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February 21, 2018

Mr. Brian Helland, RPM
BRAC PMO, East
4911 South Broad Street
Philadelphia, Pennsylvania 19112

Reference: **CLEAN Contract No. N62470-11-D-8013**
Contract Task Order (CTO) No. WE27

Subject: **Final Building 82 Explanation of Significant Differences**
Former NAS South Weymouth, Massachusetts

Dear Mr. Helland:

Resolution Consultants is pleased to issue the Building 82 Explanation of Significant Differences.

On behalf of the Navy, the FINAL document is being provided to the recipients listed below. If you have any questions, or require additional information beyond what is provided in this document, please contact me at 978.905.2409.

Sincerely,

Michelle Snyder, CHMM
NAS South Weymouth Task Order Manager

Document Distribution:
Mr. Brian Helland, RPM (1 hard copy, 1 CD)
Mr. David Barney, CSO (1 hard copy, 1 CD)
Mr. Matthew Audet, USEPA (2 hard copies, 2 CDs)
Mr. David Chaffin, MassDEP (1 hard copy, 1 CD)
Mr. Steve Ivas, Abington RAB Member (1 CD)
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Mr. Matthew Brennan, Weymouth RAB Member (1 CD)
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RESOLUTION CONSULTANTS

EXPLANATION OF SIGNIFICANT DIFFERENCES TO THE RECORD OF DECISION

OPERABLE UNIT 11
BUILDING 82

FORMER NAVAL AIR STATION
SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

BRAC PMO EAST
U.S. NAVY

FEBRUARY 2018

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FIGURES

APPENDICES

ACRONYMS

µg/L	Micrograms per Liter
1,1-DCA	1,1- Dichloroethane
APD	Aquifer Protection District
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of Concern
ESD	Explanation of Significant Differences
ft bgs	Feet below ground surface
GUVD	Groundwater Use and Value Determination
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
ILCR	Incremental Lifetime Cancer Risk
IR	Installation Restoration
ISCO	In-situ Chemical Oxidation
LTM	Long-Term Monitoring
LUC	Land Use Control
LUCIP	Land Use Control Implementation Plan
MassDEP	Massachusetts Department of Environmental Protection
NAS	Naval Air Station
Navy	United States Department of Navy
NAUL	Notice of Activity and Use Limitation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NNPA	N-nitroso-di-n-propylamine
NPDWSA	Non-Potential Drinking Water Source Area
OU	Operable Unit
OWS	Oil-Water Separator

PDWSA	Potential Drinking Water Source Area
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RG	Remedial Goal
RI	Remedial Investigation
ROD	Record of Decision
SVOC	Semi-Volatile Organic Compound
TCE	Trichloroethene
TtNUS	Tetra Tech NUS, Inc.
U.S. EPA	United States Environmental Protection Agency
VISL	Vapor intrusion screening level
VOC	Volatile Organic Compound

1.0 STATEMENT OF PURPOSE AND AUTHORIZING SIGNATURES

This decision document explains the basis for the determination to issue the attached Explanation of Significant Differences (ESD) for Building 82 at the former Naval Air Station (NAS) South Weymouth, Weymouth, Massachusetts.

For the reasons documented herein, by my signature below, I approve the issuance of this ESD for the Building 82 Site, Operable Unit (OU) 11, at the former NAS South Weymouth Superfund Site and the changes stated therein.

By: _____ Date: 2/5/18

David A. Barney
BRAC Environmental Coordinator
Naval Air Station South Weymouth
U.S. Department of Navy

Concur and recommended for immediate implementation:

By: _____ Date: 2/14/18

Bryan Olson
Director, Office of Site Remediation and Restoration
Region 1 – New England
U.S. Environmental Protection Agency

2.0 INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE

2.1 SITE NAME AND LOCATION

Building 82, also known OU 11 and Installation Restoration (IR) Site 10, is located at the former NAS South Weymouth, 1134 Main Street, Weymouth, Massachusetts 02190 (**Figure 1**). The former NAS South Weymouth has been assigned U.S. Environmental Protection Agency (U.S. EPA) Identification Number - MA2170022022.

2.2 IDENTIFICATION OF LEAD AND SUPPORT AGENCIES

The U.S. Department of Navy (Navy) is the lead agency for all environmental investigations and cleanup programs at the former NAS South Weymouth. The lead regulatory agency is the U.S. EPA. The Massachusetts Department of Environmental Protection (MassDEP) provides additional regulatory agency participation.

2.3 LEGAL AUTHORITY

Under Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), if new information becomes available that could affect the implementation of a selected remedy for a site, then the nature and significance of such finding(s) must be identified and evaluated in a post-Record of Decision (ROD) document for inclusion in the Administrative Record. In accordance with Section 300.435(c) of the National Contingency Plan (NCP) and U.S. EPA guidance (Office of Solid Waste and Emergency Response Directive 9355.3-02), an ESD is being issued for the Building 82 Site because the changes do not fundamentally alter the selected remedy set forth in the September 2012 ROD with respect to scope, performance, or cost.

In accordance with Section 300.825(a)(2) of the NCP, this ESD will become part of the Administrative Record for the Building 82 Site, and will be available for public review at the former NAS South Weymouth Caretaker Site Office (Building 11, Shea Memorial Drive) and at the local Information Repositories identified below. In addition, a notice that briefly summarizes this ESD will be published in three major local newspapers.

2.4 OVERVIEW OF THE ESD

This ESD alters the selected remedy outlined in the September 2012 Building 82 ROD by revising the risk evaluation (see Section 5.1 and **Appendix A**) due to the reclassification of groundwater at the Site. The results of the revised risk evaluation indicate that existing groundwater contamination within OU11 does not exceed CERCLA risk standards for unrestricted contact exposure. Due to the change in groundwater classification and the results of the revised risk evaluation, no further CERCLA action is required for the groundwater chemicals of concern (COCs)

identified in the ROD. Consequently, the OU11 CERCLA remedy is changed to No Further Action for the groundwater COCs identified in the ROD.

The adjustments presented in this ESD do not fundamentally alter the overall selected remedy outlined in the Building 82 ROD (U.S. Navy 2012) with respect to scope, performance, or cost.

2.5 AVAILABILITY OF DOCUMENTS

In accordance with Section 300.825(a)(2) of the NCP, this ESD will become part of the Administrative Record for the Building 82 Site. This ESD is also available for public review at the following locations:

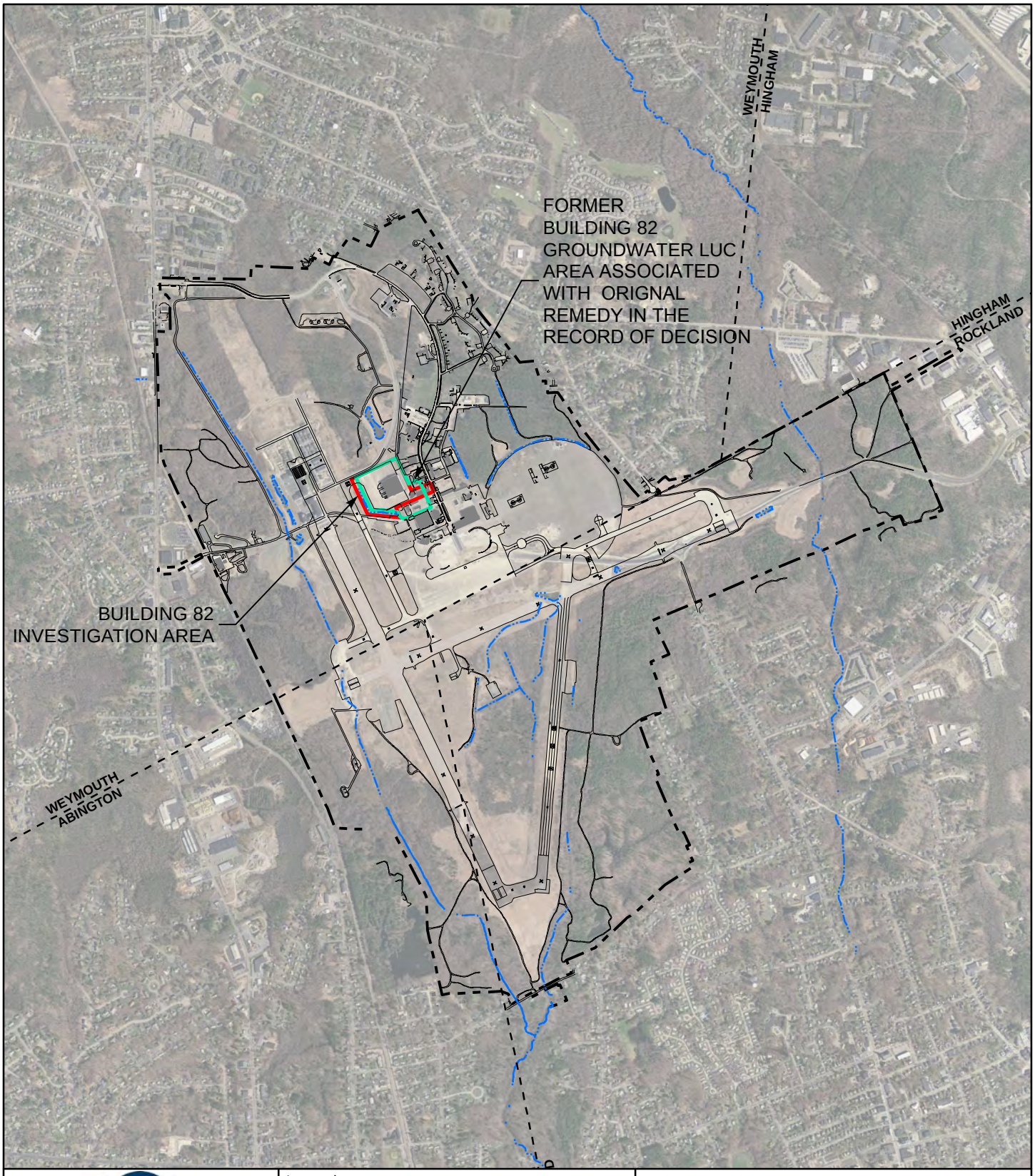
Department of the Navy
Caretaker Site Office
c/o David Barney
1134 Main Street, Bldg. 11
South Weymouth, MA 02190

Abington Public Library
600 Gliniewicz Way
Abington, MA 02351
(781) 982-2139

Rockland Memorial Library
20 Belmont Street
Rockland, MA 02370
(781) 878-1236

Tufts Library
46 Broad Street
Weymouth MA 02188
(781) 337-1402

Hingham Public Library
66 Leavitt Street
Hingham, MA 02043
(781) 741-1405



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Drawn:	JB	08/29/2017
Approved:	MS	08/29/2017
Project #:	60274866	

Legend

- Building 82 Investigation Area
- Former Building 82 Groundwater LUC Area (No Longer Required)
- Town Boundary
- Railroad
- Surface Water
- NAS South Weymouth Boundary
- Road/Runway
- Building

0 1,000 2,000 Feet

FIGURE 1
SITE LOCUS
BUILDING 82 SITE

FORMER NAVAL AIR STATION
SOUTH WEYMOUTH

Path: \\USCHL1FP001\Data\Projects\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\South_Weymouth\GIS\Projects\Building_82\ESD\MXD\Fig_1_Site_Locus.mxd

3.0 SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

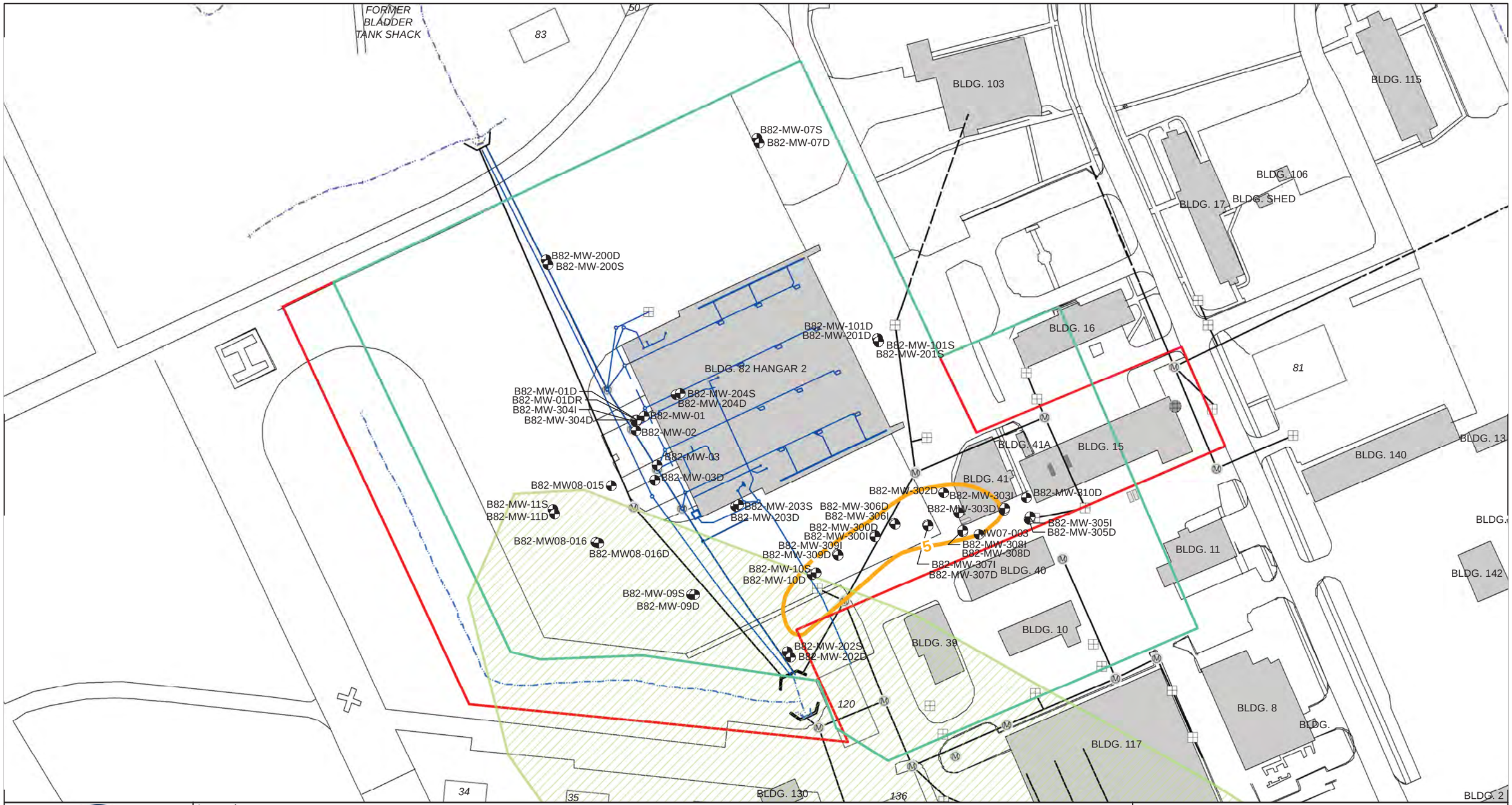
3.1 SITE DESCRIPTION AND HISTORY

The former NAS South Weymouth is located approximately 20 miles southeast of Boston and is comprised of approximately 1,444 acres. The former NAS South Weymouth is located primarily in the Town of Weymouth, Massachusetts; however, portions extend into the adjacent Towns of Abington and Rockland, Massachusetts. The Building 82 Site is located within the Weymouth portion of NAS South Weymouth (**Figure 1**).

The former NAS South Weymouth was developed during the 1940s for dirigible aircraft used to patrol the North Atlantic during World War II. The facility was closed at the end of the war and was reopened in 1953 as a Naval Air Station for aviation training. The former NAS South Weymouth remained in continuous use from that time until it was operationally closed on September 30, 1996, and was administratively closed on September 30, 1997 (Tetra Tech NUS, Inc. [TtNUS] 2010). Following closure, the former NAS South Weymouth was placed in caretaker status under the supervision of Naval Facilities Engineering Command. Portions of the former NAS South Weymouth property have been transferred by Navy to the local redevelopment authority and are undergoing redevelopment.

As presented in the Building 82 Remedial Investigation (RI) (TtNUS 2010), the investigation area includes Building 82 (also known as Hangar 2); the surrounding concrete apron to the north, west, and south; the area east of the Building 82 southern apron including Buildings 15, 41, and 41A; and the paved areas surrounding them (Site) (**Figure 2**). In addition, there is a complex network of subsurface drainage structures at the Site. Many of these subsurface structures are presumed to still exist, while other features have been altered or removed during NAS South Weymouth decommissioning activities.

Building 82 was constructed in 1956 as an aircraft hangar (maintenance facility) for fixed wing aircraft and remained in continuous use by the U.S. Marine Corps for that purpose through 1996, when operations at NAS South Weymouth ceased. During the time Building 82 was in use, oils, lubricants, solvents, and other materials necessary for aircraft maintenance were used and stored in the building. The network of floor drains and associated structures (i.e. gas trap manholes and an oil/water separator [OWS]) at Building 82 collected and conveyed spilled waste fluids from inside the building to the drainage ditch south of the building. Building 82 has an 8-inch thick concrete slab floor and any spills or leaks that occurred inside the building were likely collected in the floor drain system where residual waste materials may have remained for some time – particularly in catch basins, gas-trap manholes, and the OWS.



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Drawn:	JB	8/29/2017
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Legend

- Existing Monitoring Well
- Building 82 Investigation Area
- FORMER Building 82 Groundwater LUC Area
- Surface Water
- Fall 2016 Deep Overburden TCE Contour, ug/L (Dashed Where Inferred)
- Existing Building
- Former Building
- Oil-Water Separator
- Manhole
- Catch Basin
- Storm Line
- Floor Drain System
- Medium Yield Aquifer (Non Potential Drinking Water Source Area)

Note
TCE = Trichloroethene

N

0 60 120

Scale in Feet

FIGURE 2
BUILDING 82 TCE PLUME CONTOUR IN DEEP OVERBURDEN GROUNDWATER - FALL 2016

FORMER NAVAL AIR STATION SOUTH WEYMOUTH

Path: \\USCHL1FP001\Data\Projects\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\South_Weymouth\GIS\Projects\Building_82\ESD\MXD\Fig_2_BDG_82_TCE_Plume_Contour_Deep_Overburden_GW_Fall_2016.mxd

Following NAS South Weymouth closure, Building 82 was used for the storage of miscellaneous Navy-owned vehicles (i.e., plows, backhoes, and buses) until 2000. The western portion of Building 82 is currently vacant but may be occasionally occupied by personnel during routine building maintenance inspections or potential re-use evaluations. The eastern portion of Building 82 is currently being used by LStar (the property developer) for commercial/industrial activities.

Buildings 15 and 41A are the former Transportation Garage for the NAS South Weymouth Public Works Department. Originally, the eastern end of Building 15 was utilized as the NAS South Weymouth Fire Department before being utilized by the Public Works Department. Under the Public Works Department, Buildings 15 and 41A were used primarily for vehicle maintenance, garage space, and storage. Building 15 contained an aboveground storage tank, a battery storage room, floor drains and associated piping (some of which originally connected to the NAS South Weymouth storm sewer system), gas trap manhole (also referred to as an OWS), and hydraulic lifts. Building 41 is the former Family Service Center and did not have any identified areas of interest or potential source areas.

3.2 SITE CONTAMINATION

The primary contaminant release and transport mechanisms include releases to the subsurface via the floor drain systems and the catch basins outside Building 15. Results of previous investigations have identified, volatile organic compound (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls, and metals at the Site. A human health risk assessment (HHRA) was performed as part of the RI and concluded that the Site COCs in groundwater included: VOCs, SVOCs, pesticides, and metals, which pose unacceptable risks to human health if Site groundwater were to be used as a production, supply, or irrigation water source (TtNUS 2010). The HHRA also concluded there were no risks identified in exposure to soil, surface water, or sediment. The presence of these substances in Site groundwater appears to be a result of: past activities relating to its former use as an airplane hangar; the onsite migration of contaminants from off-site sources; and natural background conditions.

3.3 SITE SELECTED ROD REMEDY (ORIGINAL REMEDY)

The primary COCs targeted for remediation in the Building 82 ROD were trichloroethene (TCE), 1,1-dichloroethane (1,1-DCA), and N-nitro-di-n-propylamine (NNPA) in groundwater. Contaminants in subsurface soil and other potential sources of contamination were removed in a series of maintenance and removal actions performed prior to the 2012 ROD (U.S. Navy 2012).

The primary components of the selected remedy outlined in the 2012 ROD included the following:

- In-situ Chemical Oxidation (ISCO) of VOCs and NNPA in groundwater.

- Implementation of Land Use Controls (LUCs) on an interim basis to prohibit the installation of groundwater extraction wells for production, supply, or irrigation at the Site, and require Navy, U.S. EPA, and MassDEP approval of construction dewatering plans be obtained prior to conducting any construction dewatering activities at the Site.
- Performance monitoring to evaluate the progress of remediation and long-term monitoring (LTM) for Site COCs and other analytes of interest.
- Five-Year Reviews (as needed)

In April 2014, pilot test ISCO injections were performed and targeted the areas with the highest concentrations of TCE. Pre-injection groundwater data indicated that NNPA and 1,1-DCA concentrations had decreased to below their respective Remedial Goals (RGs); therefore, those areas were not targeted during the pilot test. Following the pilot test ISCO injection, groundwater monitoring was performed to evaluate ISCO performance. While initial post-injection monitoring data suggested a decrease in TCE concentrations to below the RG, data from later post-injection sampling events indicated a rebound in TCE concentrations to pre-injection levels. Based on the rebound in TCE concentrations, it was determined that ISCO would not achieve the remedial action objective (RAO) for TCE at the Site. Therefore, full-scale implementation of ISCO was suspended indefinitely. Data collected from the final post-ISCO sampling event performed in March 2015 indicated that the TCE plume above RG encompassed approximately 15,930 square feet, which was significantly less than the approximately 40,210 square foot area documented in the RI. The decrease in TCE extent over that time period was believed to be related to natural attenuation processes and that the TCE plume would continue to attenuate naturally over time (Resolution Consultants 2015). The extent of the TCE plume in March 2015 is presented on **Figure 2**. Although not identified for remediation, manganese is a chemical of interest because Site-wide concentrations exceed the manganese RG.

The required LTM Plan was developed for the monitoring of Site COCs and incorporated the Land Use Control and Implementation Plan (LUCIP), which outlined the LUCs for the Site (Resolution Consultants 2016). The LTM Plan specifies semiannual monitoring of Site COCs, including manganese, until such time as the RGs established in the ROD are achieved. LTM events have been conducted in Spring 2016 and Fall 2016, and Spring 2017. Results of the LTM indicate that TCE concentrations continue to fluctuate at the Site. However, the overall extent and magnitude of the impacts is lower than measured at the time of the RI, and overall TCE concentrations appear to be trending downward.

As described in the LUCIP, the LUCs were to be established on an interim basis and could be removed following achievement of RGs, combined with approval from Navy, U.S. EPA, and MassDEP. The LUCs were to include:

- Prohibit installation of groundwater production, supply, or irrigation wells
- Require Navy, U.S. EPA, and MassDEP approval of dewatering plans, prior to conducting any construction dewatering activities

4.0 BASIS FOR THE DOCUMENT

The RGs established by the 2012 ROD are being revised due to recent changes in classification of groundwater underlying the Site. The MassDEP classifies all medium- and high-yield aquifers mapped by the U.S. Geological Survey as potential drinking water source areas (PDWSA) unless they have been specifically excluded as such by the MassDEP. Additionally, the Southfield Redevelopment Authority Zoning and Land Use By-Laws for the former NAS South Weymouth created an overlay zoning district for the medium- and high-yield aquifers underlying the former NAS South Weymouth as Aquifer Protection Districts (APDs) (Southfield Redevelopment Authority 2015). The APD zoning requires that the medium- and high-yield aquifers be restored for beneficial future use as a PDWSA.

A medium-yield aquifer, also referred to as the 'Hangar 1 Aquifer', underlies the southwest corner of the Building 82 Site, where the TCE impacts are present (**Figure 2**). The remaining portions of the Site area are underlain by a low-yield aquifer (ENSR 2006).

On April 10, 2017, the Southfield Redevelopment Authority (SRA) Board of Directors voted in favor of excluding the Hangar 1 Aquifer and the 'Sewage Treatment Plant Aquifer' from the APD. Subsequent to this reduction of the extent of the APD by the SRA, on November 1, 2017, the MassDEP issued a Second Amendment to the Groundwater Use and Value Determination (GUVD) so that the aquifer is no longer identified as a Potential Drinking Water Source Area (PDWSA); therefore, under EPA groundwater guidance standards, the beneficial reuse for the aquifer is no longer identified as drinking water. Minutes from the April 10, 2017 SRA meeting and the Second Amendment to the GUVD are included in **Appendix B**. Based on these actions, groundwater underlying the Site and specifically within the Hangar 1 Aquifer (a non-PDWSA) - is no longer considered a suitable source of public drinking water, and drinking water would not be an anticipated potential future use. In light of this significant change, the risk assessment included in the September 2012 ROD was revised because the groundwater at the Site has been determined to have low use and value; therefore, the aquifer no longer needs to be restored for beneficial use as a drinking water source. Instead, potential risk from exposure with the contaminated groundwater based on a non-potable use scenario was assessed. Although groundwater used as drinking water is not considered a potential future use, other future uses of groundwater from the Site are considered possible, including irrigation. The Site has been zoned as a Village Center District, which could include a range of future uses from residential to commercial and light industrial land uses. The revised risk evaluation determined that existing groundwater contamination within OU11 does not exceed CERCLA risk standards for unrestricted contact

exposure. Therefore, no further CERCLA action is required for the groundwater COCs identified in the ROD[1].

