30" Hg) batch-certified 6 liter (L) Summa™ canisters equipped with dedicated flow regulators and integrated particulate filters. All of the maximum concentrations for TCE (0.87 ppbv), PCE (0.52 ppbv), and chloroform (9.0 ppbv) were well below their respective MassDEP commercial/industrial sub-slab soil gas screening values of 77 ppbv for TCE, 43 ppv for PCE, and 43 ppv for chloroform. The maximum concentration of TCE was below the federal commercial/industrial screening value of 1.6 ppv. Therefore, based on the results of the sub-slab soil gas and groundwater samples collected during the investigation, EPA and MassDEP agreed with the Army's conclusion that there does not appear to be a complete vapor intrusion exposure pathway in the ARIEM building investigation area.

There are several instances where a portion of the NSSC groundwater plumes discharge to Lake Cochituate. At the Buildings 22 & 36 Area, the plume discharges to both sides of the peninsula and at the Buildings 63 2 & 45 Area the plume discharges to the Lake. However, at these locations, the concentrations are quite low and there are no residences on NSSC. The buildings in these areas do not have basements. In accordance with EPA guidance, the data collected and assessed shows that no actual or potential VI exposure pathway exists therefore VI is not an issue.

VI Investigation Sampling Locations



2.5 Emerging Contaminants

2.5.1- 1,4-Dioxane

Army started sampling for 1,4-dioxane at select wells across the facility in 2005. Only 1 well (MW124B-2) had detections of 120 ppb which is above the detection limit of 20 ppb. In 2006, Army lowered the detection limit to 1 ppb and several other wells in the 63, 2& 45 area were found to have low levels of 1,4-dioxane. The current levels have decreased to between 11 ppb and 1 ppb across the plume. In August 2008, the 1, 4-dioxane treatment unit began operation, treating water extracted from wells EW-2 (now off),

EW-3, and EW-4 (all groundwater extracted from the Buildings 63, 2, and 45 Area). 1, 4-dioxane is removed in the 1, 4-dioxane treatment unit via Fenton's Reagent before combining with extracted groundwater from the Buildings 22 and 36 Area, and entering the T-25 treatment plant. Effluent from this treatment plant is sampled and reported in conjunction with the Annual T-25 Groundwater Treatment System Report, and results have consistently shown complete removal of 1,4-dioxane.

Pictures of the 1,4-Dioxane Treatment Shed

2.5.2 - Perfluorinated Compounds

Army performed a preliminary assessment by interviewing the fire chief and evaluating existing records and found several above ground tanks where halon had been used in fire suppression systems. No releases to the environment were documented and there have not been any fires requiring the use of firefighting foams.

3.0 INSTITUIONAL CONTROLS

NSSC is served by a public water supply, and there is no current use of groundwater at the facility. NSSC is, 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 facility and has no plans to extract or use site groundwater for potable purposes. NSSC currently obtains potable water from the Town of Natick. The NSSC Master Plan and Natick ordinance prohibit future

installation of groundwater wells or potable use of groundwater at the T-25 Area. The NSSC Master Plan (SDMS DocID 261870) 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."

The establishment of these regulations prohibiting the development of any private drinking water well within the Town of Natick is also a requirement within the OU1 ROD (SDMS DocID 26527). The Army is also required to submit an annual report to the regulatory agencies which will monitor the environmental use restrictions and controls. The annual monitoring reports will be used in preparation of the five-year review to evaluate the effectiveness of the remedy.

4.0 Five Year Reviews

There have been two Five Year Reviews conducted at NSSC. The first Five Year Review was conducted in 2007 and the second in 2012. The Five Year Reviews determined that the sites addressed in the report remain protective of human health and the environment.

Since hazardous substances will remain on various sites above concentrations allowing for unlimited use and unrestricted exposure, a policy Five Year Review will be conducted pursuant to CERCLA Section 121(c) as provided in OSWER Directive 9355.7-03B-P, June 2001 for the site in 2017. The subsequent reviews will cover specific OUs as appropriate at the time of the review. The Five Year Review concluded that the 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.

Institutional controls both on NSSC and in Natick are in place to prevent consumption of groundwater and prevent activities that would compromise the integrity of the remedy.

5.0 Activities and Schedule for Site Completion

The Natick Laboratory Research Development and Engineering facility cannot be deleted from the National Priorities List (NPL) in its entirety until all remedial actions have met their remedial action objectives as prescribed in the OU specific RODs. The schedule below summarizes the activities that remain before the entire NSSC site is deleted.

Operable Unit 1, T-25 Area and rest of Facility Groundwater

Milestone	Estimated Completion	Responsible Agency
O&M and Monitoring	Ongoing	Army
Submittal of Treatment System, Groundwater Monitoring Event, and IC Monitoring Reports	Annually	Army
OU1 Interim Remedial Action Complete Report	9/2015	Army
Submittal of Final Remedial Action Complete Report with achievement of cleanup goals	12/2030	Army
Approval of Final Remedial Action Report	3/2031	EPA
Next Policy Five Year Review	12/2017	Army
Final Five Year Review	12/2030	Army

Approved by:

SIGNATURE 12/30/14 DATE

James T. Owens III

Director

Office of Site Remediation and Restoration