[1] The Navy has determined pursuant to EPA letter of July 7, 2016, that additional investigation is required within OU11 for Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) (constituents that were not identified as COCs in the ROD). Depending on the findings of future investigations, a revision of the OU11 remedy through a future CERCLA decision document may be required if new groundwater risks are identified within OU11.

5.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES OR NEW ALTERNATIVES

5.1 REVISED RISK EVALUATION

This ESD includes a revised risk assessment for the COCs identified in the September 2012 ROD based on non-potable groundwater use scenario. As discussed in detail in Section 4.0, based on the recent removal of the APD designation, groundwater underlying the Site is no longer considered a suitable source of public drinking water, and drinking water would not be an anticipated potential future use. The conclusions of the revised risk evaluation presented herein indicate that concentrations of the ROD COCs detected in Site groundwater between 2013 and 2017, which are considered representative of current conditions, do not pose a cancer risk or noncancer hazard above U.S. EPA's target risk/hazard levels. These results indicate that there is no unacceptable risk/hazard associated with exposure to Site groundwater under a non-potable groundwater use scenario in which groundwater is used for irrigation or other outdoor use only. The details of the risk assessment are presented in this section.

5.1.1 Evaluation of Potential Risk and Hazard Associated with Non-Potable Groundwater Use

A revised risk assessment was performed based on a non-potable groundwater use scenario in which Site groundwater may be contacted by future construction workers, maintenance workers, or residents while using groundwater for non-potable/irrigation purposes. The cumulative potential incremental lifetime cancer risk (ILCR) and total noncancer hazard index (HI) were conservatively estimated per exposure scenario based on the maximum detected groundwater concentrations for the ROD COCs reported during one or more groundwater sampling events conducted between 2013 and 2017. This evaluation was conducted to determine whether potential exposure to groundwater via a non-potable groundwater use scenario would pose a potential risk/hazard above U.S. EPA's target risk/hazard levels. The estimated cumulative ILCR was compared to the U.S. EPA's target cancer risk range of 1E-6 to 1E-4. The total HI was compared to the U.S. EPA's target HI of 1 per target endpoint. Where the total HI for all compounds regardless of target endpoint is less than or equal to the target HI of 1, it can be concluded that the total HI per target endpoint is also less than the target HI of 1.

The receptors and exposure pathways evaluated as part of this risk assessment are discussed further below:

Construction Worker

The construction worker exposure scenario evaluated herein assumes contact with groundwater during construction/excavation activities through incidental ingestion, dermal contact, and inhalation of volatiles in an excavation trench. Consistent with the exposure inputs used to

evaluate a construction worker exposure scenario in the HHRA performed for Building 82 [HHRA summary tables are provided as Appendix C of the ROD (U.S. Navy 2012)], construction workers are assumed to come in direct contact groundwater for 2.5 days/week, 65 days/year, for 26 weeks/year, for an exposure duration of 1 year. It is assumed that dermal contact with groundwater occurs for 2 hours/day. Inhalation of volatiles originating from groundwater in an excavation trench is assumed to occur for 8 hours/day.

Maintenance Worker/Residential Adult

The maintenance worker/residential adult exposure scenario assumes contact with groundwater used for irrigation purposes through incidental ingestion and dermal contact. It was conservatively assumed that exposure to groundwater during irrigation activities is similar for a maintenance worker and a residential adult; therefore, a single exposure scenario was evaluated to be protective of potential contact by both receptors. Consistent with the exposure inputs used to derive site-specific groundwater screening levels for a maintenance worker and residential adult scenario for exposure to groundwater used for irrigation purposes in the Final Decision Document for the Hangar 1 Site (Tetra Tech 2012; **Appendix A**), in this risk assessment, a maintenance worker and residential adult are conservatively assumed to contact groundwater for 150 days/year, for an exposure duration of 24 years. It is assumed that 44% of the groundwater used is ingested during irrigation activities and that dermal contact with groundwater occurs for 2 hours/day. Inhalation of volatile COCs in outdoor air originating from irrigation water is considered to be an insignificant exposure pathway in comparison to the incidental ingestion and dermal contact pathways. Therefore, this pathway is not quantitatively evaluated in this risk assessment and is not considered to affect the conclusions of the assessment.

Recreational Adult/Child

An evaluation of the potential risk and hazard associated with exposure to irrigation water from a private well used recreationally by a residential adult and child was evaluated in a Technical Memorandum provided by U.S. EPA, which is included in **Appendix A**. This scenario represents an evaluation of a child or adult who wades, swims, or plays in a pool, water slide or sprinkler using water from a private well and is exposed to groundwater via incidental ingestion and dermal contact. As discussed for the Maintenance Worker/Residential Adult scenario above, the inhalation exposure pathway is considered to be insignificant in comparison to incidental ingestion and dermal contact pathways.

A detailed summary of the exposure inputs, toxicity information, and the calculations used in the evaluation of potential risk for the above receptors/exposure scenarios are provided in **Appendix A**.

5.1.2 Risk Results

The results of the revised risk assessment for a non-potable groundwater use scenario in which Site groundwater may be contacted by future construction workers, maintenance workers, or residents while using groundwater for non-potable/irrigation purposes are discussed by receptor below.

Construction Worker

The cumulative potential ILCR and HI (conservatively based on all target endpoints combined) estimated for a construction worker exposure scenario based on the maximum groundwater concentrations of COCs detected at the Site during one or more sampling events conducted at the Site between 2013 and 2017 are 4.2E-8 and 0.23, respectively. This total potential ILCR and HI are below U.S. EPA's target cancer risk range of 1E-6 to 1E-4 and target HI of 1 per target endpoint. Based on these results, the maximum groundwater concentrations of ROD COCs from recent sampling events do not pose an unacceptable risk for a construction worker exposure scenario.

Maintenance Worker/Residential Adult

The cumulative potential ILCR and HI (conservatively based on all target endpoints combined) estimated for a maintenance worker/residential adult exposure scenario based the maximum groundwater concentrations of COCs detected at the Site during one or more sampling events conducted at the Site between 2013 and 2017 are 1.5E-6 and 0.44, respectively. This total potential ILCR and HI are within U.S. EPA's target cancer risk range of 1E-6 to 1E-4 and below U.S. EPA's target HI of 1 per target endpoint. Based on these results, the maximum groundwater concentrations of ROD COCs from recent sampling events do not pose an unacceptable risk for a maintenance worker/residential adult irrigation exposure scenario.

Recreational Adult/Child

The cumulative potential ILCR and HI estimated for a recreational adult/child exposure scenario based the maximum groundwater concentrations of TCE and manganese detected at the Site during one or more sampling events conducted at the Site between 2013 and 2017 are 1.5E-6 and 0.55, respectively. This total potential ILCR and HI are within U.S. EPA's target cancer risk range of 1E-6 to 1E-4 and below U.S. EPA's target HI of 1 per target endpoint. Based on these results, the maximum groundwater concentrations of TCE and manganese from recent sampling events do not pose an unacceptable risk for an adult or child who may contact groundwater from a private well during recreational activities.

5.1.3 Evaluation of the Vapor Intrusion Pathway

The risk assessment of the non-potable groundwater exposure scenarios discussed above does not consider the potential vapor intrusion pathway for volatile COCs because the vapor intrusion pathway was not identified as an exposure pathway of concern in the ROD based on the HHRA performed during the RI (TtNUS 2010). An updated screening level evaluation was performed as part of this ESD to confirm that the conclusions of the HHRA performed during the RI that indicate the vapor intrusion pathway is not a pathway of concern remain valid.

Evaluation of groundwater for the potential vapor intrusion pathway should be performed using shallow groundwater samples from wells screened across the top of the water table. Therefore, the deeper groundwater data used for evaluation of an irrigation scenario (or potable use scenario) are not appropriate for use in evaluation of the vapor intrusion pathway. The vapor intrusion pathway evaluation is presented in **Appendix A** (Table A-10). Table A-11 in **Appendix A** summarizes the existing shallow TCE data located in and near the TCE plume that was used for this evaluation. Deeper TCE data is included in Table A-11 to demonstrate that TCE impacts at the Site are limited to deep groundwater that is located within the dense till layer at the Site. **Figure 3** depicts the existing sample locations. Sample locations where shallow data was collected are highlighted in green. Note that shallow groundwater data were not collected at the majority of sample locations on the map. Since the TCE impacts were determined to be confined to deep groundwater, additional assessments were focused on the deeper intervals. Geologic cross-sections from the RI depicting the till layer are included as **Appendix C**. Temporal data collected in and near the TCE plume are mainly limited to deep groundwater, since the TCE impacts are located in the deep interval. There are two well couplets, MW-10S/10D (at the leading edge of plume) and MW-202S/202D (downgradient of the leading edge of the plume) that have a shallow well screened to intercept the top of the water table. Data for the deeper wells in these couplets do not show significant temporal fluctuations; concentrations generally fluctuate <1 ppb between sampling events.

In this evaluation, the maximum detected VOC concentration from shallow groundwater samples collected to a maximum depth of 14 feet below ground surface (ft bgs) from the RI dataset (TtNUS 2010) were compared to conservative U.S. EPA and MassDEP groundwater screening levels protective of the vapor intrusion pathway. None of the concentrations were detected above MassDEP GW-2 standards. VOCs detected at a maximum concentration greater than the associated U.S. EPA vapor intrusion screening level (VISL) (based on a target risk of 1E-6 and target hazard quotient [HQ] of 0.1) were further evaluated based on data from more recent sampling events (if available), refined VISLs, and/or an evaluation of potential risk within U.S. EPA's target risk range, as applicable. The results of the screening evaluation were considered in

conjunction with the nature and extent of the VOC impacts at the site, which are in the deeper groundwater.

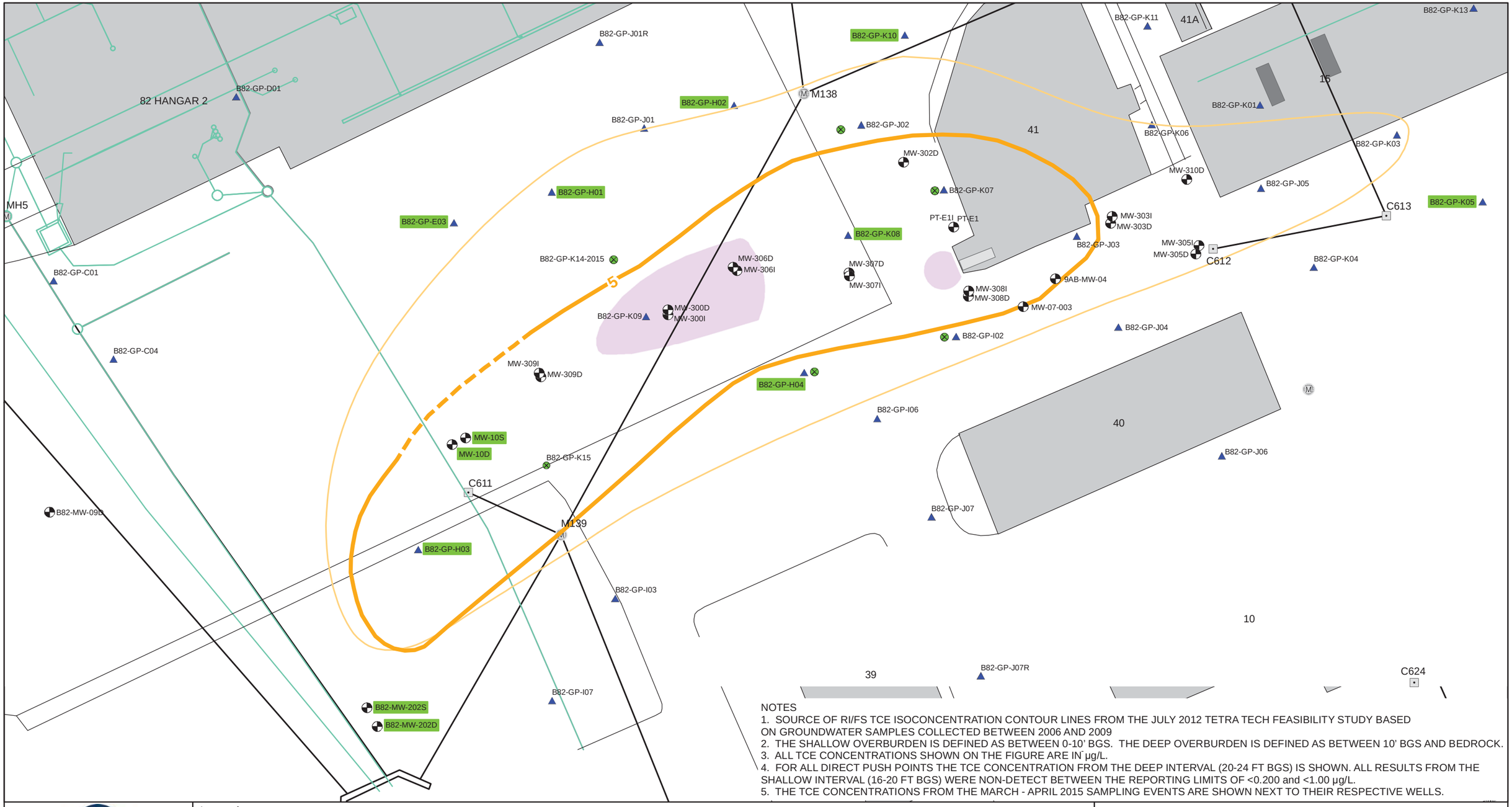
TCE has not been detected above 5 ug/L in groundwater in the shallow overburden (0-10 feet bgs). The highest concentrations of TCE range from 10 to 20 ug/L and are generally measured within the interval of 16 to 24 feet bgs. At approximately 15 to 17 feet, the very fine sand and silt in the overburden becomes very compact and much denser. This is the interval where the higher concentrations of TCE are bound. Based on groundwater measurements recorded during the 2016 and 2017 LTM events, depth to groundwater ranges between 5 and 10 feet across the Building 82 site.

U.S. EPA vapor intrusion guidance states that 'In the case of groundwater as a subsurface vapor source, the source strength will be influenced by the vertical distribution of contaminant concentrations in the upper reaches (e.g., top foot) of the water table and by seasonal fluctuations in the groundwater table. If vapor-forming chemicals are not present in the upper reaches (e.g., within the uppermost foot) of the groundwater table, vapor transport to the overlying vadose zone will be impeded due to the slower diffusion of volatile chemicals in water than in soil gas' (U.S. EPA 2015).

The results of this vapor intrusion screening, in conjunction with the nature and extent of TCE impacts at the Site, and groundwater elevation data, indicate that the vapor intrusion pathway is not a pathway of concern at the Site and that the conclusions of the RI remain valid.

5.2 CHANGE TO THE ROD REMEDY

Due to the change in groundwater classification and the results of the revised risk evaluation, the OU11 CERCLA remedy is changed to No Further Action for the groundwater COCs identified in the ROD. As such, the ROD's requirements for groundwater treatment, LUCs and monitoring are no longer required. Additionally, as Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA) will be addressed within a newly established OU, no Five Year Reviews will be required for the COCs identified in the ROD, although ongoing Navy investigations will continue to assess PFOS and PFOA, which were not identified as COCs in the ROD. Although not a component of the CERCLA remedy, the Navy may provide notice to future owners or restrict the property concerning the consumption of drinking water from the OU.



NOTES
1. SOURCE OF RI/FS TCE ISOCONCENTRATION CONTOUR LINES FROM THE JULY 2012 TETRA TECH FEASIBILITY STUDY BASED ON GROUNDWATER SAMPLES COLLECTED BETWEEN 2006 AND 2009
2. THE SHALLOW OVERBURDEN IS DEFINED AS BETWEEN 0-10' BGS. THE DEEP OVERBURDEN IS DEFINED AS BETWEEN 10' BGS AND BEDROCK.
3. ALL TCE CONCENTRATIONS SHOWN ON THE FIGURE ARE IN µg/L.
4. FOR ALL DIRECT PUSH POINTS THE TCE CONCENTRATION FROM THE DEEP INTERVAL (20-24 FT BGS) IS SHOWN. ALL RESULTS FROM THE SHALLOW INTERVAL (16-20 FT BGS) WERE NON-DETECT BETWEEN THE REPORTING LIMITS OF <0.200 and <1.00 µg/L.
5. THE TCE CONCENTRATIONS FROM THE MARCH - APRIL 2015 SAMPLING EVENTS ARE SHOWN NEXT TO THEIR RESPECTIVE WELLS.

RESOLUTION CONSULTANTS

Drawn:	JB	11/20/2017
Approved:	MS	11/20/2017
Project #:	60274866	

Legend
- Deep Overburden TCE Contour (2017)
- Deep Overburden TCE Contour (RI/FS)
- Monitoring Well
- 2015 Groundwater Profile Location
- RI Groundwater Profile Location
- Manhole
- Catch Basin
- Floor Drain System
- Storm Line
- UST
- Former Hydraulic Lifts
- ISCO Injection Areas
- Highlighted Wells have both Shallow and Deep TCE Data in Groundwater

N

0 35

Scale in Feet

FIGURE 3
SHALLOW/DEEP TCE CONCENTRATIONS IN GROUNDWATER

BUILDING 82 SITE
FORMER NAVAL AIR STATION SOUTH WEYMOUTH

Path: \\USCHL1FP001\Data\Projects\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\South_Weymouth\GIS\Projects\Building_82\ESD\MXD\Fig_4_Shallow_Deep_TCE_Concentrations_in_GW.mxd

6.0 SUPPORT AGENCY COMMENTS

U.S. EPA has reviewed and provided comments to this ESD. In signing the ESD, the U.S. EPA concurs with the findings of this document. MassDEP also reviewed this ESD and provided comments to the Navy. The Navy has addressed the comments received from both EPA and MassDEP. MassDEP has reviewed the Navy responses without further comment or objection. Evidence of MassDEP concurrence, U.S. EPA and MassDEP comments, and Navy response to comments are provided in **Appendix D**.

7.0 STATUTORY DETERMINATIONS

Considering the above-described adjustments to the selected remedy set forth in the 2012 ROD, the Navy believes that the remedy remains protective of human health and the environment. The changes described herein will provide short- and long-term effectiveness, be cost effective, implementable and be protective of human health and the environment. These changes satisfy CERCLA Section 121(b).

8.0 PUBLIC PARTICIPATION

Throughout the Site's history, the Navy has kept the community and other interested parties apprised of activities at Building 82 through informational meetings, press releases, public meetings, and contact with local officials. Also, the Navy regularly meets to discuss the status and progress of the IR Program with the Restoration Advisory Board (RAB), which includes representatives from the local community. Representatives from the Navy, U.S. EPA, and MassDEP attend these public meetings. The proposed ESD was discussed at the October 12, 2017 RAB meeting. Navy will publish a Notice of Availability and a brief description of the ESD in a major local newspaper of general circulation, as required by NCP §300.435(c)(2)(i)(B)). The ESD will also be placed in the Administrative Record file and information repository.

9.0 REFERENCES

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Appendix A

Human Health Risk Assessment Summary Tables and U.S. EPA Technical Memorandum with Risk Evaluation for a Recreational Adult/Child Scenario

TABLE A-1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemicals of Concern	CAS Number	Chronic/ Subchronic (2)	Oral RfD		Oral Absorption Efficiency for Dermal	Absorbed RfD for Dermal (1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
			Value	Units		Value	Units			Source(s)	Date(s)
CHRONIC TOXICITY VALUES											
Metals											
ARSENIC	7440-38-2	Chronic	3.0E-04	mg/kg-day	(3)	3.0E-04	mg/kg-day	Skin, Vascular	3	IRIS	2/2017
MANGANESE	7439-96-5	Chronic	2.4E-02	mg/kg-day	0.04	9.6E-04	mg/kg-day	Nervous System	3	IRIS	2/2017
Pesticides											
HEPTACHLOR EPOXIDE	1024-57-3	Chronic	1.3E-05	mg/kg-day	(3)	1.3E-05	mg/kg-day	Liver	1000	IRIS	2/2017
SVOCs											
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	Chronic	N/A	mg/kg-day	(3)	N/A	N/A	N/A	N/A	N/A	N/A
VOCs											
1,1,1-TRICLOROETHANE	71-55-6	Chronic	2.0E+00	mg/kg-day	(3)	2.0E+00	mg/kg-day	Reduced Body Weight	1000	IRIIS	4/2017
1,1-DICHLOROETHANE	75-34-3	Chronic	2.0E-01	mg/kg-day	(3)	2.0E-01	mg/kg-day	Kidney; Renal Injury	3000	PPRTV	9/2006
BENZENE	71-43-2	Chronic	4.0E-03	mg/kg-day	(3)	4.0E-03	mg/kg-day	Immune System; Blood	300	IRIS	12/2015
CHLOROFORM	67-66-3	Chronic	1.0E-02	mg/kg-day	(3)	1.0E-02	mg/kg-day	Liver	100	IRIS	4/2017
CIS-1,2-DICHLOROETHENE	156-59-2	Chronic	2.0E-03	mg/kg-day	(3)	2.0E-03	mg/kg-day	Increased relative kidney weights	3,000	IRIS	2/2017
TETRACHLOROETHENE	127-18-4	Chronic	6.0E-03	mg/kg-day	(3)	6.0E-03	mg/kg-day	Nervous System	1,000	IRIS	12/2015
TRICHLOROETHENE	79-01-6	Chronic	5.0E-04	mg/kg-day	(3)	5.0E-04	mg/kg-day	Thyroid, Developmental, Vascular	1,000	IRIS	2/2017
VINYL CHLORIDE	75-01-4	Chronic	3.0E-03	mg/kg-day	(3)	3.0E-03	mg/kg-day	Liver	30	IRIS	2/2017
SUBCHRONIC TOXICITY VALUES											
Metals											
ARSENIC	7440-38-2	Subchronic	3.0E-04	mg/kg-day	(3)	3.0E-04	mg/kg-day	Skin, Vascular	3	IRIS	2/2017
MANGANESE	7439-96-5	Subchronic	2.4E-02	mg/kg-day	0.04	9.6E-04	mg/kg-day	Nervous System	9	IRIS	2/2017
Pesticides											
HEPTACHLOR EPOXIDE	1024-57-3	Subchronic	1.3E-05	mg/kg-day	(3)	1.3E-05	mg/kg-day	Liver	1000	IRIS	2/2017
SVOCs											
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	Subchronic	N/A	mg/kg-day	(3)	N/A	mg/kg-day	N/A	N/A	N/A	N/A
VOCs											
1,1,1-TRICLOROETHANE	71-55-6	Subchronic	7.0E+00	mg/kg-day	(3)	7.0E+00	mg/kg-day	Reduced body weight	300	IRIS	4/2017
1,1-DICHLOROETHANE	75-34-3	Subchronic	2.0E+00	mg/kg-day	(3)	2.0E+00	mg/kg-day	Kidney; Renal Injury	300	PPRTV	9/2006
BENZENE	71-43-2	Subchronic	1.2E-02	mg/kg-day	(3)	1.2E-02	mg/kg-day	Immune System; Blood	100	IRIS	4/2017
CHLOROFORM	67-66-3	Subchronic	1.0E-02	mg/kg-day	(3)	1.0E-02	mg/kg-day	Liver	100	IRIS	4/2017
CIS-1,2-DICHLOROETHENE	156-59-2	Subchronic	2.0E-02	mg/kg-day	(3)	2.0E-02	mg/kg-day	Increased relative kidney weights	300	IRIS	2/2017
TETRACHLOROETHENE	127-18-4	Subchronic	8.0E-03	mg/kg-day	(3)	8.0E-03	mg/kg-day	Nervous System	300	ATSDR	3/2016
TRICHLOROETHENE	79-01-6	Subchronic	5.0E-04	mg/kg-day	(3)	5.0E-04	mg/kg-day	Thyroid, Developmental, Vascular	1,000	IRIS	2/2017
VINYL CHLORIDE	75-01-4	Subchronic	3.0E-03	mg/kg-day	(3)	3.0E-03	mg/kg-day	Liver	30	IRIS	2/2017

Notes:

ATSDR - Agency for Toxic Substances and Disease Registry. Minimal Risk Levels (MRLs). https://www.atsdr.cdc.gov/mrls/pdfs/atsdr_mrls.pdf

CAS - Chemical Abstracts Service.

IRIS - Integrated Risk Information System. https://www.epa.gov/iris.

TABLE A-1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemicals of Concern	CAS Number	Chronic/ Subchronic (2)	Oral RfD		Oral Absorption Efficiency for Dermal	Absorbed RfD for Dermal (1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
			Value	Units		Value	Units			Source(s)	Date(s)

mg/kg-day - milligram per kilogram per day.

N/A - Not Applicable/Not Available. A factor of 1 was assumed.

PPRTV - Provisional Peer-Reviewed Toxicity Value. https://hhpprtv.ornl.gov/quickview/pprtv.php.

RfD - Reference Dose.

SVOCs - Semivolatile organic compounds.

USEPA - United States Environmental Protection Agency.

VOCs - Volatile organic compounds.

(1) Calculated as: (oral RfD) x (oral to dermal adjustment factor).

(2) Published value where available. Where not available, when the chronic RfD is based on a subchronic study, a subchronic RfD has been developed by the elimination of the uncertainty factor for subchronic to chronic adjustment. If no subchronic data are available, the chronic RfD has been adopted as the subchronic RfD.

(3) Oral absorption efficiency exceeds 50%. Therefore, no adjustment of the oral reference dose is necessary (USEPA, 2004. Exhibit 4-1).

TABLE A-2

NON-CANCER TOXICITY DATA -- INHALATION

DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemical of Potential Concern	CAS Number	Chronic/ Subchronic (1)	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
			Value	Units			Source(s)	Date(s)
CHRONIC TOXICITY VALUES								
Metals								
ARSENIC	7440-38-2	Chronic	1.5E-05	mg/m^3	Developmental	30	CalEPA	9/2016
MANGANESE	7439-96-5	Chronic	5.0E-05	mg/m^3	Nervous System	1000	IRIS	2/2017
Pesticides								
HEPTACHLOR EPOXIDE	1024-57-3	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
SVOCs								
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
VOCs								
1,1,1-TRICLOROETHANE	71-55-6	Chronic	5.0E+00	mg/m^3	Liver	100	IRIS	4/2017
1,1-DICHLOROETHANE	75-34-3	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
BENZENE	71-43-2	Chronic	3.0E-02	mg/m^3	Immune, Blood	300	IRIS	4/2017
CHLOROFORM	67-66-3	Chronic	9.8E-02	mg/m^3	Liver	N/A	ATSDR	3/2016
CIS-1,2-DICHLOROETHENE	156-59-2	Chronic	N/A	N/A	N/A	N/A	N/A	N/A
TETRACHLOROETHENE	127-18-4	Chronic	4.0E-02	mg/m^3	Nervous	1000	IRIS	4/2017
TRICHLOROETHENE	79-01-6	Chronic	2.0E-03	mg/m^3	Thyroid, Vascular	100	IRIS	2/2017
VINYL CHLORIDE	75-01-4	Chronic	1.0E-01	mg/m^3	Liver	30	IRIS	2/2017

TABLE A-2

NON-CANCER TOXICITY DATA -- INHALATION

DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemical of Potential Concern	CAS Number	Chronic/ Subchronic (1)	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
			Value	Units			Source(s)	Date(s)
SUBCHRONIC TOXICITY VALUES								
Metals								
ARSENIC	7440-38-2	Subchronic	1.5E-05	mg/m^3	Developmental	30	CalEPA	9/2016
MANGANESE	7439-96-5	Subchronic	5.0E-05	mg/m^3	Nervous System	1000	IRIS	2/2017
Pesticides								
HEPTACHLOR EPOXIDE	1024-57-3	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
SVOCs								
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
VOCs								
1,1,1-TRICLOROETHANE	71-55-6	Subchronic	5E+00	mg/m^3	Liver	100	IRIS	4/2017
1,1-DICHLOROETHANE	75-34-3	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
BENZENE	71-43-2	Subchronic	9.0E-02	mg/m^3	Immune, Blood	100	IRIS	4/2017
CHLOROFORM	67-66-3	Subchronic	2E-01	mg/m^3	Liver	300	ATSDR	3/2016
CIS-1,2-DICHLOROETHENE	156-59-2	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A
TETRACHLOROETHENE	127-18-4	Subchronic	4.0E-02	mg/m^3	Nervous	1000	IRIS	4/2017
TRICHLOROETHENE	79-01-6	Subchronic	2.0E-03	mg/m^3	Thyroid, Vascular	100	IRIS	2/2017
VINYL CHLORIDE	75-01-4	Subchronic	1.0E-01	mg/m^3	Liver	30	IRIS	2/2017

TABLE A-2

NON-CANCER TOXICITY DATA -- INHALATION

DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemical of Potential Concern	CAS Number	Chronic/ Subchronic (1)	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
			Value	Units			Source(s)	Date(s)

Notes:

ATSDR - Agency for Toxic Substances and Disease Registry. Minimal Risk Levels (MRLs). https://www.atsdr.cdc.gov/mrls/pdfs/atsdr_mrls.pdf

CalEPA - California Environmental Protection Agency. Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database. http://oehha.ca.gov/chemicals.

CAS - Chemical Abstracts Service.

IRIS - Integrated Risk Information System. https://www.epa.gov/iris.

N/A - Not Applicable or Not Available.

RfC - Reference concentration.

SVOCs - Semi-volatile organic compounds.

mg/m^3 - milligram per cubic meter.

VOCs - Volatile organic compounds.

(1) Published value where available. Where not available, when the chronic RfC is based on a subchronic study, a subchronic RfC has been developed by the elimination of the uncertainty factor for subchronic to chronic adjustment. If no subchronic data are available, the chronic RfD has been adopted as the subchronic RfD.

TABLE A-3

CANCER TOXICITY DATA -- ORAL/DERMAL

DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemicals of Concern	CAS Number	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal (2)		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
		Value	Units		Value	Units		Source(s)	Date(s)
Metals									
ARSENIC	7440-38-2	1.5E+00	$(mg/kg\text{-}day)^{-1}$	(2)	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	2/2017
MANGANESE	7439-96-5	N/A	N/A	0.04	N/A	N/A	D	IRIS	2/2017
Pesticides									
HEPTACHLOR EPOXIDE	1024-57-3	9.1E+00	$(mg/kg\text{-}day)^{-1}$	(2)	9.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	2/2017
SVOCs									
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	7.0E+00	$(mg/kg\text{-}day)^{-1}$	(2)	7.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	4/2017
VOCs									
1,1,1-TRICLOROETHANE	71-55-6	N/A	N/A	(2)	N/A	N/A	INADEQUATE	IRIS	4/2017
1,1-DICHLOROETHANE	75-34-3	5.7E-03	$(mg/kg\text{-}day)^{-1}$	(2)	5.7E-03	$(mg/kg\text{-}day)^{-1}$	C	CalEPA	4/2017
BENZENE	71-43-2	5.5E-02	$(mg/kg\text{-}day)^{-1}$	(2)	5.5E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS	12/2015
CHLOROFORM	67-66-3	1.0E-02	$(mg/kg\text{-}day)^{-1}$	(2)	1.0E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	4/2017
CIS-1,2-DICHLOROETHENE	156-59-2	N/A	N/A	(2)	N/A	N/A	N/A	N/A	N/A
TETRACHLOROETHENE	127-18-4	2.1E-03	$(mg/kg\text{-}day)^{-1}$	(2)	2.1E-03	$(mg/kg\text{-}day)^{-1}$	Likely human carcinogen	IRIS	12/2015
TRICHLOROETHENE	79-01-6	4.6E-02	$(mg/kg\text{-}day)^{-1}$	(2)	4.6E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS	2/2017
VINYL CHLORIDE	75-01-4	7.2E-01	$(mg/kg\text{-}day)^{-1}$	(2)	7.2E-01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	2/2017

Notes:

CAS - Chemical Abstracts Service.

CalEPA - California Environmental Protection Agency. Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database. http://oehha.ca.gov/chemicals.

CSF - Cancer slope factor.

IRIS - Integrated Risk Information System. https://www.epa.gov/iris.

mg/kg-day - milligram per kilogram per day.

N/A - Not Applicable/Not Available.

SVOCs - Semi-volatile organic compounds.

USEPA - United States Environmental Protection Agency.

VOCs - Volatile organic compounds.

(1) Oral absorption efficiency exceeds 50%. Therefore, no adjustment of the oral slope factor is necessary (USEPA, 2004. Exhibit 4-1).

(2) Calculated as: (oral slope factor) / (oral to dermal adjustment factor)

USEPA Group / Weight of Evidence Classification:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen (by the oral route)

INADEQUATE - Inadequate information to assess carcinogenic potential

TABLE A-4

CANCER TOXICITY DATA -- INHALATION

DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemicals of Concern	CAS Number	Unit Risk		Weight of Evidence/ Cancer Guideline Description	Unit Risk	
		Value	Units		Source(s)	Date(s)
Metals						
ARSENIC	7440-38-2	4.3E-03	$(ug/m^3)^{-1}$	A	IRIS	4/2017
MANGANESE	7439-96-5	N/A	N/A	N/A	N/A	N/A
Pesticides						
HEPTACHLOR EPOXIDE	1024-57-3	2.6E-03	$(ug/m^3)^{-1}$	B2	IRIS	4/2017
SVOCs						
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	2.0E-03	$(ug/m^3)^{-1}$	B2	CalEPA	4/2017
VOCs						
1,1,1-TRICLOROETHANE	71-55-6	N/A	NA	N/A	N/A	N/A
1,1-DICHLOROETHANE	75-34-3	1.6E-06	$(ug/m^3)^{-1}$	C	CalEPA	4/2017
BENZENE	71-43-2	7.8E-06	$(ug/m^3)^{-1}$	A	IRIS	4/2017
CHLOROFORM	67-66-3	2.3E-05	$(ug/m^3)^{-1}$	B2	IRIS	4/2017
CIS-1,2-DICHLOROETHENE	156-59-2	N/A	NA	N/A	N/A	N/A
TETRACHLOROETHENE	127-18-4	2.6E-07	$(ug/m^3)^{-1}$	LIKELY	IRIS	4/2017
TRICHLOROETHENE	79-01-6	4.1E-06	$(ug/m^3)^{-1}$	A	IRIS	4/2017
VINYL CHLORIDE	75-01-4	4.4E-06	$(ug/m^3)^{-1}$	A	IRIS	4/2017

TABLE A-4

CANCER TOXICITY DATA -- INHALATION

DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemicals of Concern	CAS Number	Unit Risk		Weight of Evidence/ Cancer Guideline Description	Unit Risk	
		Value	Units		Source(s)	Date(s)

Notes:

CAS - Chemical Abstracts Service.

CalEPA - California Environmental Protection Agency. Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database. http://oehha.ca.gov/chemicals.

IRIS - Integrated Risk Information System. https://www.epa.gov/iris.

N/A - Not Applicable/Not Available.

SVOCs - Semi-volatile organic compounds.

ug/m^3 - microgram per cubic meter.

USEPA - United States Environmental Protection Agency.

VOCs - Volatile organic compounds.

USEPA Group / Weight of Evidence Classification:

A - Human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

LIKELY - Likely to be carcinogenic to humans

TABLE A-5
DERMAL WATER PARAMETERS
DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemicals of Concern	CAS Number	Chemical Properties		Dermal Water Parameters											
		MW (d) g/mol	log Kow (d) unitless	Kp (cm/hr)	B unitless	Lag Time t hr/event	t* hr	FA unitless	lsc (e) cm	log (Dsc/lsc) unitless	Dsc/lsc unitless	Dsc unitless	b (a) unitless	c (a) unitless
Metals															
ARSENIC	7440-38-2	--	--	1.00E-03 (b,c)	--	--	--	--	--	--	--	--	--	--	--
MANGANESE	7439-96-5	--	--	1.00E-03 (b,c)	--	--	--	--	--	--	--	--	--	--	--
Pesticides															
HEPTACHLOR EPOXIDE	1024-57-3	3.74E+02	4.27E+00	8.64E-03 (a)	6.43E-02 (a)	1.33E+01 (a)	3.19E+01 (a)	1.00E+00 (a)	1.00E-03	-4.90E+00	1.26E-05	1.26E-08	3.44E-01	3.77E-01
SVOCs															
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	1.30E+02	1.36E+00	2.33E-03 (a)	1.02E-02 (a)	5.72E-01 (a)	1.37E+00 (a)	1.00E+00 (a)	1.00E-03	-3.54E+00	2.91E-04	2.91E-07	3.10E-01	3.40E-01
VOCs															
1,1,1-TRICLOROETHANE	71-55-6	1.33E+02	2.49E+00	1.26E-02 (a)	5.61E-02 (a)	5.96E-01 (a)	1.43E+00 (a)	1.00E+00 (a)	1.00E-03	-3.55E+00	2.79E-04	2.79E-07	3.38E-01	3.72E-01
1,1-DICHLOROETHANE	75-34-3	9.90E+01	1.79E+00	6.74E-03 (a)	2.58E-02 (a)	3.82E-01 (a)	9.18E-01 (a)	1.00E+00 (a)	1.00E-03	-3.36E+00	4.36E-04	4.36E-07	3.19E-01	3.51E-01
BENZENE	71-43-2	7.81E+01	2.13E+00	1.49E-02 (a)	5.05E-02 (a)	2.92E-01 (a)	7.00E-01 (a)	1.00E+00 (a)	1.00E-03	-3.24E+00	5.71E-04	5.71E-07	3.35E-01	3.68E-01
CHLOROFORM	67-66-3	1.19E+02	1.97E+00	6.83E-03 (a)	2.87E-02 (a)	4.98E-01 (a)	1.19E+00 (a)	1.00E+00 (a)	1.00E-03	-3.48E+00	3.35E-04	3.35E-07	3.21E-01	3.53E-01
CIS-1,2-DICHLOROETHENE	156-59-2	9.69E+01	1.86E+00	7.71E-03 (a)	2.92E-02 (a)	3.72E-01 (a)	8.93E-01 (a)	1.00E+00 (a)	1.00E-03	-3.35E+00	4.48E-04	4.48E-07	3.21E-01	3.53E-01
TETRACHLOROETHENE	127-18-4	1.66E+02	3.40E+00	3.34E-02 (a)	1.66E-01 (a)	9.06E-01 (a)	2.18E+00 (a)	1.00E+00 (a)	1.00E-03	-3.74E+00	1.84E-04	1.84E-07	4.13E-01	4.52E-01
TRICHLOROETHENE	79-01-6	1.31E+02	2.42E+00	1.16E-02 (a)	5.13E-02 (a)	5.81E-01 (a)	1.39E+00 (a)	1.00E+00 (a)	1.00E-03	-3.54E+00	2.87E-04	2.87E-07	3.35E-01	3.68E-01
VINYL CHLORIDE	75-01-4	6.25E+01	1.36E+00	5.60E-03 (a)	1.70E-02 (a)	2.39E-01 (a)	5.73E-01 (a)	1.00E+00 (a)	1.00E-03	-3.16E+00	6.99E-04	6.99E-07	3.14E-01	3.45E-01

Notes:

CAS - Chemical Abstracts Service.

cm - centimeter.

cm/hr - centimeter per hour.

g/mol - grams per mole.

hr/event - hour per event.

SVOCs - Semi-volatile organic compounds.

VOCs - Volatile organic compounds.

(a) USEPA, 2004. Risk Assessment Guidance for Superfund. Vol. 1, Part E. July, 2004. Exhibit B-3 (Organics). Values calculated based the equations below may have rounding different from that presented in Exhibit B-3.
Values for trans-1,2-dichloroethene used for cis-1,2-dichloroethene; values for heptachlor used for heptachlor epoxide.

(b) USEPA, 2004. Risk Assessment Guidance for Superfund. Vol. 1, Part E. July, 2004. Exhibit 3-1. (Inorganics)

(c) Default for all other inorganics.

(d) USEPA, 2004. Risk Assessment Guidance for Superfund. Vol. 1, Part E. July, 2004. Exhibit B-2.

(e) USEPA, 2004. Risk Assessment Guidance for Superfund. Vol. 1, Part E. July, 2004. Equation A-4. Default value.

TABLE A-5
DERMAL WATER PARAMETERS
DEVELOPMENT OF RISK-BASED CONCENTRATIONS

Chemicals of Concern	CAS Number	Chemical Properties		Dermal Water Parameters										
		MW (d)	log Kow (d)	Kp	B	Lag Time t	t*	FA	lsc (e)	log (Dsc/lsc)	Dsc/lsc	Dsc	b (a)	c (a)
		g/mol	unitless	(cm/hr)	unitless	hr/event	hr	unitless	cm	unitless	unitless	unitless	unitless	unitless

Equations:

USEPA, 2004. Risk Assessment Guidance for Superfund. Volume 1, Part E, Supplemental Guidance for Dermal Risk Assessment

Equation 3.8: Log Kp = -2.80 + 0.66 log Kow - 0.0056 MW

Equation A.1: $B = Kp \times MW^{0.5}/2.6$

Equation A.2: Log Dsc/lsc = -2.8-0.0056 MW, where lsc = 1E-3 cm. Solving for Dsc: $Dsc = 10^{-2.8-0.0056\ MW} * lsc$.

Equation A.4: $t = lsc^2/(6*Dsc)$

Equation A.5: If $B \leq 0.6$, Equation A.5: $t^* = 2.4* t$

Equation A.6: If B> 0.6: $t^* = (b- (b^2-c^2)^{0.5}) * l^2sc/(Dsc)$

Equation A-7: $b = (2*(1+B)^2/p) -c$

Equation A-8: $c = (1+3B+3B^2)/(3*(1+B))$

Definitions:

B - Relative Contribution of Permeability Coefficient.
Dsc - Effective diffusion coefficent through stratum corneum.
FA - Fraction Absorbed.
Kow - Octanol-Water Partition Coefficient.
Kp - Dermal Permeability Coefficient.
lsc - Apparent thickness of stratum corneum.
MW - Molecular Weight.
t - lag time (hr/event).
t* - Time to reach steady state.

TABLE A-6
EXPOSURE ASSUMPTIONS - CONSTRUCTION WORKER - GROUNDWATER
REASONABLE MAXIMUM EXPOSURE
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Receptor	Medium	Pathway	Parameter	Assumed Value (e)	Units	Calculated Value	Rationale/Source
Construction/Utility Worker	Groundwater	Incidential Ingestion					
			Water Ingestion Rate	0.01	(L/day)		(a)
			Body Weight	80	(kg)		(b)
			Exposure Frequency	65	(days)/365(days) =	1.78E-01	(c)
			Exposure Duration (cancer)	1	(yrs)/70(yrs) =	1.43E-02	(c)
			Exposure Duration (noncancer)	1	(yrs)/1(yrs) =	1.00E+00	(c)
			Lifetime	70	(years)		(f)
		Dermal Contact					
			Skin Exposed	6077	(cm^2)		(d)
			Body Weight	80	(kg)		(b)
			Exposure Time	2	(hr/event)		(h)
			Event Frequency	1	(event/day)		(c)
			Exposure Frequency	65	(days)/365(days) =	1.78E-01	(c)
			Exposure Duration (cancer)	1	(yrs)/70(yrs) =	1.43E-02	(c)
			Exposure Duration (noncancer)	1	(yrs)/1(yrs) =	1.00E+00	(c)
			Lifetime	70	(years)		(f)
			Unit Conversion Factor	0.001	(L/cm^3)		-
		Inhalation					
			Exposure Time	8	(hrs)/24 (hours) =	3.33E-01	(g)
			Exposure Frequency	65	(days)/365 (days) =	1.78E-01	(c)
			Exposure Duration (cancer)	1	(yrs)/70(yrs) =	1.43E-02	(c)
			Exposure Duration (noncancer)	1	(yrs)/1(yrs) =	1.00E+00	(c)
			Lifetime	70	(years)		(f)
			Unit Conversion Factor	1000	ug/mg		-

Notes:

(a) Assumed exposure to 1/5 the amount assumed for swimming in Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). U.S. EPA, 1989.

(b) U.S. EPA, 2014. Recommended default body weight for a worker; U.S. EPA 2011. Table 8-3; weighted mean value for adults 21-78.

(c) Professional judgment. Assumes contact with groundwater in a trench may occur 2.5 days/week, 6 months/year for a duration of 1 year.

(d) U.S. EPA, 2011. Table 7-2. Represents weighted mean surface area for males and females, including hands, forearms, lower legs and feet. Body parts assumed to come in contact with groundwater are consistent with those assumed in the human health risk assessment, as documented in the ROD (2012).

(e) Value consistent with that assumed in the human health risk assessment, as documented in the ROD (2012), updated as appropriate.

(f) U.S. EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). U.S. EPA, 1989.

(g) Assumes a construction worker may inhale volatiles originating from groundwater in an excavation trench for 8 hours/day.

(h) Assumes a construction worker may come into dermal contact with groundwater in an excavation trench for 2 hours/day.

(i) Exposure assumptions are consistent with those used in the human health risk assessment, as documented in the ROD (2012), updated as appropriate.

ROD (2012) - Navy Facilities Engineering Command, 2012. Record of Decision, Building 82 (Hangar 2), Former NAS South Weymouth, Weymouth, Massachusetts. September 2012.

U.S. EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). U.S. EPA, 1989.

U.S. EPA, 2011. Exposure Factors Handbook, 2011 Edition. EPA/600/R-090/052F, September 2011. U.S. EPA, 2011.

U.S. EPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February 6, 2014. Corrected September 2015.

TABLE A-7.1
CARCINOGENIC AND NONCARCINOGENIC ASSESSMENT - INCIDENTAL
INGESTION AND DERMAL CONTACT WITH GROUNDWATER
CONSTRUCTION WORKER
REASONABLE MAXIMUM EXPOSURE
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

		Compound Parameters												
Compound	CAS	Concentration in Groundwater (mg/L)	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Dermal Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Oral Reference Dose (mg/kg-day)	Dermal Reference Dose (mg/kg-day)	Dermal Permeability Constant (cm/hr)	B (unitless)	Tau event (hr/event)	Time to steady state t* (hr)	Fraction Absorbed	Exposure Time (ET) (hr)		DA event Dose Absorbed $(mg/cm^2\text{-}event)$
Metals														
ARSENIC	7440-38-2	4.09E-03	1.50E+00	1.50E+00	3.00E-04	3.00E-04	1.00E-03	--	--	--	--	2		8.18E-09
MANGANESE	7439-96-5	4.79E+00	N/A	N/A	2.40E-02	9.60E-04	1.00E-03	--	--	--	--	2		9.58E-06
Pesticides														
HEPTACHLOR EPOXIDE	1024-57-3	2.00E-05	9.10E+00	9.10E+00	1.30E-05	1.30E-05	8.64E-03	6.43E-02	1.33E+01	3.19E+01	1	2	ET<t*	2.46E-09
SVOCs														
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	ND	7.00E+00	7.00E+00	N/A	N/A	2.33E-03	1.02E-02	5.72E-01	1.37E+00	1	2	ET>t*	NA
VOCs														
1,1,1-TRICLOROETHANE	71-55-6	ND	N/A	N/A	7.00E+00	7.00E+00	1.26E-02	5.61E-02	5.96E-01	1.43E+00	1	2	ET>t*	NA
1,1-DICHLOROETHANE	75-34-3	2.69E-03	5.70E-03	5.70E-03	2.00E+00	2.00E+00	6.74E-03	2.58E-02	3.82E-01	9.18E-01	1	2	ET>t*	4.96E-08
BENZENE	71-43-2	1.90E-03	5.50E-02	5.50E-02	1.20E-02	1.20E-02	1.49E-02	5.05E-02	2.92E-01	7.00E-01	1	2	ET>t*	7.11E-08
CHLOROFORM	67-66-3	7.66E-03	1.00E-02	1.00E-02	1.00E-02	1.00E-02	6.83E-03	2.87E-02	4.98E-01	1.19E+00	1	2	ET>t*	1.55E-07
CIS-1,2-DICHLOROETHENE	156-59-2	4.86E-04	N/A	N/A	2.00E-02	2.00E-02	7.71E-03	2.92E-02	3.72E-01	8.93E-01	1	2	ET>t*	1.02E-08
TETRACHLOROETHENE	127-18-4	5.81E-03	2.10E-03	2.10E-03	8.00E-03	8.00E-03	3.34E-02	1.66E-01	9.06E-01	2.18E+00	1	2	ET<t*	7.23E-07
TRICHLOROETHENE	79-01-6	2.09E-02	4.60E-02	4.60E-02	5.00E-04	5.00E-04	1.16E-02	5.13E-02	5.81E-01	1.39E+00	1	2	ET>t*	7.60E-07
VINYL CHLORIDE	75-01-4	ND	7.20E-01	7.20E-01	3.00E-03	3.00E-03	5.60E-03	1.70E-02	2.39E-01	5.73E-01	1	2	ET>t*	NA

Notes:
CAS - Chemical Abstracts Service.
cm/hr - centimeter per hour.
ILCR - Incremental Lifetime Cancer Risk.
HI - Hazard Index.
hr - hour.
mg/cm^2 - milligram per square centimeter.
mg/cm^2-event - milligram per square centimeter per event.
mg/kg - milligram per kilogram.
mg/kg-day - milligram per kilogram per day.
mg/L - milligram per liter.
N/A - Not available or applicable.
NC - Not calculated.
(a) Equal to the maximum detected groundwater concentrations since 2013, except for manganese, which is the maximum detected concentration since 2015, following permanganate injections in 2014.

TABLE A-7.1
CARCINOGENIC AND NONCARCINOGENIC ASSESSMENT - INCIDENTAL
INGESTION AND DERMAL CONTACT WITH GROUNDWATER
CONSTRUCTION WORKER
REASONABLE MAXIMUM EXPOSURE
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

		Estimates Based on Groundwater Concentration													
		Average Daily Dose - Cancer (mg/kg-day)			Average Daily Dose - Noncancer (mg/kg-day)			Potential Excess Lifetime Cancer Risk				Potential Hazard Index			
Compound	CAS	Ingestion	Dermal Contact	Lifetime	Ingestion	Dermal Contact	Lifetime	Ingestion	Dermal Contact	Inhalation (From Table A-7.2)	Total	Ingestion	Dermal Contact	Inhalation (From Table A-7.2)	Total
Metals															
ARSENIC	7440-38-2	1.30E-09	1.58E-09	2.88E-09	9.10E-08	1.11E-07	2.02E-07	1.95E-09	2.37E-09	NC	4.32E-09	3.03E-04	3.69E-04	NC	6.72E-04
MANGANESE	7439-96-5	1.52E-06	1.85E-06	3.37E-06	1.07E-04	1.30E-04	2.36E-04	NC	NC	NC	NC	4.44E-03	1.35E-01	NC	1.39E-01
Pesticides															
HEPTACHLOR EPOXIDE	1024-57-3	6.36E-12	4.76E-10	4.82E-10	4.45E-10	3.33E-08	3.37E-08	5.79E-11	4.33E-09	4.24E-10	4.81E-09	3.42E-05	2.56E-03	NC	2.60E-03
SVOCs															
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
VOCs															
1,1,1-TRICLOROETHANE	71-55-6	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,1-DICHLOROETHANE	75-34-3	8.55E-10	9.59E-09	1.04E-08	5.99E-08	6.71E-07	7.31E-07	4.88E-12	5.46E-11	4.11E-10	4.70E-10	2.99E-08	3.36E-07	NC	3.65E-07
BENZENE	71-43-2	6.04E-10	1.37E-08	1.43E-08	4.23E-08	9.62E-07	1.00E-06	3.32E-11	7.56E-10	1.59E-09	2.38E-09	3.52E-06	8.01E-05	1.59E-04	2.42E-04
CHLOROFORM	67-66-3	2.44E-09	3.00E-08	3.24E-08	1.71E-07	2.10E-06	2.27E-06	2.44E-11	3.00E-10	1.52E-08	1.56E-08	1.71E-05	2.10E-04	1.90E-04	4.17E-04
CIS-1,2-DICHLOROETHENE	156-59-2	1.55E-10	1.96E-09	2.12E-09	1.08E-08	1.37E-07	1.48E-07	NC	NC	NC	NC	5.41E-07	6.87E-06	NC	7.41E-06
TETRACHLOROETHENE	127-18-4	1.85E-09	1.40E-07	1.42E-07	1.29E-07	9.78E-06	9.91E-06	3.88E-12	2.93E-10	1.12E-10	4.09E-10	1.62E-05	1.22E-03	7.55E-04	1.99E-03
TRICHLOROETHENE	79-01-6	6.65E-09	1.47E-07	1.53E-07	4.65E-07	1.03E-05	1.07E-05	3.06E-10	6.75E-09	7.13E-09	1.42E-08	9.30E-04	2.06E-02	6.09E-02	8.24E-02
VINYL CHLORIDE	75-01-4	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
								Total ILCR:			**4.2E-08**		**Total HI:**		**2E-01**

Notes:

CAS - Chemical Abstracts Service.

cm/hr - centimeter per hour.

ILCR - Incremental Lifetime Cancer Risk.

HI - Hazard Index.

hr - hour.

mg/cm^2 - milligram per square centimeter.

mg/cm^2-event - milligram per square centimeter per event.

mg/kg - milligram per kilogram.

mg/kg-day - milligram per kilogram per day.

mg/L - milligram per liter.

N/A - Not available or applicable.

NC - Not calculated.

(a) Equal to the maximum detected groundwater concentrations since 2013, except for manganese, which is the maximum detected concentration since 2015, following permanganate injections in 2014.

TABLE A-7.2
CARCINOGENIC AND NONCARCINOGENIC ASSESSMENT - INHALATION OF VOLATILES FROM GROUNDWATER IN AN EXCAVATION TRENCH
CONSTRUCTION WORKER
REASONABLE MAXIMUM EXPOSURE
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

		Compound Parameters			Estimates Based on Groundwater Concentration			
Compound	CAS	Concentration In Air (a) (mg/m^3 air)	Unit Risk Factor $(ug/m^3)^{-1}$	Inhalation Reference Concentration (mg/m^3)	Average Daily Exposure - Cancer (mg/m^3 air)	Average Daily Exposure - Noncancer (mg/m^3 air)	Potential Excess Lifetime Cancer Risk	Potential Hazard Index
Metals								
ARSENIC	7440-38-2	N/A	4.30E-03	1.50E-05	NC	NC	NC	NC
MANGANESE	7439-96-5	N/A	N/A	5.00E-05	NC	NC	NC	NC
Pesticides								
HEPTACHLOR EPOXIDE	1024-57-3	1.92E-07	2.60E-03	N/A	1.63E-10	1.14E-08	4.24E-10	NC
SVOCs								
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	N/A	2.00E-03	N/A	NC	NC	NC	NC
VOCs								
1,1,1-TRICLOROETHANE	71-55-6	N/A	N/A	5.00E+00	NC	NC	NC	NC
1,1-DICHLOROETHANE	75-34-3	3.03E-04	1.60E-06	N/A	2.57E-07	1.80E-05	4.11E-10	NC
BENZENE	71-43-2	2.41E-04	7.80E-06	9.00E-02	2.04E-07	1.43E-05	1.59E-09	1.59E-04
CHLOROFORM	67-66-3	7.81E-04	2.30E-05	2.44E-01	6.62E-07	4.64E-05	1.52E-08	1.90E-04
CIS-1,2-DICHLOROETHENE	156-59-2	5.50E-05	N/A	N/A	4.67E-08	3.27E-06	NC	NC
TETRACHLOROETHENE	127-18-4	5.09E-04	2.60E-07	4.00E-02	4.32E-07	3.02E-05	1.12E-10	7.55E-04
TRICHLOROETHENE	79-01-6	2.05E-03	4.10E-06	2.00E-03	1.74E-06	1.22E-04	7.13E-09	6.09E-02
VINYL CHLORIDE	75-01-4	N/A	4.40E-06	1.00E-01	NC	NC	NC	NC

Notes:
CAS - Chemical Abstracts Service.
mg/m^3 - milligram per cubic meter.
N/A - Not applicable or not available.
NC - Not calculated.
ug/m^3 - microgram per cubic meter.
(a) Air concentrations modeled from the maximum detected groundwater concentrations since 2013 (as presented on Table A-7.1) using the Virginia Department of Environmental Quality (VDEQ) trench model for groundwater depth less than 15 feet (ft), with trench dimensions of 4 ft x 8 ft x 4 ft, as discussed on the following page.

VADEQ Trench Model Discussion

The Virginia Department of Environmental Quality (VADEQ) has published an approach and spreadsheet for predicting exposure of workers to volatile substances in trenches. The VADEQ model uses a simple box model to model the mixing of volatile chemicals in air. The main equation is:

$C_{trench} = C_{GW} \times VF$ Equation (1)

where:

C_{trench} = concentration of volatile substance in trench (ug/m^3)

C_{GW} = concentration of volatile substance in groundwater (ug/L)

VF = volatilization factor

The exposed groundwater model is very conservative and in some cases yields unrealistic vapor concentrations in a trench. Therefore, the model was modified as discussed below.

For exposed groundwater, the following equation is used to determine the volatilization factor:

$VF = (K_i \times A \times F \times 10^{-3} \times 10^4 \times 3600) \div (ACH \times V)$ Equation (2)

where:

Ki = overall mass transfer coefficient of the volatile substance (cm/s)

A = Area of trench (m^2)

F = fraction of floor through which contaminant can enter (dimensionless)

ACH = air changes per hour (hr^{-1})

V = volume of trench (m^3)

Per the United States Environmental Protection Agency (USEPA) Region III, a value of 2 hr^{-1} is to be used for ACH in cases when the trench depth is greater than the trench width. This low value represents the restricted gas exchange between the trench and the ambient atmosphere. When the trench width exceeds the trench depth, the gas exchange between the trench and the ambient is relatively unrestricted and a value of 360 hr^{-1} is suggested for ACH. The VADEQ model was adjusted to allow calculation of the ACH based on user inputted values of trench length and depth. As noted previously, the VADEQ model is essentially a box model that evaluates the mixing of volatile chemicals in air. For such models, either an air exchange rate or wind speed is used to evaluate the rate of mixing. The ACH can be determined given the wind speed in the trench and the length of the trench:

$ACH = (U_{trench} \times 3600) \div L$ Equation (3)

where:

U_{trench} = air velocity in the trench (m/s)

L = length of trench (m)

Based on engineering judgment, it is assumed that the air velocity in the trench is approximately half the ambient air velocity for a 100 feet long trench. This results in an ACH of 59 hr^{-1}. Similarly, for a trench that is 8 feet in length, the air velocity in the trench is estimated to be approximately 10% of the ambient air velocity, resulting in an ACH of 148 hr^{-1}. These calculated ACHs can then be used in conjunction with the VADEQ model predicted ACHs to estimate the value of F (fraction of floor through which a chemical can enter). For example, for a 100 foot long

by 4 feet wide by 8 feet deep trench, the VADEQ modeled ACH is 2 hr^{-1} (since the depth > width). For an ambient wind speed of 1 m/s, it is assumed that the in-trench air velocity is 0.5 m/s (50% of ambient), resulting in an ACH of 59 hr^{-1}. The calculated value of F in this instance is 2÷59 = 0.034. This value of F is used in Equation (1) above to calculate the volatilization factor representative of the actual setup being modeled.

GROUNDWATER TRENCH AIR CALCULATIONS

For Mass-Transfer Coefficients

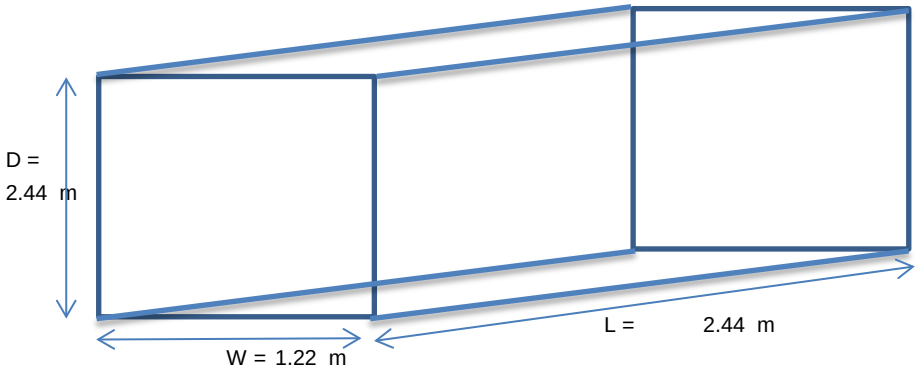
Kg,H2O	0.833	cm/s
MWH2O	18	
Kl,O2	0.002	cm/s
MWO2	32	
T	**77**	F
T	298	K
R	8.20E-05	atm-m3/mol-K

For Emission Flux and Concentration in Trench

CF1	1.00E-03	L/cm3
CF2	1.00E+04	cm2/m2
CF3	3600	s/hr
F	**0.0135**	
ACH	2	hr-1
Effective ACH =	148	hr-1

Trench dimensions

Length	**8**	ft
	2.44	m
Width	**4**	ft
	1.22	m
Depth	**8**	ft
	2.44	m
Width/Depth	0.50	



The two approaches are functionally the same. It is possible to convert the air exchange rate to a wind speed (or vice versa) by simplifying the equations:

$$U_{air} = \frac{ACH \times L}{3600} \quad \text{or} \quad ACH = \frac{U_{air} \times 3600}{L}$$

Overall it makes no difference whether an air exchange rate or a wind speed is used as the basis for evaluating mixing of vapours in the trench, since they can be readily be converted to the other form.

Length =	2.44	m
Width =	1.22	m
Depth =	2.44	m
Area =	2.97	m^2
Volume =	7.25	m^3
Ambient wind speed	1.00	m/sec
Expected wind speed in trench =	0.10	m/s
User Input	10%	of ambient

http://www.ccme.ca/files/Resources/supporting_scientific_documents/pn1455_n_hexane.pdf

Parameter	Value	Units
U_{trench}	0.10	m/sec
L	2.44	m
ACH	148	1/hr
F	0.014	none

GROUNDWATER TRENCH AIR CALCULATIONS

Table 3.8 Exposure-point concentrations (inhalation) for construction/utility workers in a trench: Groundwater less than 15 feet deep	CAS No.	Molecular Weight MWi g/mol	Henry's Law Constant Hi atm-m3/mol	Gas-Phase Mass Transfer Coefficient KiG cm/s	Liquid-Phase Mass Transfer Coefficient KiL cm/s	Overall Mass Transfer Coefficient Ki cm/s	Volatilization Factor VF L/m3
Benzene	71-43-2	78.11	5.55E-03	5.09E-01	1.28E-03	1.27E-03	1.27E-01
Chloroform	67-66-3	119.38	3.67E-03	4.42E-01	1.04E-03	1.02E-03	1.02E-01
1,1-Dichloroethane	75-34-3	98.96	5.62E-03	4.71E-01	1.14E-03	1.13E-03	1.13E-01
cis-1,2-Dichloroethene	156-59-2	96.94	4.08E-03	4.74E-01	1.15E-03	1.13E-03	1.13E-01
Tetrachloroethene	127-18-4	165.83	1.84E-02	3.96E-01	8.79E-04	8.76E-04	8.76E-02
1,1,1-Trichloroethane	71-55-6	133.40	1.72E-02	4.26E-01	9.80E-04	9.76E-04	9.76E-02
Trichloroethene	79-01-6	131.39	1.03E-02	4.28E-01	9.87E-04	9.82E-04	9.82E-02
Vinyl Chloride	75-01-4	62.50	2.70E-02	5.49E-01	1.43E-03	1.43E-03	1.43E-01
N-Nitroso-di-n-propylamine	621-64-7	130.19	2.25E-06	4.29E-01	9.92E-04	3.80E-05	3.80E-03

TABLE A-8
EXPOSURE ASSUMPTIONS - MAINTENANCE WORKER/RESIDENTIAL ADULT - GROUNDWATER (USED FOR IRRIGATION) (e)
REASONABLE MAXIMUM EXPOSURE
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Receptor	Medium	Pathway	Parameter	Assumed Value (f)	Units	Calculated Value	Rationale/Source
Maintenance Worker/Residential Adult	Groundwater	Incidential Ingestion					
			Water Ingestion Rate	0.12	(L/day)		(a)
			Body Weight	80	(kg)		(b)
			Exposure Frequency	150	(days)/365(days) =	4.11E-01	(a)(h)
			Fraction Groundwater Used	0.44	(unitless)		(a)
			Exposure Duration (cancer)	24	(yrs)/70(yrs) =	3.43E-01	(a)
			Exposure Duration (noncancer)	24	(yrs)/24(yrs) =	1.00E+00	(a)
			Lifetime	70	(years)		(g)
		Dermal Contact					
			Skin Exposed	6077	(cm^2)		(c)
			Body Weight	80	(kg)		(b)
			Exposure Time	2	(hr/event)		(d)
			Event Frequency	1	(event/day)		(d)
			Exposure Frequency	150	(days)/365(days) =	4.11E-01	(h)
			Exposure Duration (cancer)	25	(yrs)/70(yrs) =	3.57E-01	(a)
			Exposure Duration (noncancer)	24	(yrs)/24(yrs) =	1.00E+00	(a)
			Lifetime	70	(years)		(g)
			Unit Conversion Factor	0.001	(L/cm^3)		-

Notes:
(a) Value used by the Navy Marine Corps Public Health Center in screening level calculations for incidental ingestion of groundwater by a residential adult/maintenance worker for irrigation purposes (Tetra Tech, 2012).
(b) U.S. EPA, 2014. Recommended default body weight for a worker; U.S. EPA 2011. Table 8-3; weighted mean value for adults 21-78.
(c) U.S. EPA, 2011. Table 7-2. Represents weighted mean surface area for males and females, including hands, forearms, lower legs and feet. Body parts assumed to come in contact with groundwater are consistent with those assumed in the human health risk assessment, as documented in the ROD (2012).
(d) Professional judgment. Assumes contact with groundwater may occur for 2 hours per event for 1 event per day.
(e) Non-drinking water use (i.e., irrigation water use).
(f) Exposure assumptions are consistent with those used in the Hangar 1 Site Final Decision Document (Tetra Tech, 2012), updated as appropriate.
(g) U.S. EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). U.S. EPA, 1989.
(h) Professional judgment. Conservatively assumes contact with groundwater may occur for 150 days per year, which is equivalent to 5 days per week for 30 weeks (i.e., 7 months) of the year.
U.S. EPA, 2011. Exposure Factors Handbook, 2011 Edition. EPA/600/R-090/052F, September 2011. U.S. EPA, 2011.
Tetra Tech, 2012. Draft Final Decision Document, Review Item Area II, Release of Aqueous Film Forming Foam, Hangar I Site, Former NAS South Weymouth, Weymouth, MA. Tetra Tech 2012.
U.S. EPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. February 6, 2014. Corrected September 2015.

TABLE A-9
CARCINOGENIC AND NONCARCINOGENIC ASSESSMENT - INCIDENTAL
INGESTION AND DERMAL CONTACT WITH GROUNDWATER (USED FOR IRRIGATION)
MAINTENANCE WORKER/RESIDENTIAL ADULT
REASONABLE MAXIMUM EXPOSURE
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Compound	CAS	Compound Parameters												
		Concentration in Groundwater	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Oral Reference Dose	Dermal Reference Dose	Dermal Permeability Constant	B	Tau event	Time to steady state t*	Fraction Absorbed	Exposure Time (ET)		DA event Dose Absorbed
		(a) (mg/L)	$(mg/kg\text{-}day)^{-1}$	$(mg/kg\text{-}day)^{-1}$	(mg/kg-day)	(mg/kg-day)	(cm/hr)	(unitless)	(hr/event)	(hr)		(hr)		$(mg/cm^2\text{-}event)$
Metals														
ARSENIC	7440-38-2	4.09E-03	1.50E+00	1.50E+00	3.00E-04	3.00E-04	1.00E-03	--	--	--	--	2		8.18E-09
MANGANESE	7439-96-5	4.79E+00	N/A	N/A	2.40E-02	9.60E-04	1.00E-03	--	--	--	--	2		9.58E-06
Pesticides														
HEPTACHLOR EPOXIDE	1024-57-3	2.00E-05	9.10E+00	9.10E+00	1.30E-05	1.30E-05	8.64E-03	6.43E-02	1.33E+01	3.19E+01	1	2	ET<t*	2.46E-09
SVOCs														
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	ND	7.00E+00	7.00E+00	N/A	N/A	2.33E-03	1.02E-02	5.72E-01	1.37E+00	1	2	ET>t*	NA
VOCs														
1,1,1-TRICLOROETHANE	71-55-6	ND	N/A	N/A	2.00E+00	2.00E+00	1.26E-02	5.61E-02	5.96E-01	1.43E+00	1	2	ET>t*	NA
1,1-DICHLOROETHANE	75-34-3	2.69E-03	5.70E-03	5.70E-03	2.00E-01	2.00E-01	6.74E-03	2.58E-02	3.82E-01	9.18E-01	1	2	ET>t*	4.96E-08
BENZENE	71-43-2	1.90E-03	5.50E-02	5.50E-02	4.00E-03	4.00E-03	1.49E-02	5.05E-02	2.92E-01	7.00E-01	1	2	ET>t*	7.11E-08
CHLOROFORM	67-66-3	7.66E-03	1.00E-02	1.00E-02	1.00E-02	1.00E-02	6.83E-03	2.87E-02	4.98E-01	1.19E+00	1	2	ET>t*	1.55E-07
CIS-1,2-DICHLOROETHENE	156-59-2	4.86E-04	N/A	N/A	2.00E-03	2.00E-03	7.71E-03	2.92E-02	3.72E-01	8.93E-01	1	2	ET>t*	1.02E-08
TETRACHLOROETHENE	127-18-4	5.81E-03	2.10E-03	2.10E-03	6.00E-03	6.00E-03	3.34E-02	1.66E-01	9.06E-01	2.18E+00	1	2	ET<t*	7.23E-07
TRICHLOROETHENE	79-01-6	2.09E-02	4.60E-02	4.60E-02	5.00E-04	5.00E-04	1.16E-02	5.13E-02	5.81E-01	1.39E+00	1	2	ET>t*	7.60E-07
VINYL CHLORIDE	75-01-4	ND	7.20E-01	7.20E-01	3.00E-03	3.00E-03	5.60E-03	1.70E-02	2.39E-01	5.73E-01	1	2	ET>t*	NA

Notes:
CAS - Chemical Abstracts Service.
cm/hr - centimeter per hour.
ILCR - Incremental Lifetime Cancer Risk.
HI - Hazard Index.
hr - hour.
mg/cm^2 - milligram per square centimeter.
mg/cm^2-event - milligram per square centimeter per event.
mg/kg-day - milligram per kilogram per day.
mg/L - milligram per liter.
N/A - Not available or applicable.
NC - Not calculated.
(a) Equal to the maximum detected groundwater concentrations since 2013, except for manganese, which is the maximum detected concentration since 2015, following permanganate injections in 2014.

TABLE A-9
CARCINOGENIC AND NONCARCINOGENIC ASSESSMENT - INCIDENTAL
INGESTION AND DERMAL CONTACT WITH GROUNDWATER (USED FOR IRRIGATION)
MAINTENANCE WORKER/RESIDENTIAL ADULT
REASONABLE MAXIMUM EXPOSURE
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

		Estimates Based on Groundwater Concentration											
		Average Daily Dose - Cancer (mg/kg-day)			Average Daily Dose - Noncancer (mg/kg-day)			Potential Excess Lifetime Cancer Risk			Potential Hazard Index		
Compound	CAS	Ingestion	Dermal Contact	Lifetime	Ingestion	Dermal Contact	Lifetime	Ingestion	Dermal Contact	Total	Ingestion	Dermal Contact	Total
Metals													
ARSENIC	7440-38-2	3.80E-07	9.12E-08	4.72E-07	1.11E-06	2.55E-07	1.36E-06	5.71E-07	1.37E-07	7.07E-07	3.70E-03	8.51E-04	4.55E-03
MANGANESE	7439-96-5	4.45E-04	1.07E-04	5.52E-04	1.30E-03	2.99E-04	1.60E-03	NC	NC	NC	5.41E-02	3.12E-01	3.66E-01
Pesticides													
HEPTACHLOR EPOXIDE	1024-57-3	1.86E-09	2.74E-08	2.93E-08	5.42E-09	7.69E-08	8.23E-08	1.69E-08	2.50E-07	2.67E-07	4.17E-04	5.91E-03	6.33E-03
SVOCs													
N-NITROSO-DI-N-PROPYLAMINE	621-64-7	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
VOCs													
1,1,1-TRICLOROETHANE	71-55-6	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
1,1-DICHLOROETHANE	75-34-3	2.50E-07	5.53E-07	8.03E-07	7.30E-07	1.55E-06	2.28E-06	1.43E-09	3.15E-09	4.58E-09	3.65E-06	7.74E-06	1.14E-05
BENZENE	71-43-2	1.77E-07	7.93E-07	9.69E-07	5.15E-07	2.22E-06	2.73E-06	9.72E-09	4.36E-08	5.33E-08	1.29E-04	5.55E-04	6.84E-04
CHLOROFORM	67-66-3	7.12E-07	1.73E-06	2.44E-06	2.08E-06	4.84E-06	6.92E-06	7.12E-09	1.73E-08	2.44E-08	2.08E-04	4.84E-04	6.92E-04
CIS-1,2-DICHLOROETHENE	156-59-2	4.52E-08	1.13E-07	1.58E-07	1.32E-07	3.17E-07	4.49E-07	NC	NC	NC	6.59E-05	1.59E-04	2.24E-04
TETRACHLOROETHENE	127-18-4	5.40E-07	8.06E-06	8.60E-06	1.58E-06	2.26E-05	2.41E-05	1.13E-09	1.69E-08	1.81E-08	2.63E-04	3.76E-03	4.02E-03
TRICHLOROETHENE	79-01-6	1.94E-06	8.47E-06	1.04E-05	5.67E-06	2.37E-05	2.94E-05	8.94E-08	3.90E-07	4.79E-07	1.13E-02	4.74E-02	5.88E-02
VINYL CHLORIDE	75-01-4	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
									Total ILCR:	**1.6E-06**		**Total HI:**	**4E-01**

Notes:
CAS - Chemical Abstracts Service.
cm/hr - centimeter per hour.
ILCR - Incremental Lifetime Cancer Risk.
HI - Hazard Index.
hr - hour.
mg/cm^2 - milligram per square centimeter.
mg/cm^2-event - milligram per square centimeter per event.
mg/kg-day - milligram per kilogram per day.
mg/L - milligram per liter.
N/A - Not available or applicable.
NC - Not calculated.
(a) Equal to the maximum detected groundwater concentrations since 2013, except for manganese, which is the maximum detected concentration since 2015, following permanganate injections in 2014.

TABLE A-10
UPDATED VAPOR INTRUSION SCREENING EVALUATION
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Compound (a)	CAS	Maximum Detected Concentration in Shallow Groundwater (RI dataset)		Location of Maximum Detected Concentration	U.S. EPA Groundwater VISL (TR = 1E-6; THQ = 0.1)	MassDEP GW-2	Is the Maximum Detected Concentration > Screening Level?	Further Evaluation Summary for Compounds Detected Above the Groundwater Screening Level
Acetone	67-64-1	12		B82-GP-H01 (7-12 ft)	2,259,317	50,000	No	--
Aroclor 1260	11096-82-5	0.028	J	B82-MW-203S (4-14 ft)	0.36	5	No	--
Benzene	71-43-2	1.3		B82-GP-D02 (8-11 ft)	1.6	1,000	No	--
Butylbenzene, sec-	135-98-8	1.2		B82-GP-D02 (8-11 ft)	NA	NA	No	--
Isopropylbenzene (Cumene)	98-82-8	1.4		B82-GP-A01 (9-12 ft); B82-GP-D02 (8-11 ft)	89	NA	No	--
Dichloroethane, 1,1-	75-34-3	99	J	B82-GP-A01 (9-12 ft)	7.6	2,000	**Yes (VISL only)**	Sampling conducted between 2014 and 2017 indicates the maximum detected concentration of 1,1-dichloroethane decreased to 2.69 ug/L in 2014 and was not detected in more current sampling rounds. Since current concentrations of 1,1-dichloroethane are less than the groundwater VISL, 1,1-dichloroethane is not a COC for the vapor intrusion pathway.
Dichloroethylene, 1,1-	75-35-4	14		B82-GP-A01 (9-12 ft)	19.5	80	No	--
Ethylbenzene	100-41-4	1.5		B82-GP-A01 (9-12 ft)	3.5	20,000	No	--
Methyl Ethyl Ketone (2-Butanone)	78-93-3	3		B82-GP-B01 (12-14 ft)	224,155	50,000	No	--
Methyl tert-Butyl Ether (MTBE)	1634-04-4	1.3		B82-MW-200S (4-14 ft)	450	50,000	No	--
Naphthalene	91-20-3	68	J	B82-GP-A01 (9-12 ft)	4.6	700	**Yes (VISL only)**	Naphthalene was detected above the U.S. EPA groundwater VISL in only 1 out of 28 shallow groundwater samples from the RI dataset. The estimated potential risk associated with the maximum detected concentration assuming U.S. EPA's conservative default attenuation factor utilized in the VISL calculator is 1E-5 (for a residential exposure scenario), which is within U.S. EPA's target risk range. The maximum detected concentration is less than the MassDEP GW-2 standard. Naphthalene was also not identified as a COC in the ROD. Therefore, naphthalene is not a COC for the vapor intrusion pathway.
Tetrachloroethylene (PCE)	127-18-4	0.4		B82-MW-203S (4-14 ft)	5.8	50	No	--
Toluene	108-88-3	5.6		B82-GP-A01 (9-12 ft)	1,921	50,000	No	--
Trichloroethane, 1,1,1-	71-55-6	360		B82-GP-A01 (9-12 ft)	742	4,000	No	--
Trichloroethylene (TCE)	79-01-6	1.05		B82-GP-H02 (9-13 ft)	0.52	5	**Yes (VISL only)**	The maximum detected concentration in shallow groundwater from the RI dataset is less than the U.S. EPA groundwater VISL based on a target cancer risk of 1E-6 and target hazard quotient of 1 (1.2 ug/L). The critical effect for each of the four compounds detected above the conservative screening levels is different [See footnote (d)]. Therefore, use of the groundwater VISL based on a target hazard quotient of 1 is appropriate. Therefore, TCE is not a COC for the vapor intrusion pathway.

TABLE A-10
UPDATED VAPOR INTRUSION SCREENING EVALUATION
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

Compound (a)	CAS	Maximum Detected Concentration in Shallow Groundwater (RI dataset)	Location of Maximum Detected Concentration	U.S. EPA Groundwater VISL (TR = 1E-6; THQ = 0.1)	MassDEP GW-2	Is the Maximum Detected Concentration > Screening Level?	Further Evaluation Summary for Compounds Detected Above the Groundwater Screening Level
Trimethylbenzene, 1,2,4-	95-63-6	36	B82-GP-A01 (9-12 ft)	24.8 (b)	NA	**Yes (VISL only)**	The maximum detected concentration in shallow groundwater from the RI dataset is less than the U.S. EPA groundwater VISL based on a target cancer risk of 1E-6 and target hazard quotient of 1 (248 ug/L). The critical effect for each of the four compounds detected above the conservative screening levels is different [See footnote (d)]. Therefore, use of the groundwater VISL based on a target hazard quotient of 1 is appropriate. Therefore, 1,2,4-trimethylbenzene is not a COC for the vapor intrusion pathway. Naphthalene was also not identified as a COC in the ROD.
Trimethylbenzene, 1,3,5-	108-67-8	11	B82-GP-A01 (9-12 ft)	24.8 (c)	NA	No	--
Xylenes	1330-20-7	9.5	B82-GP-A01 (9-12 ft)	38.5	3,000	No	--

Notes:
All values on this table are presented in units of microgram per liter (ug/L).
-- Indicates further evaluation is not necessary because compound was detected below conservative screening levels.
bgs - below ground surface.
CAS - Chemical Abstracts Service.
COC - Compound of concern.
IRIS - U.S. EPA Integrated Risk Information System, October 2017.
J - Estimated value.
MassDEP - Massachusetts Department of Environmental Protection.
NA - Not available; compound is not considered sufficiently volatile and toxic to pose a potential health concern via the vapor intrusion pathway.
RI dataset - Shallow groundwater results collected from groundwater wells screened closest to the top of the water table (depths ranging from 9 to 14 feet below ground surface). Sampling events were conducted in July/Aug 2006, Oct/Nov 2006, and May 2009.
THQ - Target noncancer hazard quotient.
TR - Target cancer risk level.
U.S. EPA - United States Environmental Protection Agency.
VISL - U.S. EPA Vapor Intrusion Screening Level. Version 3.5.1 based on the May 2016 Regional Screening Levels. Target groundwater concentration for residential exposure scenario.
(a) Volatile compounds detected in the RI dataset.
(b) Groundwater VISL was updated with more current IRIS toxicity value.
(c) Groundwater VISL for 1,2,4-trimethylbenzene was used as a surrogate compound due to structural similarities.
(d) The critical effect(s) for the compounds detected above U.S. EPA groundwater VISLs are as follows (U.S. EPA Integrated Risk Information System):
- 1,1-Dichloroethane - Not applicable - No noncancer toxicity value available;
- Naphthalene - Nasal effects: hyperplasia and metaplasia in respiratory and olfactory epithelium, respectively;
- Trichloroethene - Developmental/Immune System: Increased fetal cardiac malformations in Sprague-Dawley rats (heart malformations); Decreased thymus weight in female B6C3F1 mice (immunotoxicity);
- 1,2,4-Trimethylbenzene - Neurological: Decreased pain sensitivity in male Wistar rats.

TABLE A-11
SUMMARY OF TRICHLOROETHENE CONCENTRATIONS IN GROUNDWATER
BUILDING 82 SITE
FORMER NAS SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

			TCE Concentrations in parts-per-billion										
Location	Sample/ Screen Depth	Depth to Water (at RI)	RI Data	RI Sample Date	Dec 2013	June 2014	Aug 2014	Mar 2015	Jul 2015	Oct 2015	Mar 2016	Oct 2016	Mar 2017
B82-GP-E03	6-9	Shallowest sample was collected at the top of the water table.	<1	August 2006									
	17-19		1.8										
	19-21		2.7										
B82-GP-H01	7-12		<1	May 2009									
	17-22		1.7										
	26-30		5.9										
B82-GP-H02	9-13		1.05	May 2009									
	19-23		2.8										
B82-GP-H03	6-10		0.7J	May 2009									
	15-19		1.3										
	24-28		6.5										
B82-GP-H04	6-10		<1	May 2009									
	16-20		8.5										
	26-30		2.5										
B82-GP-K05	6-10		<0.5	April 2010									
	15-19		2.2										
B82-GP-K08	6-10		0.6J	April 2010									
	17-21		21										
B82-GP-K10	6-10		1.1	March 2010									
	16-20		4.5										
B82-MW-10S	6-16	6.75	0.11	Oct 2006									
B82-MW-10D	32-42	7.3	9	Oct 2006	5.84	5.44	4.29	5.28	5.65	7.19	7.25	8.22	6.99
B82-MW-202S	7-17	9.86	0.94	Oct 2006				<0.2	<0.5				
B82-MW-202D	26-36	8.43	3.1	Oct 2006	2.1			4.25	3.58	3.44	3.92	3.63	4.03

Shallow data shaded in green was used for the Vapor Intrusion pathway evaluation

TECHNICAL MEMORANDUM

To: Matthew Audet
From: Richard Sugatt
Date: November 14, 2017
RE: Recreational Irrigation risk of TCE and manganese in groundwater at Building 82 NASOWEY

The purpose of this memorandum is to estimate the potential risk to a child and adult of recreational exposure to irrigation water from a private well that contains manganese and trichloroethene (TCE). The exposure parameters for such an exposure are difficult to estimate because of uncertainty concerning the rates of incidental ingestion, exposure time, exposure frequency, and modeling of volatilization of TCE from the irrigation water under variable wind speeds and temperatures under various irrigation scenarios, such as playing in a pool, water slide or under a sprinkler.

It was therefore decided to use the Risk Assessment Information System (RAIS) calculator (https://rais.ornl.gov/) to calculate the surface water recreator risk of the maximum concentrations of TCE (20.9 ug/L) and manganese (4790 ug/L) in shallow groundwater as a surrogate for the recreational use of irrigation water by a resident. This scenario is conservatively and reasonably representative for a child or adult who wades, swims or plays in a pool, water slide or sprinkler using water from a private well. The default exposure assumptions for this scenario are summarized in Table 1, and detailed in the attached RAIS calculator printout.

As shown in Table 1, the Hazard Index (HI) for TCE was 0.09 for a six-year old child and 0.04 for an adult, with an Excess Lifetime Cancer Risk (ELCR) of 1.5E-06. The HI for manganese was 0.46 for a child and 0.17 for an adult. Manganese is not carcinogenic.

The default recreational calculator does not include inhalation, but this exposure route is considered to be insignificant compared to incidental ingestion or dermal exposure because TCE would rapidly volatilize from a pool or during exposure in a sprinkler or water slide, and manganese is not volatile. The results suggest that recreational irrigation by residents using groundwater from the shallow aquifer at the site would not have a risk higher than EPA's risk limits of HI =1 or ELCR = 1E-04.

Table 1. Exposure assumptions and screening level risks of TCE (20.9 ug/L) and manganese (4790 ug/L) in groundwater used for irrigation in a recreational scenario

				Manganese		TCE		
Exposure Factor	Units	Recreator		HI		HI		ELCR
		Child	Adult	Child	Adult	Child	Adult	Adult
Ingestion Rate	L/day	0.12	0.071					
Exposure Frequency	day/yr	45	45					
Exposure duration	yr	6	26					
Exposure Time	hr./day	1	1					
Dermal Exposure Time	hr./event	1	1					
Body Weight	kg	15	80					
Events per day	ev/day	1	1					
Skin Surface Area	cm^2	6365	19652					
Lifetime	yr	--	70					
				0.46	0.17	0.09	0.04	1.5E-06

HI = Hazard Index

ELCR = Excess Lifetime Cancer Risk

Site-specific Risk
Recreator Equation Inputs for Surface Water

Variable	Value
ED_{rec} (exposure duration - recreator) year	26
ED_{rec-c} (exposure duration - child) year	6
ED_{rec-a} (exposure duration - adult) year	26
ED_{0-2} (mutagenic exposure duration) year	2
ED_{2-6} (mutagenic exposure duration) year	4
ED_{6-16} (mutagenic exposure duration) year	10
ED_{16-30} (mutagenic exposure duration) year	10
LT (lifetime - recreator) year	70
EF (exposure frequency) day/year	45
EF_{rec-c} (exposure frequency - child) day/year	45
EF_{rec-a} (exposure frequency - adult) day/year	45
EF_{0-2} (mutagenic exposure frequency) day/year	45
EF_{2-6} (mutagenic exposure frequency) day/year	45
EF_{6-16} (mutagenic exposure frequency) day/year	45
EF_{16-30} (mutagenic exposure frequency) day/year	45
$ET_{rec-adj}$ (age-adjusted exposure time) hour/event	1
$ET_{rec-madj}$ (mutagenic age-adjusted exposure time) hour/event	1
ET_{rec-a} (exposure time - adult) hour/event	1
ET_{rec-c} (exposure time - child) hour/event	1
ET_{0-2} (mutagenic exposure time) hour/event	1
ET_{2-6} (mutagenic exposure time) hour/event	1
ET_{6-16} (mutagenic exposure time) hour/event	1
ET_{16-30} (mutagenic exposure time) hour/event	1
EV_{rec-c} (child) events/day	1
EV_{rec-a} (adult) events/day	1
EV_{0-2} (mutagenic) events/day	1
EV_{2-6} (mutagenic) events/day	1
EV_{6-16} (mutagenic) events/day	1
EV_{16-30} (mutagenic) events/day	1
BW_{rec-c} (body weight - child) kg	15
BW_{rec-a} (body weight - adult) kg	80

Output generated 14NOV2017:15:40:36

Site-specific Risk
Recreator Equation Inputs for Surface Water

Variable	Value
BW_{0-2} (mutagenic body weight) kg	15
BW_{2-6} (mutagenic body weight) kg	15
BW_{6-16} (mutagenic body weight) kg	80
BW_{16-30} (mutagenic body weight) kg	80
SA_{rec-c} (skin surface area - child) cm^2	6365
SA_{rec-a} (skin surface area - adult) cm^2	19652
SA_{0-2} (mutagenic skin surface area) cm^2	6365
SA_{2-6} (mutagenic skin surface area) cm^2	6365
SA_{6-16} (mutagenic skin surface area) cm^2	19652
SA_{16-30} (mutagenic skin surface area) cm^2	19652
$IFW_{rec-adj}$ (age-adjusted water intake rate) L/kg	2.96
$IFWM_{rec-adj}$ (mutagenic age-adjusted water intake rate) L/kg	13.1
$DFW_{rec-adj}$ (age-adjusted dermal factor) cm^2-event/kg	335655
$DFWM_{rec-adj}$ (mutagenic age-adjusted dermal factor) cm^2-event/kg	1053210
IRW_{rec-c} (water intake rate - child) L/hr	0.12
IRW_{rec-a} (water intake rate - adult) L/hr	0.071
IRW_{0-2} (mutagenic water intake rate) L/hr	0.12
IRW_{2-6} (mutagenic water intake rate) L/hr	0.12
IRW_{6-16} (mutagenic water intake rate) L/hr	0.071
IRW_{16-30} (mutagenic water intake rate) L/hr	0.071
l_{sc} (apparent thickness of stratum corneum) cm	0.001

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Site-specific Risk

Recreator RISK for Surface Water

Chemical	Mutagen?	VOC?	Surface Water Concentration (µg/L)	Child Ingestion HQ	Child Dermal HQ	Child Total HI	Adult Ingestion HQ	Adult Dermal HQ	Adult Total HI	Adjusted Ingestion HQ
Manganese (Non-diet)	No	No	4790	1.97E-01	2.61E-01	4.58E-01	2.18E-02	1.51E-01	1.73E-01	6.23E-02
Trichloroethylene	Yes	Yes	20.9	4.12E-02	5.30E-02	9.43E-02	4.57E-03	3.07E-02	3.53E-02	1.30E-02
*Total Risk/HI			-	2.38E-01	3.14E-01	5.52E-01	2.64E-02	1.82E-01	2.08E-01	7.53E-02

Adjusted Dermal HQ	Adjusted Total HI	Ingestion Risk	Dermal Risk	Total Risk
1.76E-01	2.39E-01	-	-	-
3.59E-02	4.89E-02	4.93E-07	9.61E-07	1.45E-06
2.12E-01	2.88E-01	4.93E-07	9.61E-07	1.45E-06

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Appendix B

Southfield Redevelopment Authority April 10, 2017 Meeting Minutes and MassDEP November 1, 2017 Second Amendment Groundwater Use and Value Determination

Southfield Redevelopment Authority
Board of Directors Meeting
Monday, April 10, 2017 @ 7:00PM
Conference Room, SRA Offices

Directors Present: Kelli O'Brien-McKinnon, Vice Chairman
Patricia O'Leary, Clerk
Steve LeMott
Anthony Agnitti
Chris Primiano

Directors Absent: Lyndsey Kruzer
Chris Aiello
Tom Henderson
Robert Rizzi

Also Present: Jim Young, Land Use Administrator
Scott Bois, Finance/Treasurer
Mike Nelligan, Powers & Sullivan, LLC
Donna Pallister, Arcadis U.S. Inc., LStar Team

The Vice Chairman called the meeting to order at 7:00pm

Minutes

VOTED: Motion of Steve LeMott, seconded by Anthony Agnitti, to accept the minutes of the March 27, 2017
Unanimous 5-0 vote

PUBLIC HEARING – Water Resources Protection District

VOTED: Motion of Steve LeMott, seconded by Tony Agnitti, to open the Public Hearing at 7:05pm
Unanimous 5-0 vote

Ms. Pallister presented LStar's request to amend the boundaries of the Water Resource Protection (WRP) District to exclude two small isolated medium yield aquifers from the Aquifer Protection District, so that the WRP district would more accurately describe the areas that contain the resources intended to be protected. It was noted that the aquifers were located in areas formerly used for NAVY industrial operations and were not considered productive; and that SRA Health Regulations prohibited on site drinking wells.

Mr. Young and Mr. Ivas acknowledged that the 'Hangar 1 Aquifer' and the 'Sewage Treatment Plant Aquifer' were too small and too shallow for any useful purpose. Based on the progress made on NAVY cleanup and LStar development, and in preparation of the transfer of remaining NAVY property, it was time to clarify the protection district with consistent legal and environmental language for proposed land use controls.

There were no Public Comments

VOTED: Motion of Chris Primiano, seconded by Steve LeMott, to close the Public Hearing at 7:10pm Unanimous 5-0 vote

Board Measure 17-013

VOTED: Motion of Patricia O'Leary, seconded by Steve LeMott, to approve the request dated February 27, 2017 submitted by LStar Southfield, LLC to amend the Water Resources Protection District Map (Exhibit B to the Zoning and Land Use By-Laws for NAS South Weymouth) by removing the two potential medium – yield aquifers from the Aquifer Protection District which aquifers are generally referred to as the 'Hangar 1 Aquifer' and the 'Sewage Treatment Plant Aquifer'. Unanimous 5-0 vote

Powers & Sullivan, LLC

Mr. Nelligan attended the meeting to review the FY16 Audited Financial Statements and noted a smooth audit process with books all reconciled per statutory requirements. Discussion ensued on Bond Payments, Cash Receivables, Capital Assets, GASB Pension Liability, Claw Back Provision, Developer Deposits, Restricted/Unrestricted Funds, and Long Term Assets/Liabilities.

Mr. Agnitti was informed that the Authority only had 2 sources of revenue, based on development.

Mr. Primiano was informed that Wells Fargo, Bond Trustee, was holding $250K in restricted funds.

The Board was informed that the State Auditors and Mass Dept. of Revenue had received the Financial Statements.

Mr. LeMott asked for a comment on the state audit report of 2013 and Mr. Nelligan stated it was more critical than it needed to be for the economic climate; nobody had recovered at that time.

Mr. Agnitti asked for comments on management weaknesses and expense control, and was informed that since the 2014 legislative changes the organizational staff was now smaller with limited resources, although much of SRA's operation remained the same as pre-legislation. The SRA still remains as the Local Redevelopment Authority to the Navy; the SRA operates as a municipality with an annual approved tax rate and certification of free cash; the SRA has long term debt obligations through 2040; and the SRA operates a water/sewer utility. Until those things change the SRA will continue to be much more than a planning board.

Staff Reports

Master Plan – Mr. LeMott noted that roadway public hearings would be forthcoming in the near future.

Agreements – Ms. O'Leary noted that SRA and LStar attorneys were working on DDA Revisions.

Infrastructure/Construction – Ms. O'Leary noted that a Greystar pre-filing meeting with Weymouth would take place this week

Parkway/NAVY – No update at this time

SRA Operations – No update at this time

Staff – No Update at this time. Mr. Primiano was informed no LStar payments were received or bills issued since the last meeting

LStar – No update at this time

Next meeting - April 24, 2017

VOTED: Motion of Patricia O'Leary, seconded by Tony Agnitti, to adjourn the meeting

Unanimous 5-0 vote

The Meeting ended at 7:40pm

Mary Cordeiro, Recording Secretary

Kelli O'Brien-McKinnon, Vice Chairman

Documents Reviewed during the meeting:

Letter from LStar Ventures on zoning modification

FY16 Audited Financial Statements

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

Mr. Matt Audet
U.S. Environmental Protection Agency
5 Post Office Sq., Suite 100
Mail Code: OSRR07-3
Boston, MA 02109-3912

Re: Second GUVD Amendment
Former South Weymouth NAS
Weymouth, Massachusetts
RTN 4-3002621
November 1, 2017

Dear Mr. Audet:

Please find attached the second amendment to the December 1998 Groundwater Use and Value Determination for the former South Weymouth Naval Air Station NPL site. The second amendment revises the site-specific use and value determinations for Site 10 – Building 82 (Hangar 2) and AOC Hangar 1 and provides site-specific use and value determinations for Site 13 - Industrial Operations Area and Site 7 – Sewage Treatment Plant, which were not previously evaluated.

If you have any questions about the amendment, I can be reached at (617) 348-4005.

Sincerely,

D. Chaffin

David Chaffin
Federal Facilities Project Manager
Bureau of Waste Site Cleanup

cc: D. Barney, USN-S. Weymouth

SECOND AMENDMENT
GROUNDWATER USE AND VALUE DETERMINATION
FORMER SOUTH WEYMOUTH NAVAL AIR STATION (RTN 4-3002621)
NOVEMBER 1, 2017

PURPOSE

The purpose of this amendment is to update the 1998 basewide groundwater use and value determination (GUVD) for the former S. Weymouth Naval Air Station NPL Site and provide site-specific use and value determinations for several active sites.

UPDATE FOR SOUTH WEYMOUTH NAS NPL SITE

The 1998 GUVD determined that the four medium-to-high yield aquifers located within the former base boundaries have high use and value (**Figure 1**). The determination was based on geologic mapping by U.S. Geological Survey, which delineated the four aquifers, and the designation of these aquifers as parts of an aquifer protection district (APD). The APD was established by the South Shore Tri-Town Development Corporation (SSTTDC) to protect the aquifers for future use as drinking water sources. In accordance with the Massachusetts Contingency Plan, MassDEP determined that these aquifers were potential drinking water source area (PDWSAs), classified the groundwater within the four aquifers GW-1, where drinking water standards apply, and determined that groundwater in the four aquifers has high use and value. Groundwater outside of the four aquifers was assumed to have low yield and medium or low use and value.

An update to 1998 GUVD is necessary because of recent changes in zoning by-laws, which reduced the extent of the APD, and recently submitted site-specific information that indicates one of the aquifers is not a high- or medium-yield aquifer. Zoning by-law changes reduced the extent of the APD by eliminating the portion APD that overlaid the two medium-yield aquifers located along the central axis of the property (**Figure 1**). The changes were approved by the Southfield Redevelopment Authority (successor to SSTTDC) during an April 10, 2017 board meeting. After the two medium-yield aquifers were removed from the APD, MassDEP reassessed the use and value of groundwater within the two affected aquifers using the Department's Priority Resource Map (**Figure 2**). This map shows that the southern affected aquifer has been classified by MassDEP as a non-potential drinking water source area (NPDWSA). Based on this classification, this aquifer is no longer considered a PDWSA. The map does not indicate that the northern aquifer is a NPDWSA; however, site-specific hydraulic data recently submitted by the Navy indicates that this aquifer is not a medium-yield aquifer. In particular, a conservative analysis of slug test data obtained from wells installed within the mapped aquifer boundary indicates that the transmissivity of the aquifer is approximately 15 ft^2/day, well below the medium yield aquifer threshold of 1,350 ft^2/day (Resolution Consultants, 2017). In accordance with 310 CMR 40.0932(5)(b)(1), this aquifer is no longer considered to be a PDWSA.

SITE-SPECIFIC USE AND VALUE DETERMINATIONS

In 2012, USEPA requested that MassDEP prepare site-specific use and value determinations for four sites: Site 9 – Building 81, Site 10 – Building 82 (Hangar 2), Site 11 – Solvent Release Area, and AOC Hangar 1. The purpose of the request was to support decision documents that were being prepared for these sites and to ensure the completeness of the administrative record. In response, MassDEP submitted the first amendment to the GUVD on August 31, 2012. The first amendment did not change the use and value determinations provided in the 1998 GUVD.

This second amendment to the GUVD was prepared in response to a similar request from USEPA. The second amendment changes the site-specific determinations for two of the four previously evaluated sites, Site 10 – Building 82 (Hangar 2) and AOC Hangar 1, and adds site-specific determinations for two sites, Site 13 - Industrial Operations Area (IOA) and Site 7 – Sewage Treatment Plant. Determinations for Site 10 and AOC Hangar 1 were changed based on changes to the limits of the APD, as outlined in the previous section.

Site 7 and Site 13 were not evaluated in the first amendment because groundwater was not known to be a medium of concern at those sites when the first amendment was prepared. Groundwater at the Site 7 has since been determined to be a medium of concern due to the presence of dieldrin and perfluoroalkyl substances (PFAS) with concentrations exceeding drinking water standards and USEPA lifetime health advisory levels, respectively. Groundwater at Site 13 has since been determined to be a medium of concern due to the presence of PFAS with concentrations exceeding lifetime health advisory levels.

Site 10 – Building 82 (Hangar 2)

Site 10 – Building 82 is located near the geographic center of the base (**Figure 3**). The site includes two source areas: (1) a chlorinated solvent release area located south of Building 82, and (2) the former Hangar 2 floor drain system, where petroleum releases occurred. The locations of the associated TCE and manganese plumes are shown in **Figure 4**. The vertical extent of contamination in both plumes appears to be limited to overburden, which extends to a maximum depth of approximately 50 feet. The lateral extent of the larger plume (manganese) is approximately 700 feet. A groundwater remedy (ISCO) was implemented to address the TCE plume in 2014. Long-term monitoring is on-going.

Future use of Site 10 groundwater as a public drinking water source is not expected. A portion of the underlying aquifer is a designated NPDWSA (indicated by gray shading in **Figure 2**), and the closest PDWSA is located more than 1,000 feet west of the site (**Figure 3**).

The results from the Site 10 remedial investigation indicate that the site does not extend to ecological receptors in a sensitive habitat. The closest surface water body is the west branch of French Stream, located more than 1,000 feet west of the site.

Based on the preceding, MassDEP concludes that the aquifer impacted by Site 10 has low use and value.

AOC Hangar 1

AOC Hangar 1 is located near the geographic center of the base (**Figure 5**). The primary contaminants of concern are PFAS. The source of groundwater contamination is releases of aqueous fire-fighting foam (AFFF) within the former Hangar 1 footprint. The vertical extent of contamination appears to be limited to overburden, which extends to a maximum depth of approximately 50 feet. The lateral extent of contamination exceeds 2,000 feet.

Future use of AOC Hangar 1 groundwater as a public drinking water source is not expected. A portion of the underlying aquifer is a designated NPDWSA (indicated by gray shading in **Figure 2**). The results from the AOC Hangar 1 remedial investigation indicate that the site extends to the eastern limit of the PDWSA located on the west side of the former base property (**Figure 3**); however, PFAS concentrations at that limit do not exceed lifetime health advisory levels, indicating that the impacts to the PDWSA are not significant.

The results from the remedial investigation indicate that the site may extend to surface water southwest of the site in the TACAN Ditch and west branch of French Stream; however, these discharge areas are not a considered sensitive habitats and site impacts have not been determined to pose a significant risk to ecological receptors.

Based on the preceding, MassDEP concludes that the aquifer impacted by AOC Hangar 1 has low or medium use and value.

Site 13 - Industrial Operations Area

Site 13 – Industrial Operations Area is located near the geographic center of the base (**Figure 3**). The groundwater contaminants of concern are PFAS. The source of groundwater contamination is one or more releases of AFFF. Investigations to determine the full extent of contamination are on-going; however, available data indicate that AFFF was released in an open area located west of Building 96 (former firehouse), and several other potential source areas have been identified within the Site 13 limits (**Figure 6**). The associated PFAS plume, which was identified during the AOC Hangar 1 remedial investigation, appears to extend across the Site 13 area and extend to the southwest, comingling with the AOC Hangar 1 PFAS plume. For the purposes of this determination, the extent of Site 13 was assumed to consist of the portion of the AOC Hangar 1 plume that extends north of the central plume axis (**Figure 3**). The vertical extent appears to be limited to overburden, which extends to a maximum depth of approximately 50 feet. The lateral extent of contamination is uncertain, but could exceed 1,000 feet.

Future use of Site 13 groundwater as a public drinking water source is not expected. A portion of the underlying aquifer is a designated NPDWSA (indicated by gray shading in **Figure 2**). The results from the AOC Hangar 1 remedial investigation indicate that Site 13 does not extend to a current or PDWSA. The closest PDWSA is located more than 500 feet west of the site (**Figure 3**).

The results from the AOC Hangar 1 remedial investigation indicate that Site 10 does not extend to ecological receptors in a sensitive habitat. The closest surface water body is the west branch of French Stream, located more than 500 feet west of the site.

Based on the preceding, MassDEP concludes that the aquifer impacted by Site 13 has low use and value.

Site 7 – Sewage Treatment Plant

Site 7 – Sewage Treatment Plant is located on the north side of the base (**Figure 3**). The contaminants of concern are dieldrin and PFAS. The source of groundwater contamination is believed to be one or more releases from the former treatment plant structures (**Figure 7**). The vertical extent of contamination appears to be limited to overburden, which extends to a maximum depth of approximately 30 feet beneath the site. Limited post-ROD data indicate that PFAS contamination extends several hundred feet downgradient of the former treatment plant footprint. The extent of dieldrin appears to be limited to the immediate vicinity of one monitoring well.

Future use of the Site 7 groundwater as a public drinking water source is not expected. As noted previously, site-specific information submitted by the Navy indicates that the underlying aquifer is not a medium-yield aquifer and therefore not considered a PDWSA. The closest PDWSA is located approximately 1,000 feet west of the site (**Figure 3**).

The results from the Site 7 remedial investigation indicate that PFAS in site groundwater may impact ecological receptors in a sensitive habitat (vernal pool) located immediately downgradient of the former treatment plant location (**Figure 2**). The significance of this impact cannot yet be evaluated because of insufficient understanding of the ecological risks posed by exposure to PFAS.

Based on the preceding, MassDEP concludes that Site 7 groundwater has low or medium use and value.

REFERENCES

Resolution Consultants, 2017. Letter Request for Change to Non-Potential Drinking Water Source Area, Sewage Treatment Plant Area, Weymouth Naval Air Station, dated October 16, 2017.

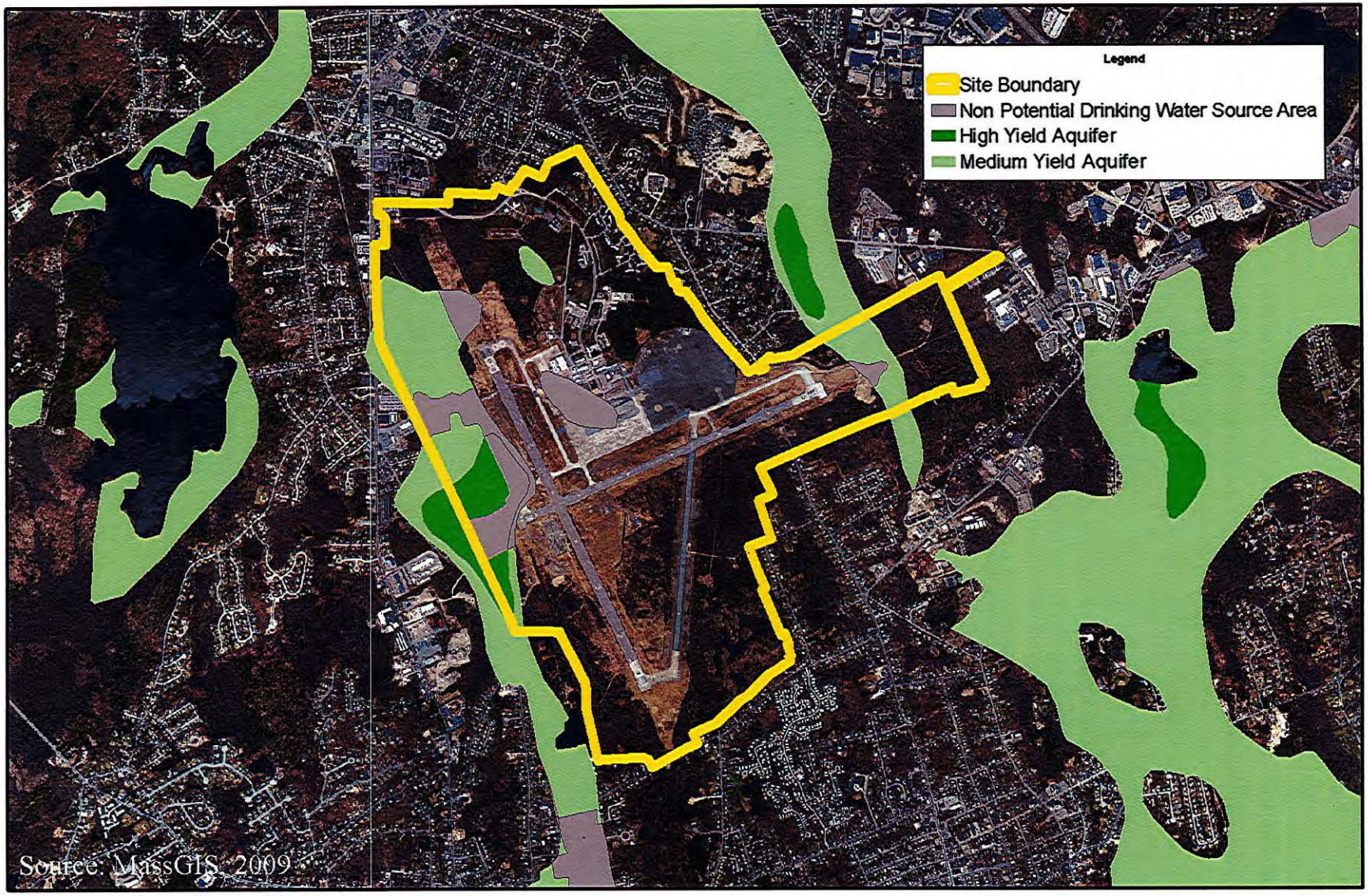


Exhibit B-1: NAS South Weymouth

Figure 1

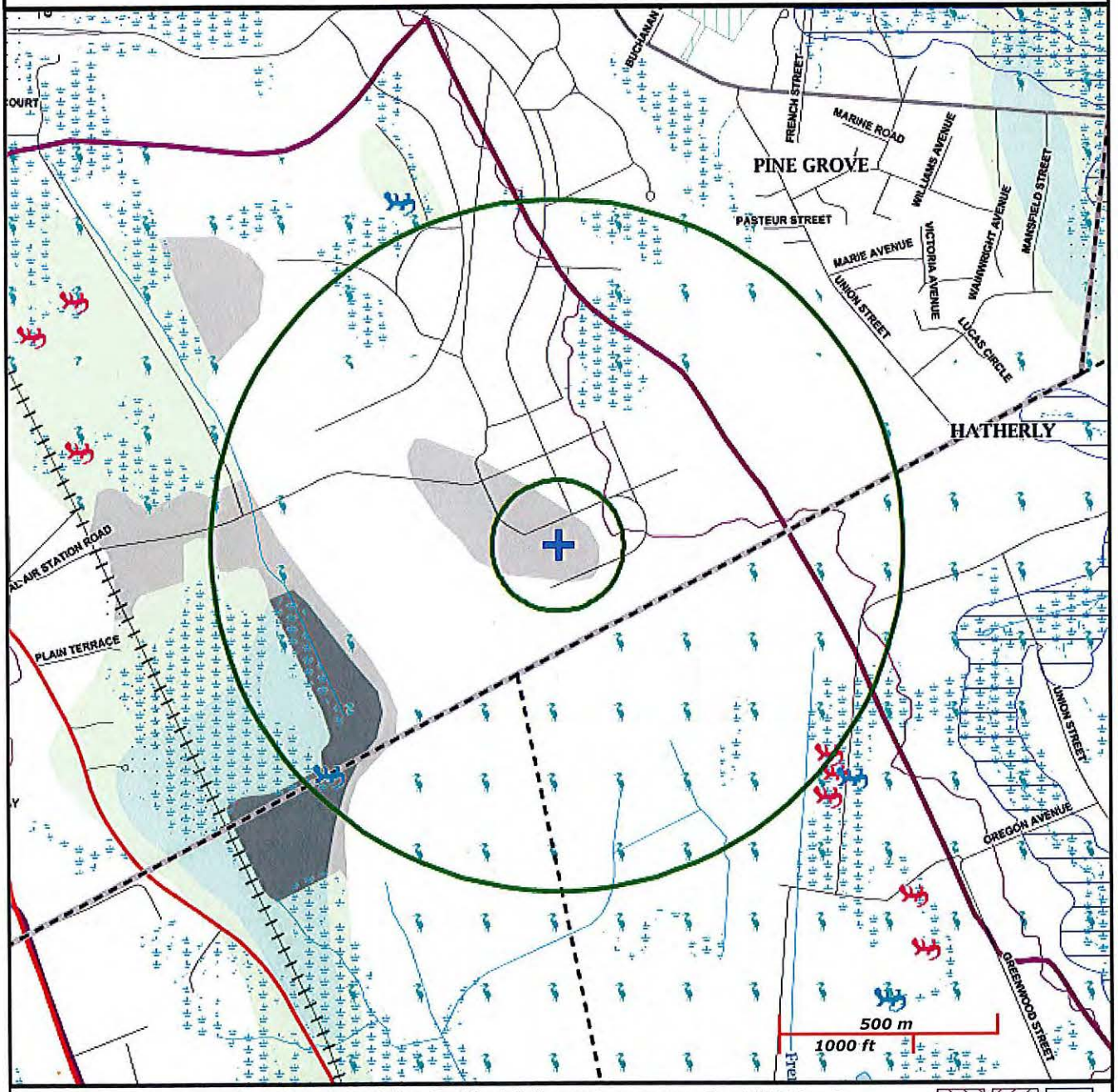
MassDEP - Bureau of Waste Site Cleanup

Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

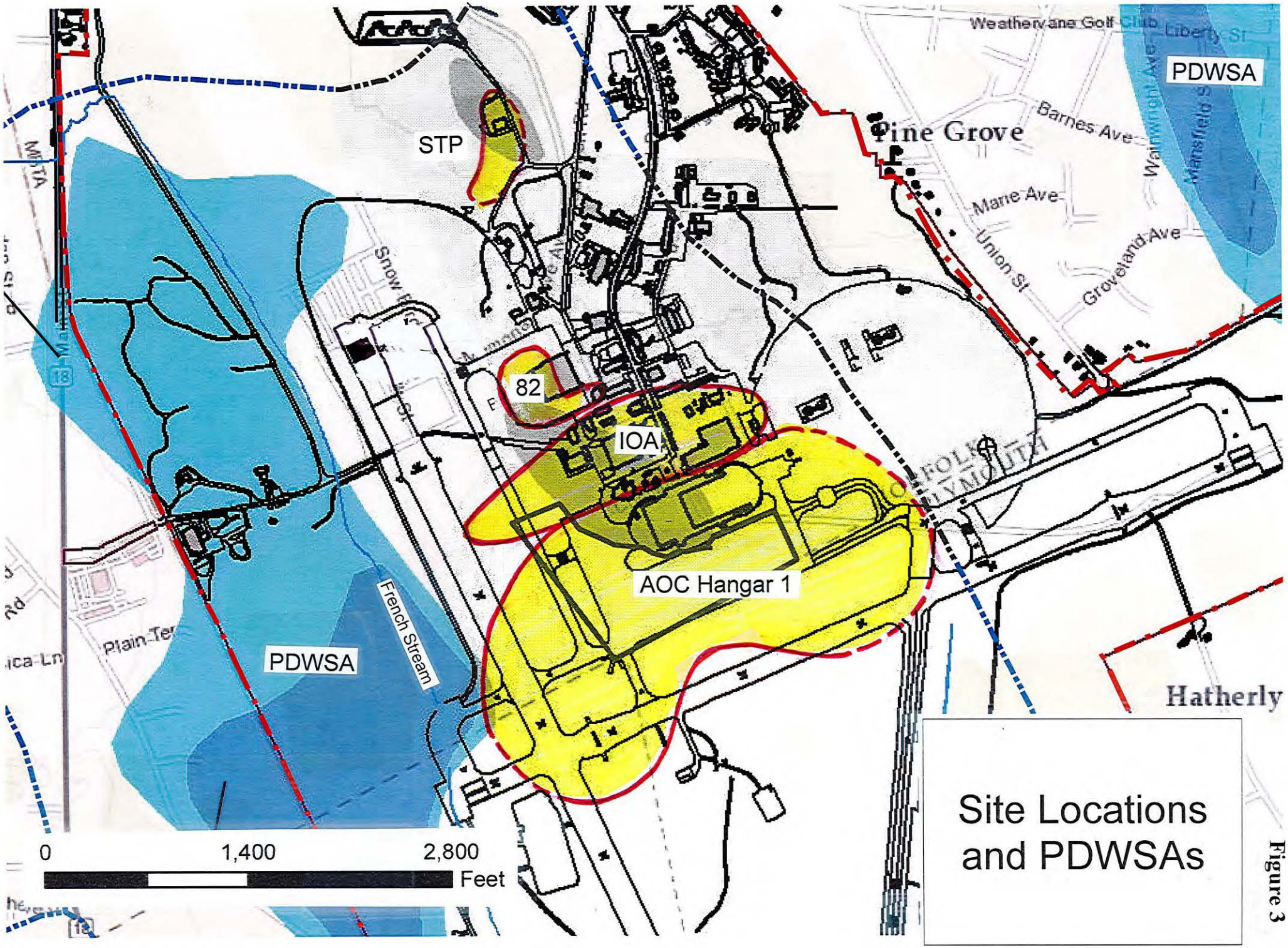
Site Information:
WEYMOUTH, MA
4-003002621
NAD83 UTM Meters:
4668698mN , 339754mE (Zone: 19)
April 26, 2017

The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at:
http://www.mass.gov/mgis/.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail
Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct
Basins: Major, PWS; Streams: Perennial, Intermittent, Man Made Shore, Dam
Aquifers: Medium Yield, High Yield, EPA Sole Source
Non Potential Drinking Water Source Area: Medium, High (Yield)
PWS Protection Areas: Zone II, IWPA, Zone A
Hydrography: Open Water, PWS Reservoir, Tidal Flat
Wetlands: Freshwater, Saltwater, Cranberry Bog
FEMA 100yr Floodplain; Protected Open Space; ACEC
Est. Rare Wetland Wildlife Hab; Vernal Pool: Cert., Potential
Solid Waste Landfill; PWS: Com.GW,SW, Emerg., Non-Com.



Site Locations and PDWSAs

Figure 3


82 HANGAR 2
SHED
B82-MW-201D
B82-MW-201S
B82-MW-204D
B82-MW-204S
B82-MW-02
B82-MW-03
B82-MW08-015
B82-MW-03S
B82-MW-203S
B82-MW-203D
B82-MW-11S
B82-MW-11D
B82-MW08-016
B82-MW08-016D
B82-MW-10S
B82-MW-10D
B82-MW-09S
B82-MW-09D
B82-GP-J02
B82-GP-K07
B82-GP-K11
B82-GP-J07
B82-GP-H04
MW-302D
MW-303D
MW-303I
MW-310D
MW-305I
MW-306D
MW-306I
MW-307D
MW-307I
MW-309D
MW-309I
9AB-MW-01
9AB-MW-02
9AB-MW-03
9AB-MW-04
9AB-MW-05
NOTE
THE SHALLOW OVERBURDEN IS DEFINED AS BETWEEN 0-10' BGS.
THE DEEP OVERBURDEN IS DEFINED AS BETWEEN 10' BGS AND BEDROCK.
Legend
Groundwater Profile Location
Overburden Monitoring Well
Oil-Water Separator
Manhole
Catch Basin
Storm Line
Floor Drain System
Road/Pavement
Building
UST
Former Hydraulic Lifts
Area of TCE Remedial Goal Exceedances (Based on March 2016 Data)
Area of Manganese Remedial Goal Exceedances (Based on March 2016 Data)
N
0 55 110
Scale in Feet
RESOLUTION CONSULTANTS
Drawn: JB 4/19/2016
Approved: MS 4/19/2016
Project #: 60274866
IR PROGRAM SITE 10
BUILDING 82
SITE MANAGEMENT PLAN
FORMER NAVAL AIR STATION
SOUTH WEYMOUTH

Figure 4

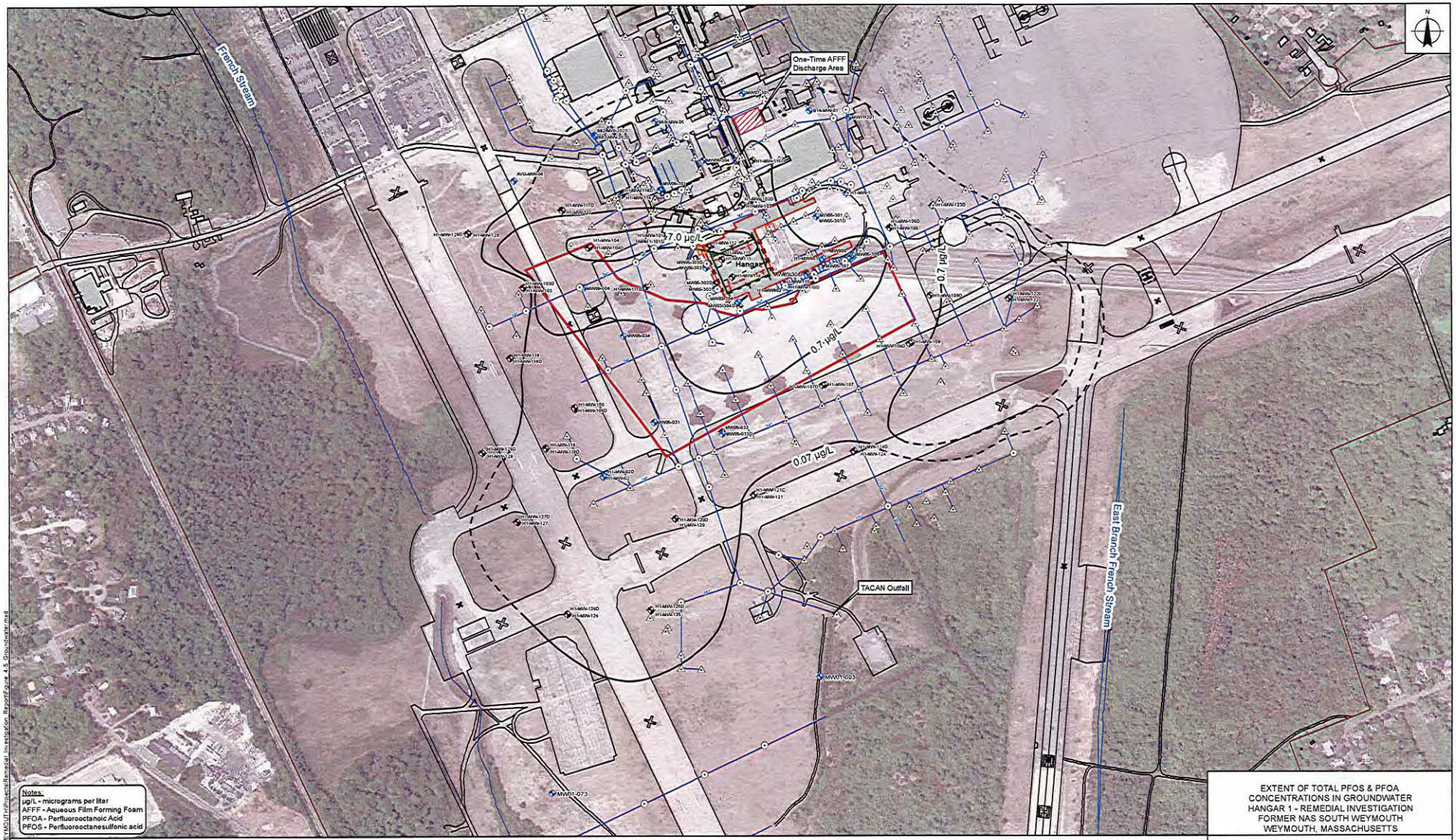

French Stream
One-Time AFFF Discharge Area
Hangar 1
7.0 µg/L
0.7 µg/L
0.07 µg/L
TACAN Outfall
East Branch French Stream
MW01-093
MW01-073
Notes:
µg/L - micrograms per liter
AFFF - Aqueous Film Forming Foam
PFOA - Perfluorooctanoic Acid
PFOS - Perfluorooctanesulfonic acid
Remedial Investigation Monitoring Well
Existing Monitoring Well Location (wells in grey are destroyed)
Catch Basin
Manhole
Oil-Water Separator
AFFF Pipe
Subsurface Drain Pipes
Floor Trenches
Subsurface Sanitary Sewer
Subsurface Storm Sewer
Subsurface OWS Line
Naval Air Station South Weymouth Boundary
Total PFOS and PFOA Isocontour (dashed where inferred)
Building
Former Location of Hangar 1
Groundwater Restriction Boundary
0
460
920
Feet
N
EXTENT OF TOTAL PFOS & PFOA CONCENTRATIONS IN GROUNDWATER
HANGAR 1 - REMEDIAL INVESTIGATION
FORMER NAS SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS
NAVFAC
Naval Facilities Engineering Command
REQUESTED BY: M. Gibson
DATE: 2/1/2017
DRAWN BY: kburnum
TASK ORDER NUMBER: WE27
Service Layer Credits: Google Earth Pro
X:\Navy\MAS SOUTH WEYMOUTH\Projects\Remedial Investigation Report\Figure 4-5 Groundwater.mxd

Figure 5

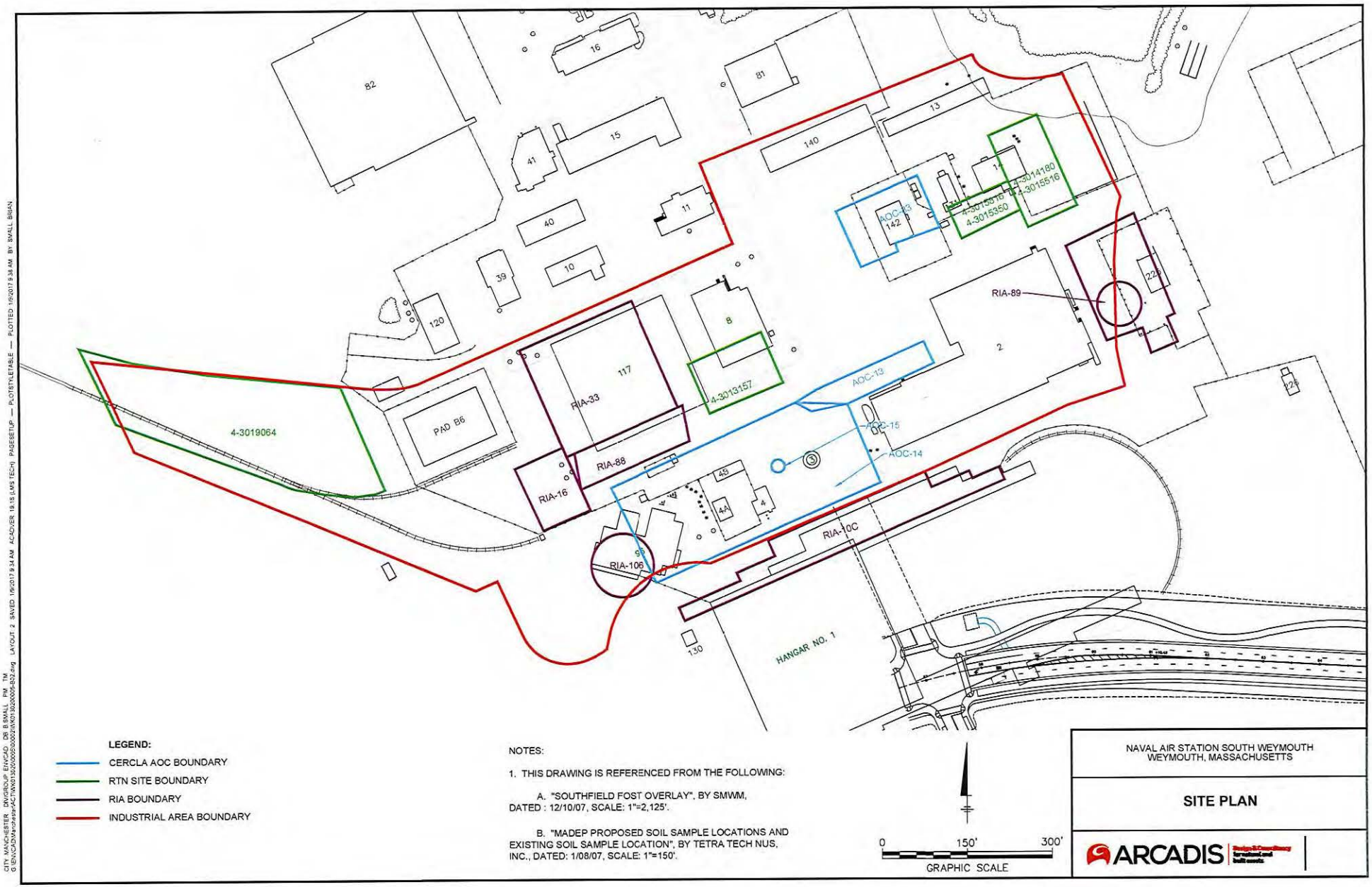
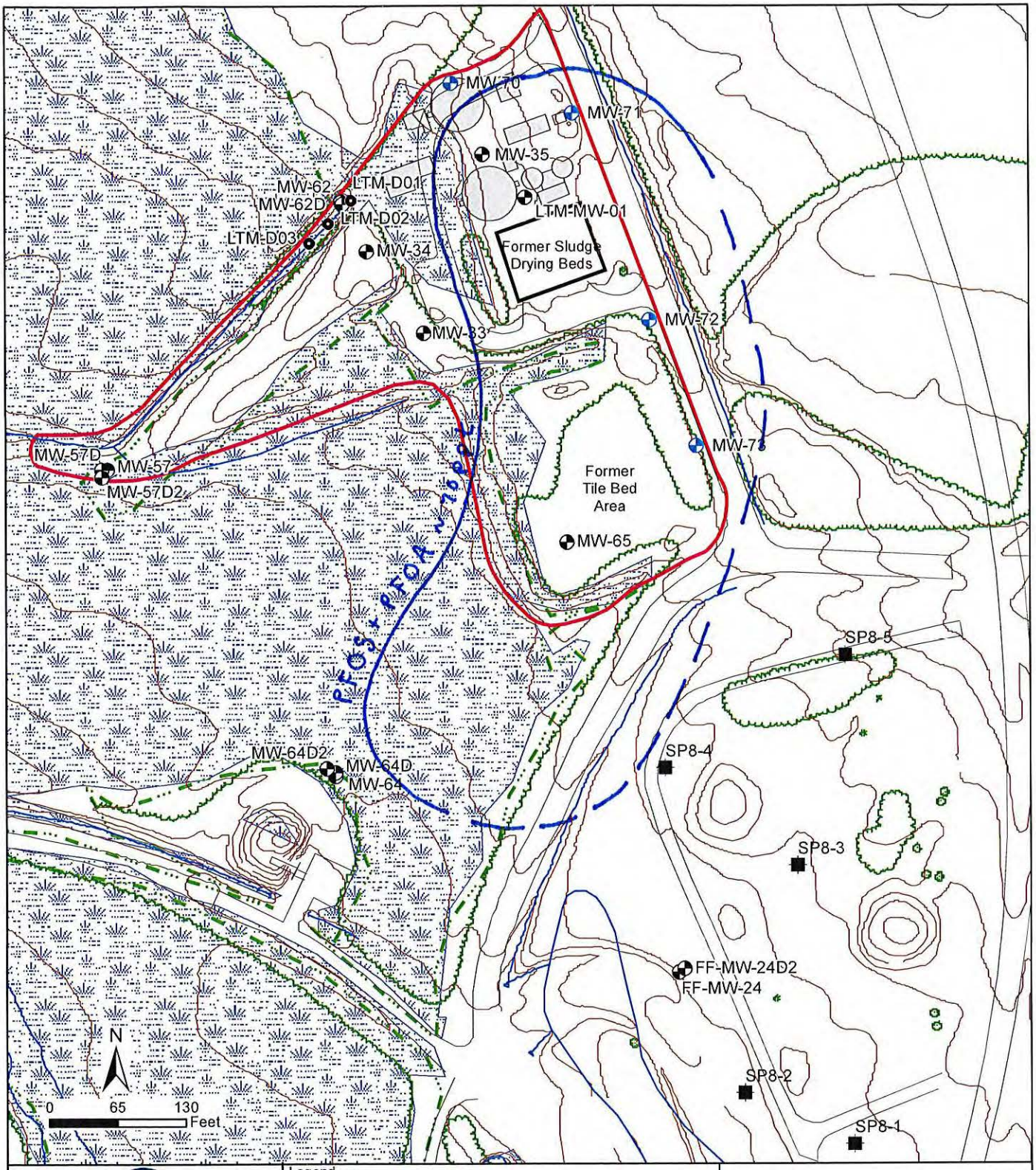

82
16
81
15
41
140
13
40
11
39
10
120
8
117
RIA-33
4-3013157
PAD B6
4-3019064
RIA-88
RIA-16
AOC-13
AOC-15
AOC-14
RIA-89
2
22
24
49
44
4
RIA-10C
9
RIA-106
130
HANGAR NO. 1
AOC-33
142
4-3015350
4-3014180
4-3015516
LEGEND:
CERCLA AOC BOUNDARY
RTN SITE BOUNDARY
RIA BOUNDARY
INDUSTRIAL AREA BOUNDARY
NOTES:
1. THIS DRAWING IS REFERENCED FROM THE FOLLOWING:
A. "SOUTHFIELD FOST OVERLAY", BY SMWM, DATED : 12/10/07, SCALE: 1"=2,125'.
B. "MADEP PROPOSED SOIL SAMPLE LOCATIONS AND EXISTING SOIL SAMPLE LOCATION", BY TETRA TECH NUS, INC., DATED: 1/08/07, SCALE: 1"=150'.
0
150'
300'
GRAPHIC SCALE
NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS
SITE PLAN
ARCADIS

Figure 6

Figure 7



RESOLUTION CONSULTANTS

Drawn:	JB	03/15/2017
Approved:	MS	03/15/2017
Project #:	60274866	

Legend

- Proposed Monitoring Well
- Existing Monitoring Well
- Well Installed and Sampled by Arcadis (Locations Approximate)
- Sediment Sample in Long-Term Monitoring Plan
- Approximate Site 7, Former Sewage Treatment Plant Boundary
- Former Structures
- Edge of Pavement
- 2 Foot Topographic Contour
- Tree Line
- Current Wetland Boundary
- Record of Decision Wetland Boundary

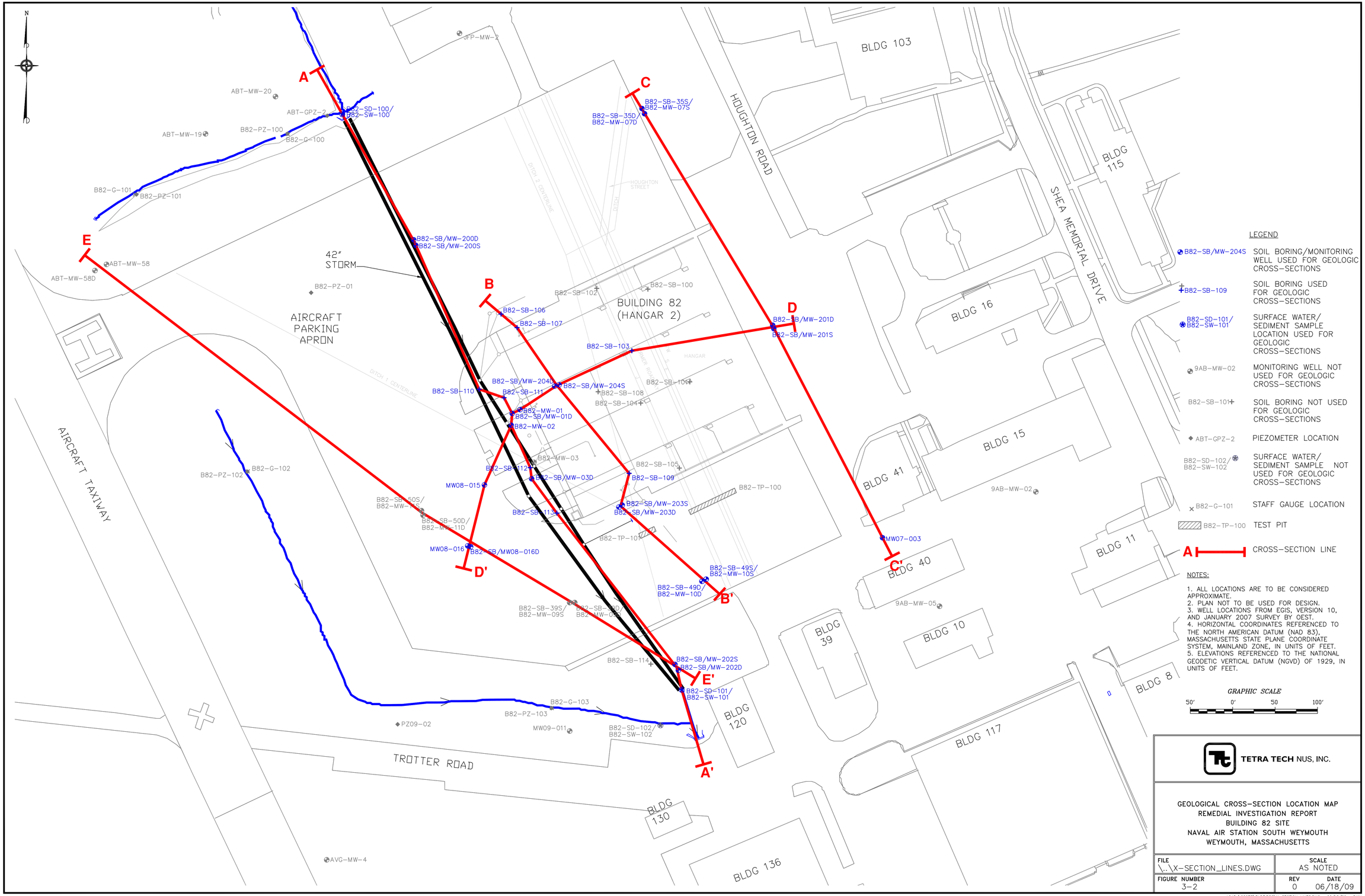
SITE LAYOUT

SAMPLING AND ANALYSIS PLAN
SITE 7
FORMER SEWAGE TREATMENT PLANT
FORMER NAVAL AIR STATION
SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

Path: P:\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\South_Weymouth\GIS\Projects\STP\SAP\MXD\Fig_10_2_Site_Layout.mxd

Appendix C

Remedial Investigation Geologic Cross-Sections


N
A
A'
B
B'
C
C'
D
D'
E
E'
ABT-MW-20
ABT-GPZ-2
ABT-MW-19
B82-PZ-100
B82-G-100
B82-SD-100/
B82-SW-100
B82-G-101
B82-PZ-101
ABT-MW-58
ABT-MW-58D
B82-PZ-01
JFP-MW-2
42"
STORM
AIRCRAFT
PARKING
APRON
BUILDING 82
(HANGAR 2)
B82-SB/MW-200D
B82-SB/MW-200S
B82-SB-106
B82-SB-107
B82-SB-102
B82-SB-100
B82-SB-103
B82-SB/MW-201D
B82-SB/MW-201S
B82-SB/MW-204D
B82-SB/MW-204S
B82-SB-110
B82-SB-111
B82-SB-108
B82-SB-104
B82-SB-101
B82-MW-01
B82-SB/MW-01D
B82-MW-02
B82-MW-03
B82-SB-112
B82-SB/MW-03D
B82-SB-105
B82-SB-109
B82-TP-100
MW08-015
B82-SB-50S/
B82-MW-11S
B82-SB-50D/
B82-MW-11D
B82-SB-113
B82-SB/MW-203S
B82-SB/MW-203D
B82-TP-101
MW08-016
B82-SB/MW08-016D
B82-SB-49S/
B82-MW-10S
B82-SB-49D/
B82-MW-10D
B82-SB-39S/
B82-MW-09S
B82-SB-39D/
B82-MW-09D
B82-SB-114
B82-SB/MW-202S
B82-SB/MW-202D
B82-SD-101/
B82-SW-101
B82-G-103
B82-PZ-103
PZ09-02
MW09-011
B82-SD-102/
B82-SW-102
B82-PZ-102
B82-G-102
AVG-MW-4
AIRCRAFT TAXIWAY
TROTTER ROAD
HOUGHTON ROAD
HOUGHTON STREET
DITCH 2 CENTERLINE
DITCH 1 CENTERLINE
POWER ROAD
HANGAR
BLDG 103
BLDG 115
SHEA MEMORIAL DRIVE
BLDG 16
BLDG 15
BLDG 41
9AB-MW-02
MW07-003
BLDG 40
BLDG 11
9AB-MW-05
BLDG 39
BLDG 10
BLDG 8
BLDG 120
BLDG 117
BLDG 130
BLDG 136
LEGEND
B82-SB/MW-204S SOIL BORING/MONITORING WELL USED FOR GEOLOGIC CROSS-SECTIONS
B82-SB-109 SOIL BORING USED FOR GEOLOGIC CROSS-SECTIONS
B82-SD-101/ B82-SW-101 SURFACE WATER/ SEDIMENT SAMPLE LOCATION USED FOR GEOLOGIC CROSS-SECTIONS
9AB-MW-02 MONITORING WELL NOT USED FOR GEOLOGIC CROSS-SECTIONS
B82-SB-101 SOIL BORING NOT USED FOR GEOLOGIC CROSS-SECTIONS
ABT-GPZ-2 PIEZOMETER LOCATION
B82-SD-102/ B82-SW-102 SURFACE WATER/ SEDIMENT SAMPLE NOT USED FOR GEOLOGIC CROSS-SECTIONS
B82-G-101 STAFF GAUGE LOCATION
B82-TP-100 TEST PIT
A A' CROSS-SECTION LINE
NOTES:
1. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. WELL LOCATIONS FROM EGIS, VERSION 10, AND JANUARY 2007 SURVEY BY OEST.
4. HORIZONTAL COORDINATES REFERENCED TO THE NORTH AMERICAN DATUM (NAD 83), MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MAINLAND ZONE, IN UNITS OF FEET.
5. ELEVATIONS REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929, IN UNITS OF FEET.
GRAPHIC SCALE
50' 0' 50 100'
TETRA TECH NUS, INC.
GEOLOGICAL CROSS-SECTION LOCATION MAP
REMEDIAL INVESTIGATION REPORT
BUILDING 82 SITE
NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS
FILE \..\X-SECTION_LINES.DWG
SCALE AS NOTED
FIGURE NUMBER 3-2
REV 0
DATE 06/18/09
ACAD: \02073\RI.DF.B82\X-SECTION_LINES.DWG 06/18/09 DWM

ACAD: \00028\0625\X-SECTIONS.DWG 10/04/07 DWM

A

A'

ELEVATION (FT)

160
150
140
130
120
110
100

NORTHERN DITCH

SD-100/SW-100

MW-200D
MW-200S

SB-110

(Sewer offset approximately11 feet east of cross-section line)

SB-111

MW-01D
MW-02

(Sewer offset approximately 8 feet west of cross-section line)

SB-112

SB/MW-03D

SB-113

MW-202S
MW-202D

SD-101/SW-101

SOUTHERN DITCH

ASPHALT OR CONCRETE SURFACE

SANDY FILL (INTERPRETED)

SAND AND SILT

SAND

SAND, SILT, AND GRAVEL (POTENTIAL TILL)

SILT AND CLAY

SB/MW-03D

SOIL BORING / WELL LOCATION ID

GROUND SURFACE

TOP OF WELL SCREEN

BOTTOM OF WELL SCREEN

BOTTOM OF BORING

GRAPHIC SCALE

0′ 50′ 100′

SHALLOW GROUNDWATER ELEVATION (NOVEMBER 30, 2006)

ELEVATION OF BEDROCK (ESTIMATED BETWEEN BORINGS WHERE BEDROCK CONFIRMED)

APPROXIMATE LOCATION OF EAST 42 INCH DIAMETER STORM SEWER

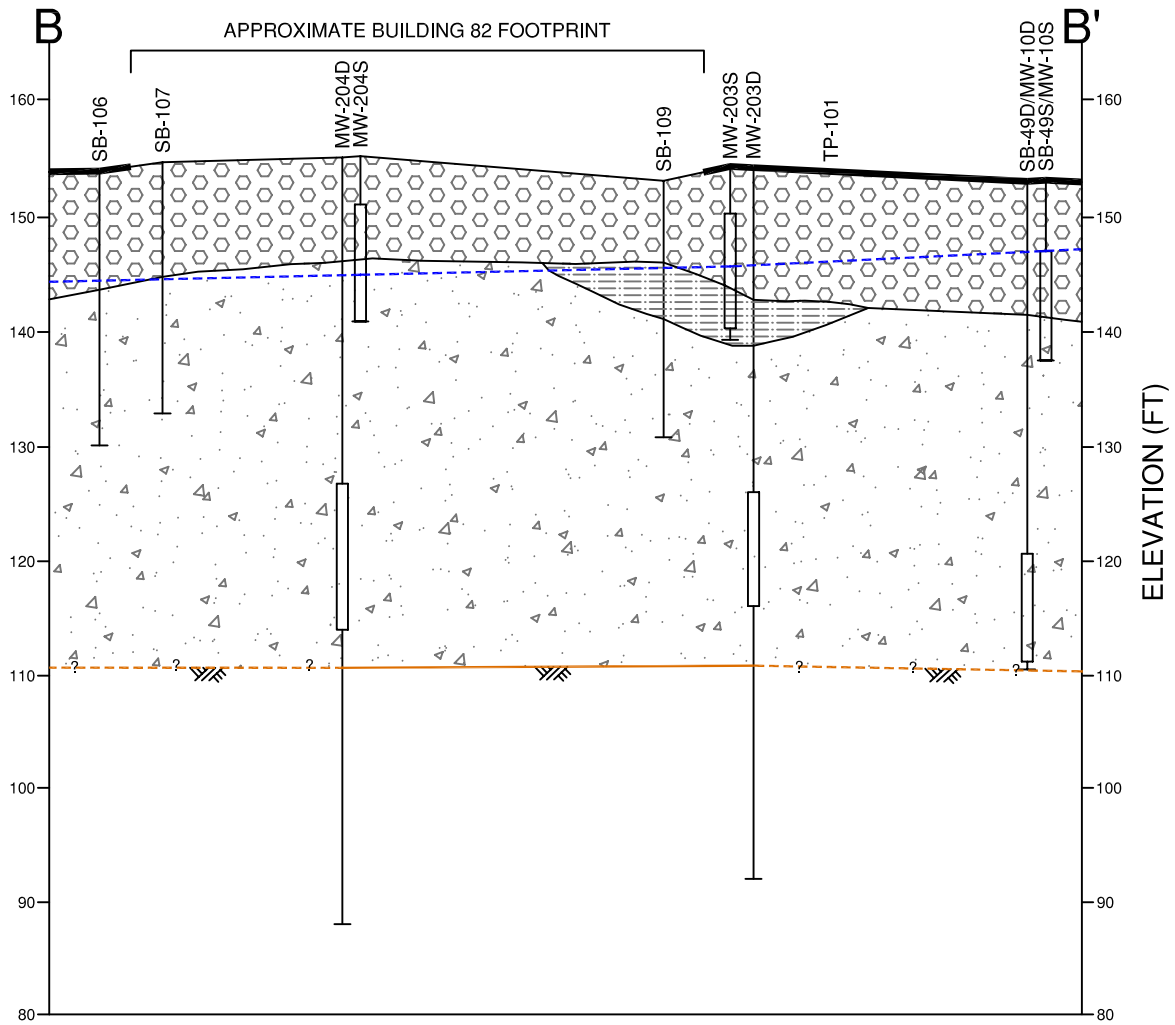
ELEVATIONS IN NGVD 1929, FEET

TETRA TECH NUS, INC.

GEOLOGICAL CROSS-SECTION A-A'
REMEDIAL INVESTIGATION REPORT
BUILDING 82 SITE
NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

FILE	SCALE
\00028\0625\X-SECTIONS.DWG	AS NOTED
FIGURE NUMBER 3-3	REV 0 / DATE 10/04/07

ACAD: \02073\RI.DF.B82\X-SECTIONS.DWG 07/21/09 DWM



ASPHALT OR CONCRETE SURFACE

SANDY FILL (INTERPRETED)

SAND, SILT, AND GRAVEL (POTENTIAL TILL)

SAND AND SILT

SB-401D/MW-10D — SOIL BORING / WELL LOCATION ID

GROUND SURFACE

TOP OF WELL SCREEN

BOTTOM OF WELL SCREEN

BOTTOM OF BORING

SHALLOW GROUNDWATER ELEVATION (NOVEMBER 30, 2006)

ELEVATION OF BEDROCK (ESTIMATED BETWEEN BORINGS WHERE BEDROCK CONFIRMED)

ELEVATIONS IN NGVD 1929, FEET

GRAPHIC SCALE

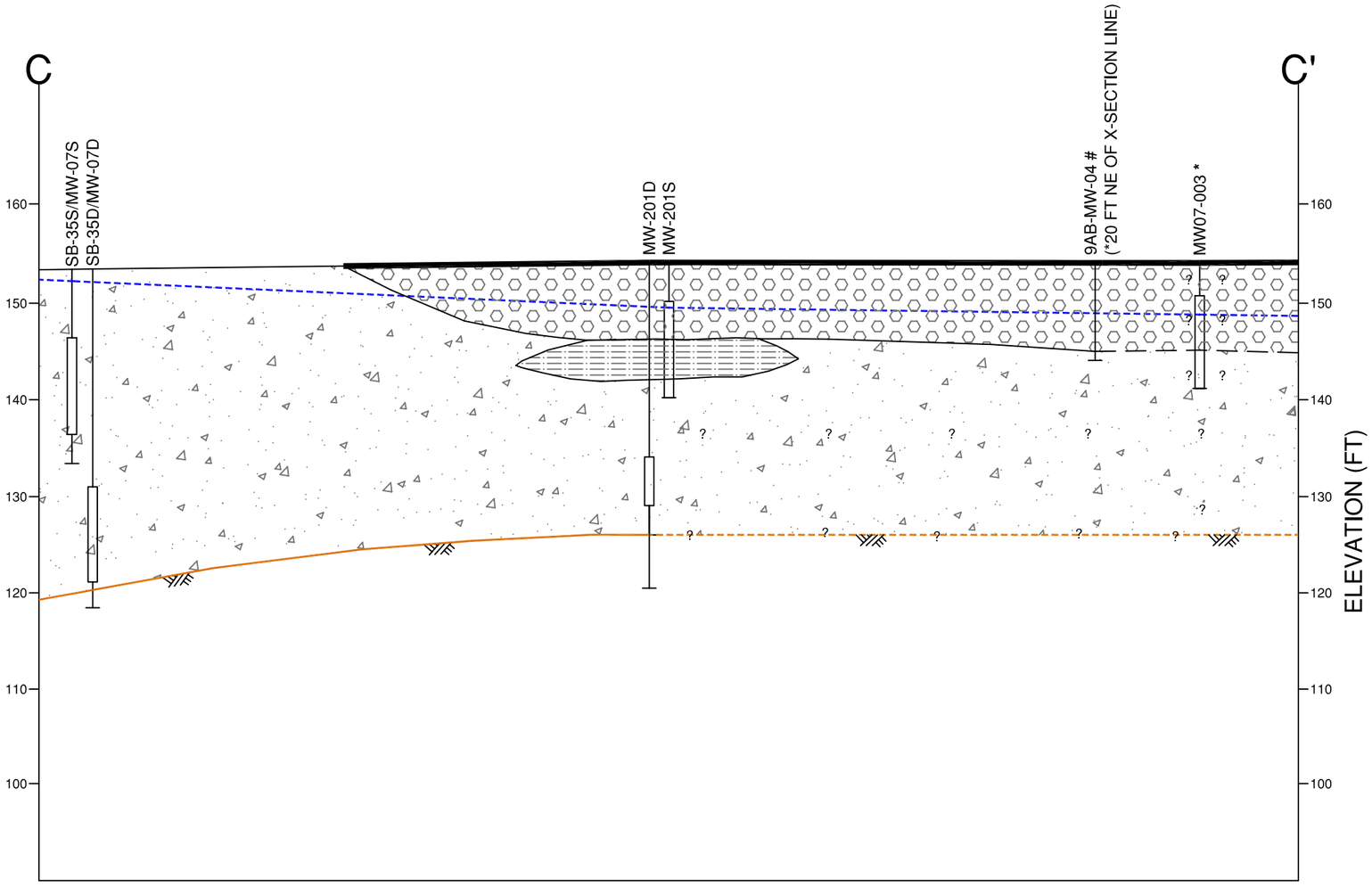
0′ 60′ 120′

TETRA TECH NUS, INC.

GEOLOGICAL CROSS-SECTION B-B'
REMEDIAL INVESTIGATION REPORT
BUILDING 82 SITE
NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

SCALE	AS NOTED
FILE	\..\X-SECTIONS.DWG
REV	0
DATE	07/21/09
FIGURE NUMBER	3-4

ACAD: \02073\RI.DF.B82\X-SECTIONS.DWG 07/21/09 DWM



ASPHALT OR CONCRETE SURFACE

SANDY FILL (INTERPRETED)

SAND AND SILT

SAND, SILT, AND GRAVEL (POTENTIAL TILL)

SB-35S/MW-07S

SOIL BORING / WELL LOCATION ID

GROUND SURFACE

TOP OF WELL SCREEN

BOTTOM OF WELL SCREEN

BOTTOM OF BORING

GRAPHIC SCALE

0′ 50′ 100′

SHALLOW GROUNDWATER ELEVATION (NOVEMBER 30, 2006)

ELEVATION OF BEDROCK (ESTIMATED BETWEEN BORINGS WHERE BEDROCK CONFIRMED)

- SHALLOW STRATIGRAPHY BASED ON DESCRIPTION IN ENSR 2000

* - NO SOIL DATA, WELL CONSTRUCTION AND WATER ELEVATION DATA ONLY

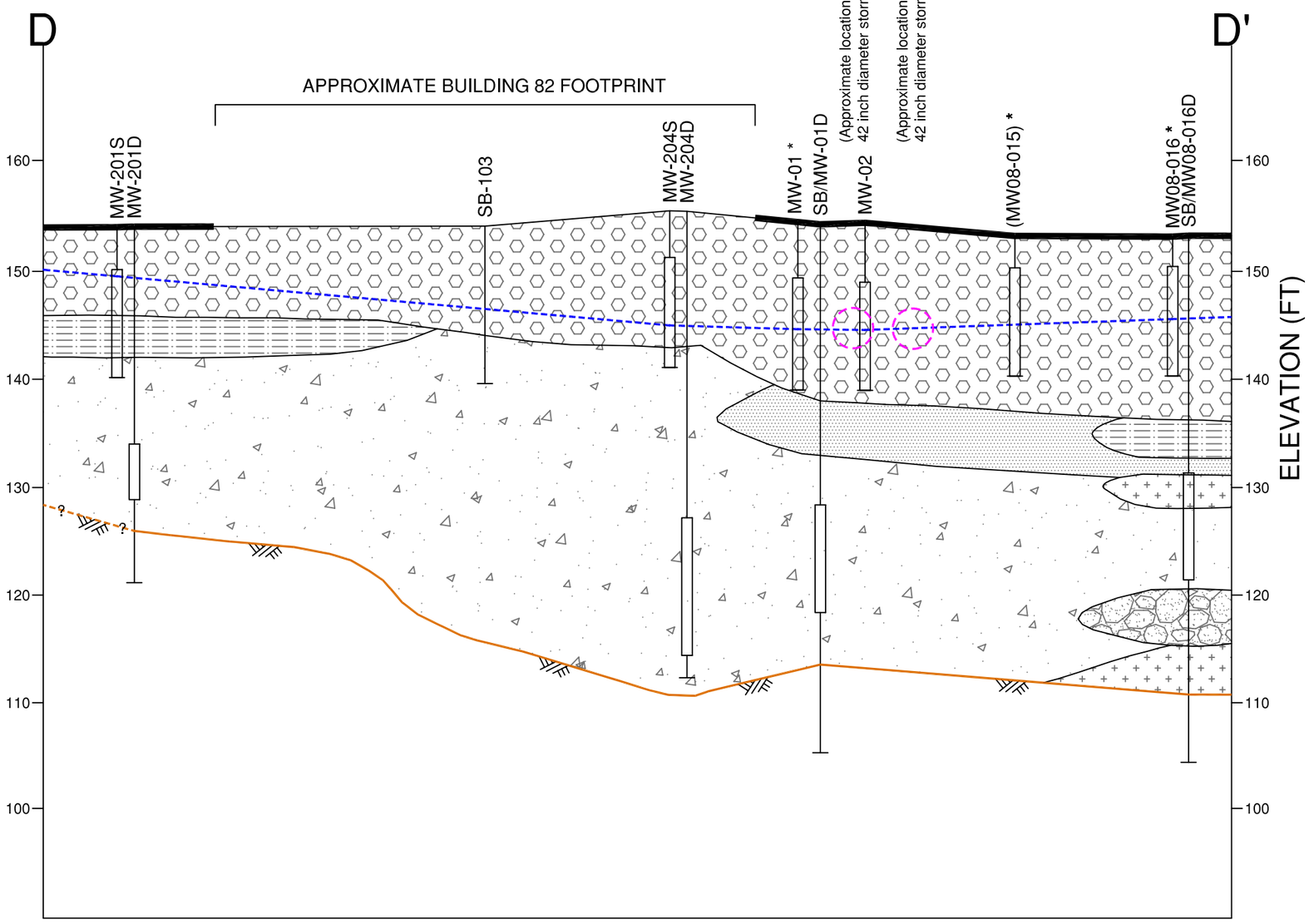
ELEVATIONS IN NGVD 1929, FEET

TETRA TECH NUS, INC.

GEOLOGICAL CROSS-SECTION C-C'
REMEDIAL INVESTIGATION REPORT
BUILDING 82 SITE
NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

FILE	SCALE
\..\X-SECTIONS.DWG	AS NOTED
FIGURE NUMBER 3-5	**REV** 0 **DATE** 07/21/09

ACAD: \02073\RI.DF.B82\X-SECTIONS.DWG 07/21/09 DWM



ASPHALT OR CONCRETE SURFACE

SANDY FILL (INTERPRETED)

SAND AND GRAVEL

SAND AND SILT

SAND

SAND, SILT, AND GRAVEL (POTENTIAL TILL)

SILT

SB/MW08-016D — SOIL BORING / WELL LOCATION ID

GROUND SURFACE

TOP OF WELL SCREEN

BOTTOM OF WELL SCREEN

BOTTOM OF BORING

SHALLOW GROUNDWATER ELEVATION (NOVEMBER 30, 2007)

ELEVATION OF BEDROCK (DASHED LINE IS AREA OF ESTIMATION)

* - NO SOIL DATA, WELL CONSTRUCTION AND WATER ELEVATION DATA ONLY

APPROXIMATE LOCATION WHERE 42 INCH DIAMETER STORM SEWER AND CROSS-SECTION LINE INTERSECT

ELEVATIONS IN NGVD 1929, FEET

GRAPHIC SCALE

0′ 50′ 100′

(MW08-015) GROUNDWATER CONTOUR NOT USED IN CROSS-SECTION. DATA DETERMINED TO BE INACCURATE.

TETRA TECH NUS, INC.

GEOLOGICAL CROSS-SECTION D-D'
REMEDIAL INVESTIGATION REPORT
BUILDING 82 SITE
NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

FILE	SCALE
\..\X-SECTIONS.DWG	AS NOTED
FIGURE NUMBER 3-6	REV 0 / DATE 07/21/09

ACAD: \02073\RI.DF.B82\X-SECTIONS.DWG 07/21/09 DWM

E

GSB-02/ABT-MW-58D
ABT-MW-58

SB-50S/MW-11S
SB-50D/MW-11D

SB-39S/MW-9S
SB-50D/MW-9D

MW-202S
MW-202D

E

160
150
140
130
120
110
100

ASPHALT OR CONCRETE SURFACE

SANDY FILL (INTERPRETED)

SAND AND SILT

SAND, SILT, AND GRAVEL (POTENTIAL TILL)

SB-35S/MW-07S

SOIL BORING / WELL LOCATION ID

GROUND SURFACE

TOP OF WELL SCREEN

BOTTOM OF WELL SCREEN

BOTTOM OF BORING

GRAPHIC SCALE
0' 50' 100'

SHALLOW GROUNDWATER ELEVATION (NOVEMBER 30, 2006)

ELEVATION OF BEDROCK (ESTIMATED BETWEEN BORINGS WHERE BEDROCK CONFIRMED)

TETRA TECH NUS, INC.

GEOLOGICAL CROSS-SECTION E-E'
REMEDIAL INVESTIGATION REPORT
BUILDING 82 SITE
NAVAL AIR STATION SOUTH WEYMOUTH
WEYMOUTH, MASSACHUSETTS

FILE	SCALE
\..\X-SECTIONS.DWG	AS NOTED
FIGURE NUMBER 3-7	**REV** 0 **DATE** 07/21/09

Appendix D

Evidence of MassDEP Concurrence, U.S. EPA and MassDEP Comments, and Navy Responses to Comments

JANUARY 23, 2018 RESPONSE TO ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS RECEIVED JANUARY 10, 2018 AND MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION (MassDEP) COMMENTS RECEIVED DECEMBER 18, 2017, FOR THE DRAFT (V2) BUILDING 82 EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD), DATED DECEMBER 8, 2017, FORMER NAVAL AIR STATION SOUTH WEYMOUTH, WEYMOUTH, MASSACHUSETTS

EPA Comments:

General Comments

The following comments are predicated on the assumption that PFAS in groundwater will be addressed under a separate Operable Unit to OU11.

Specific Comments

1. **Comment:** p. iii. PFOA is misspelled.

   Response: The spelling will be corrected.

2. **Comment:** p. 1. EPA signature is incorrect. Bryan Olson is the Director, Office of Site Remediation and Restoration..

   Response: The EPA signatory will be updated.

3. **Comment:** p. 8, §3.3, 1st bullet. Please remove "that" from the 2nd sentence.

   Response: Requested change will be made.

4. **Comment:** p. 8, §3.3, ¶ 1. As its definition was removed from p. 2., the term RGs needs to be spelled out.

   Response: Requested change will be made.

5. **Comment:** p. 11, Footnote. Please define PFOA and PFOS.

   Response: Requested change will be made.

6. **Comment:** p. 14, §5.1.2. Should the date range for the sampling events read "between 2013 and 2017?

   Response: Yes, the date range will be corrected to "between 2013 and 2017."

7. **Comment:** p. 25, References. The 2nd reference should be a final document. Is the 8th reference (TetraTech, Inc 2012) a Draft Final?

   Response: The 2nd reference will be updated to reflect that the RACR was finalized in January 2018. The 8th reference is a Draft Final, acting as Final. This will be clarified in the references.

8. **Comment:** Please include the SRA minutes on the APD removal as well as the 11/1/17 MADEP revised U&V Determination documents referenced on p. 10. §4.0, ¶ 3, in the document appendix.

   Response: Requested change will be made.

MassDEP Bureau of Waste Site Cleanup Comments:

9. **Comment:** Section 4.0: To assist the Weymouth Board of Health in preventing exposure to groundwater that could pose unacceptable risk via private drinking water wells, MassDEP requests that the Navy, following execution of the ESD, submit a letter to the Board summarizing the contents of the ESD and, in particular, identifying the extent of remaining groundwater contamination at the site. Though the Board has an established permit process that would generally be expected to produce this information, MassDEP is concerned that site-specific circumstances may limit the effectiveness of the permit process. For example, on-line resources such as MassDEP's Waste Site/Reportable Releases Look Up database, which usually provide an independent means to confirm information submitted in a permit request, cannot be used to find site-specific information about the Building 82 site, and a concise reference document that shows the extent of remaining groundwater contamination at the base is not available, potentially burdening the Board with an onerous review of the voluminous base administrative record.

   Response: Following execution of the ESD Navy agrees to submit a letter to the Board of Health summarizing the contents of the ESD and, in particular, identifying the extent of remaining groundwater contamination at the site. A draft of the letter is attached.

10. **Comment:** Section 5.1.2 Recreational Adult/Child: Please confirm or correct the stated HI for TCE and manganese (0.55 instead of 0.46?).

    Response: The HI for TCE and managese (based on combined target endpoints) is 0.55. The text will be revised to reflect this.

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE EAST
4911 SOUTH BROAD STREET
PHILADELPHIA, PA 19112-1303

5090
Ser BPMOE/18-xxx
February xx, 2018

Ms. Maureen DelPrete, Chair
Weymouth Board of Health
75 Middle Street
Weymouth, MA 02189

Subject: Building 82 Site Explanation of Significant Differences
Former NAS South Weymouth, Massachusetts

Dear Ms. DelPrete:

On February xx, 2018, the US Navy in conjunction with the U.S. EPA and MassDEP issued an Explanation of Significant Differences (ESD) for the Building 82 site. The ESD changed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedy for the site to No Further Action. A brief summary of the ESD is provided below, including a description of the extent of remaining groundwater contamination at the site. This information is being provided to assist the Board of Health in preventing exposure to the groundwater, which could pose unacceptable risk if it were used as drinking water.

Summary of the ESD

The original September 2012 Building 82 Record of Decision (ROD) included In-situ Chemical Oxidation (ISCO) of VOCs in groundwater. Trichloroethene (TCE) concentrations are present at the site at concentrations up to 20 parts-per-billion (ppb), which exceeds the Maximum Contaminant Level (MCL) of 5 ppb. Manganese is present at the site above the EPA Health Advisory of 300 ppb. The ROD also included implementation of Land Use Controls (LUCs) to prohibit the installation of groundwater extraction wells for production, supply, or irrigation at the

Site, and require Navy, U.S. EPA, and MassDEP approval of construction dewatering plans be obtained prior to conducting any construction dewatering activities at the site.

In April 2017, the Southfield Redevelopment Authority (SRA) Board of Directors voted in favor of excluding aquifer that underlies the Building 82 Site from the aquifer protection district (APD). In November 2017, the MassDEP issued a Second Amendment to the Groundwater Use and Value Determination (GUVD) for the Former NAS, so that the aquifer is no longer identified as a Potential Drinking Water Source Area (PDWSA); therefore, under EPA groundwater guidance standards, the beneficial reuse for the aquifer is no longer identified as drinking water.

Based on these actions, groundwater underlying the Site and specifically within the Hangar 1 Aquifer (a non-PDWSA) - is no longer considered a suitable source of public drinking water, and drinking water would not be an anticipated potential future use. In light of this significant change, the risk assessment included in the September 2012 ROD was revised because the groundwater at the Site has been determined to have low use and value; therefore, the aquifer no longer needs to be restored for beneficial use as a drinking water source. Instead, potential risk from exposure with the contaminated groundwater based on a non-potable use scenario was assessed. Although groundwater used as drinking water is not considered a potential future use, other future uses of groundwater from the Site are considered possible, including irrigation. The Site has been zoned as a Village Center District, which could include a range of future uses from residential to commercial and light industrial land uses. The revised risk evaluation determined that existing groundwater contamination at the Building 82 Site does not exceed CERCLA risk standards for unrestricted contact exposure.

The revised risk assessment was included in the February xx, 2018 ESD, which altered the selected remedy outlined in the September 2012 Building 82 Record of Decision (ROD) to no further action.

Closing

Although not a part of the CERLA remedy, Navy intends on placing a deed restriction on the site to prevent exposure to groundwater. This notice is being provided to the Board of Health as an extra measure to ensure that you are aware that the groundwater at the site is not suitable for consumption. A figure showing the extent of TCE and manganese impacts is included as **Attachment A**. A CD containing an electronic copy of the ESD is included as **Attachment B**.

If you have any questions, or require additional information beyond what is provided in this document, please contact me at 781-626-0105.

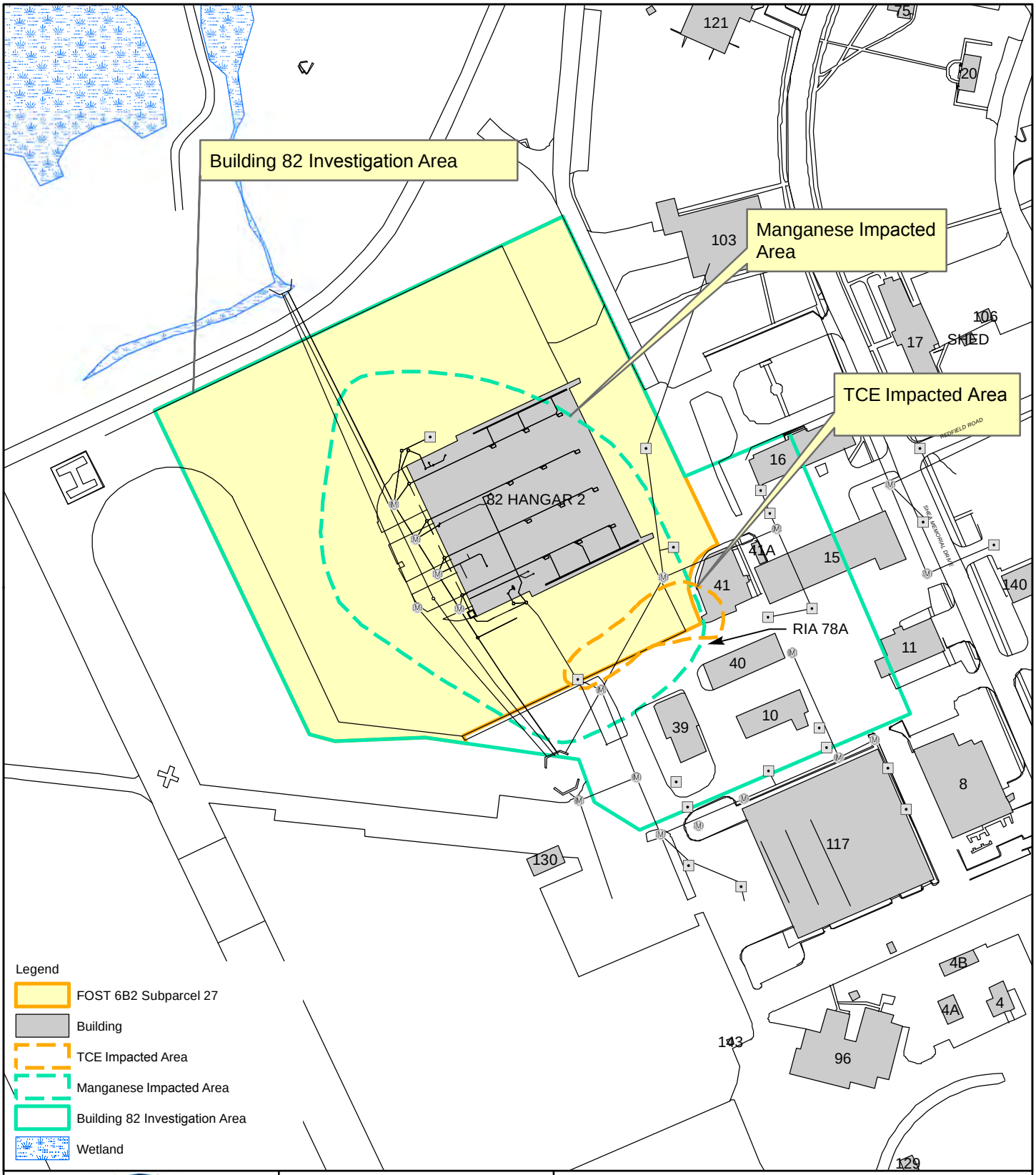
Sincerely,

DAVID BARNEY
BRAC Environmental Coordinator
By Direction of BRAC PMO

Copy to: NAVFAC MIDLANT (B. Helland)
EPA (M. Audet)
MassDEP (D. Chaffin)

Attachments:

Attachment A – Figure of TCE and Manganese Impacts
Attachment B - February xx, 2018 ESD (provided on CD)



RESOLUTION CONSULTANTS

Drawn:	JB	09/24/2017
Approved:	MS	09/24/2017
Project #:	60274866	

N

0 100 200

Scale in Feet

Attachment A
Trichloroethene and Manganese Areas Not Suitable for Human Consumption

FORMER NAVAL AIR STATION SOUTH WEYMOUTH

Path: P:\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\South_Weymouth\GIS\Projects\Building_82\FOST\MXD\Fig_5_LUC_Boundary_NAUL_Boundary.mxd

From: Audet, Matthew <Audet.Matthew@epa.gov>
Sent: Wednesday, January 31, 2018 9:58 AM
To: Snyder, Michelle; Chaffin, David (DEP)
Cc: Helland, Brian J CIV NAVFAC MIDLANT, EV (brian.helland@navy.mil); Barney, David A CIV NAVFAC HQ, BRAC PMO
Subject: RE: Draft Final B82 ESD and RTCs

EPA has reviewed the subject document and has no further comment. mra

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From: Snyder, Michelle [mailto:Michelle.Snyder@aecom.com]
Sent: Tuesday, January 23, 2018 12:55 PM
To: Audet, Matthew <Audet.Matthew@epa.gov>; Chaffin, David (DEP) <david.chaffin@state.ma.us>
Cc: Helland, Brian J CIV NAVFAC MIDLANT, EV (brian.helland@navy.mil) <brian.helland@navy.mil>; Barney, David A CIV NAVFAC HQ, BRAC PMO <david.a.barney@navy.mil>
Subject: Draft Final B82 ESD and RTCs

Hello,

Attached for your review please find the Draft Final Building 82 ESD in tracked changes. RTCs for EPA and MassDEP comments to the Draft V2 are included in Appendix D.

Thank you,

Michelle Snyder, CHMM
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From: Chaffin, David (DEP) <David.Chaffin@MassMail.State.MA.US>
Sent: Tuesday, January 30, 2018 3:34 PM
To: Helland, Brian J CIV NAVFAC MIDLANT, EV (brian.helland@navy.mil); Barney, David A CIV NAVFAC HQ, BRAC PMO; Snyder, Michelle; Audet.Matthew@epa.gov
Cc: Malewicz, Anne (DEP); Rogers, Lucas (DEP)
Subject: RE: Draft Final B82 ESD and RTCs

For Use In Intra-Agency Policy Deliberations

The responses to MassDEP comments and associated revisions are acceptable.

David Chaffin
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Visit our web site: mass.gov/dep

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Sent: Tuesday, January 23, 2018 12:55 PM
To: Audet.Matthew@epa.gov; Chaffin, David (DEP)
Cc: Helland, Brian J CIV NAVFAC MIDLANT, EV (brian.helland@navy.mil); Barney, David A CIV NAVFAC HQ, BRAC PMO
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